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# The Afforestation Gap The Program and Policy Challenge

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## Abstract

The Saskatchewan Forest Centre (SFC) is established and provides direct support to grow the forest and agriculture sector. As part of the SFC mandate, several agroforestry demonstration sites have been established across the province. Through technology transfer activities of the SFC Agroforestry Unit, the SFC has seen a great increase in interest from farmers and land managers in growing trees as part of their crop rotation, mostly throughout the forest fringe/northern grain belt. Of course many questions arise that the SFC has worked to answer in order to respond to this interest. Of main concern is the economics of growing trees.

The development of a reasonable predictive model creates several challenges, including predicting yield, prices, and cost of production twenty years out. A future value model (FV) was developed that shows costs and returns for different yield, management, and end use scenarios. The results show that a plantation managed for a high value end use is certainly profitable and achievable even with the resources available today.

Challenges to programs and policies that would reduce costs, improve yield potential, and remove risk remain in research and development for different aspects of tree production. Issues such as applicability of crop insurance, role of farm income programs, and other risk sharing programs and finance require development. But from the analysis, a substantial opportunity exists to lower cost across three specific areas: yield improvement through genetic research, mechanical planting, and access to registered herbicides for vegetation management options. A commitment to replicate the rapeseed to canola success story and creating scarcity and competition through efficacy in use of the Crown forests would contribute greatly to the realization of this industry for Saskatchewan farmers.

## Introduction

The Saskatchewan Forest Centre is now successfully established and provides direct support to grow the forest and agriculture sector. It began operating in the fall of 2001. Through a series of partnership agreements with nationally renowned corporations, it provides technology transfer services to forest, farm, and value added clients and, through a development fund it fills gaps in province specific knowledge in support of the sector.

The agroforestry component of the Centre is mandated to:

- broaden economic choices for farmers and landowners; and
- increase the long term wood supply.

In 1999 Saskatchewan launched a major expansion of its forest industry, seeking to more than double primary sector output. Over the past several years Saskatchewan has seen nearly \$1B of investment in the primary forest sector. As a result, the Province is moving towards full utilization of its “Crown” forest resource. Through a combination of government policy, expected supply pressures, and a potential response to the Kyoto Protocol, major opportunities now lie in developing a fibre supply on private lands that would diversify Saskatchewan’s rural economy, and in building the associated products and businesses that would add value to this resource.

Provincially and nationally much attention is focused on trees as a viable farm crop and carbon sink, most particularly poplar. Saskatchewan has a significant potential to establish trees as a new crop system given its large agricultural land base, relatively low land prices, soil suitability and declining returns from traditional crops. It contains almost 50% of Canada’s farmland. Saskatchewan contains millions of acres of land that was cleared for agricultural use since the turn of the 20<sup>th</sup> century; these acres hold great potential for the successful development of a new industry based on planting trees as a crop.

Agroforestry, and the plantation component described generically as afforestation, are key delivery methods. Demonstrating that trees are a viable crop is undertaken by the SFC Agroforestry Unit through technical information, workshops and advice. In the course of its work, a number of issues have been identified by the farm community including questions about the economics, future markets risk sharing, and agronomics. As a part of its mandate, the Centre has established a number of demonstration sites across the Province utilizing several different species. For the purpose of this paper and presentation, it is not the intent to consider every possible tree variety that might be grown. The focus is on the species which can produce the greatest biomass in the shortest possible time which has a demonstrated use in the lumber industry, hybrid poplar.

## Modeling Methodology and Future Value Results

The adoption of hybrid poplar as a viable alternative will only occur if the economics of the crop, which has high front end costs for establishment and twenty years to realize a return, can be proven up. The development of an economic model for this variety demonstrates further the most immediate gaps in program and policy.

The development of a reasonable predictive model creates several challenges associated with predicting yield and prices twenty years out.

### 1. Yield

Saskatchewan does not have an abundance of hybrid poplar plantations from which to gather yield data. In addition, those the sites which are available for study, generally lack sufficient management information which will be a key determinant of yield. Vegetative management for the first three to four years is critical to establishment. Other data sources include shelterbelts of which there are many across the province, however, given expected differences between plantation layout verses the shelterbelts, yield data is considered somewhat suspect. Other jurisdictions provide another source of information but they are equally difficult to translate to the Saskatchewan environment with great confidence. Notwithstanding the difficulties with the data, the combination of information sources suggest a yield range from dryland plantations of 100 to 200m<sup>3</sup> per acre, with 100m<sup>3</sup> being a poor yield and 200 m<sup>3</sup> exceptional.

### 2. Price

A significant challenge is the estimation of current prices, let alone predicting what the value of the resource will be when it is ready for harvest in twenty years. Hybrid poplar's close substitute is native aspen which is harvested from both Crown forest and private lands. It, generally, is directed toward the commodity industries of pulp and oriented strand board (OSB) and private lands represents a very small percentage of the total tree fibre harvest. Standing privately held aspen has a purchase price in the range of \$2 to \$4/m<sup>3</sup>.

The difficulty in accepting these values as indicative of future poplar values will tend to understate the price. There is no competitive, transparent market. There are effectively only two buyers, the Crown forest is not yet fully utilized and as such there is no scarcity. Saskatchewan is one of two Canadian jurisdictions which have not fully built out its forest industry and so a significant annual allowable cut is available. In addition, while the fibre in such application as OSB are substitutes, the differences between the consistency and quality of a hybrid poplar stand will favour the poplar plantation significantly over native aspen.

It quickly becomes evident that development of a shadow pricing model is required and there appears to be two approaches. One is to review the standing value of poplar in other jurisdictions where there are competitive forces and then to attempt to equalize the other variables that might determine price between Saskatchewan and these other jurisdictions. Some of the variables which will

complicate pricing include wood quality and yield, distance to the mill, respective distance to market, etc.

A simpler methodology which this paper utilizes is an indifference model which relates to the cost of aspen fibre delivered to the mill. It is known from industry that total costs which includes planning, stumpage and renewal fees, silviculture, roads and harvest/haul to get aspen from Saskatchewan's Crown forest is:

- The commodity mill costs for delivered aspen from the forest is \$30 to \$35/m<sup>3</sup>; and
- Value aspen logs delivered are \$60 to \$65/m<sup>3</sup>

Utilizing these values and inflating them out 20 years gives a future value for the commodity (OSB) fibre and higher value logs which, in an environment of scarcity, will set the floor price. The key assumption is that the industry would be indifferent in regard to where they source their fibre if the cost to them is the same.

### 3. Costs of Production

A number of the costs associated with poplar production have been taken from experiences in the establishment of the Centre's demonstration network. As with any crop production systems, costs are related to specific decisions.

The range of plant stock costs are related to choice of cuttings verses rooted stock. The planting costs represent hand plantings and are higher than those experienced in the crown forest. The difference in cost is a result of the distance to take a planting crew out of Prince Albert across Saskatchewan to relatively small planting areas associated with the demonstration site development. In addition, the efficiency of hand planters relative to mechanized is significantly higher given the level of mechanization currently available. As noted earlier, vegetative management is critical to success and the cost range reflects chemical verses mechanical control with mechanical being higher cost. Pruning is recommended to create clear lumber where some portion of the tree is targeted toward the higher valued industries. If a producer were targeting the OSB market, the pruning and its related costs would not be undertaken.

A core set of gaps in policy and programming becomes evident as a net return model is built out. This model is a future value model utilizing the cost and price structure outlined above. The model is based on the most conservative data in the range. Hence, it uses the highest cost of the range and lowest prices. The cost of harvest/haul is inflated out 20 years as is the two mill delivery costs which represent the price to producers. Taxes have been assumed to be \$5/ac/yr. The model also has built in a return to land and management of \$25/ac/yr. In addition to the data above, the following model assumptions have been applied to develop a future value model.

## Future Value (FV) Model

Future value (FV) model assumptions:

- 8X8 spacing – 680 plants/acre.
- Two yield models of 100m<sup>3</sup> and 150m<sup>3</sup>.
- Discount rate of 6%.
- Inflation rate of 2% per year.
- Utilize high cost/low price of range.
- 1/3 of tree used for value added market model.

**Table 1: Key Costs: Poplar Yield of 100m<sup>3</sup>/acre in 20 years**

Activity	Costs*	Cost Range*
Land preparation		\$40/ac
Plant stock	\$0.25 to \$0.40/cutting	\$170 to \$272/ac
Hand Planting	\$0.20 to \$0.30/cutting	\$136 to \$204/ac
Vegetative Management	3 to 4 years	\$150 to \$240/ac
Pruning	2 to 3 years	\$120 to \$180/ac
Taxes	\$5/ac/yr for 20 yrs.	\$100
Harvest/Haul	\$12 to \$15/m <sup>3</sup>	\$1,200 to \$1,500/ac
Return to Land & Management	\$25/ac/yr for 20 yrs.	\$500
<b>TOTAL</b>		<b>\$2,416 to \$2,836/ac</b>

\* 2004 dollars

**Table 2: Key Costs: Poplar Yield of 150m<sup>3</sup>/acre in 20 years**

Activity	Costs*	Cost Range*
Land prep.		\$40/ac
Plant stock	\$0.25 to \$0.40/cutting	\$170 to \$272/ac
Hand Planting	\$0.20 to \$0.30/cutting	\$136 to \$204/ac
Vegetative Management	3 to 4 years	\$150 to \$240/ac
Pruning	2 to 3 years	\$120 to \$180/ac
Taxes	\$5/ac/yr for 20 yrs.	\$100
Harvest/Haul	\$12 to \$15/m <sup>3</sup>	\$1,800 to \$2,250/ac
Return to Land & Management	\$25/qc/yr for 20 yrs.	\$500
<b>TOTAL</b>		<b>\$3,016 to \$3,786/ac</b>

\* 2004 dollars

The production of wood fibre at a yield of 100m<sup>3</sup> per acre targeted toward the OSB market (scenario 1) will result in a significant net loss. The annual return to land and management of \$25ac/yr. totals almost \$1,000 on a future value bases. Thus, scenarios 2 and 3 come close to breaking even with scenario 4 achieving substantial returns above the cost of production and return to land and management.

**Table 3: Net Future Value Model**

	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>	<b>Scenario 4</b>
Yield	100m3 /ac OSB**	100m3 /ac VA***	150m3 /ac OSB**	150m3 /ac VA***
Revenue	\$4,450	\$5,900	\$6,700	\$8,900
Costs*	\$5,700	\$6,100	\$6,800	\$7,200
<b>Net</b>	<b>(\$1,250)</b>	<b>(\$200)</b>	<b>(\$100)</b>	<b>\$1,700</b>

\* includes \$25/acre/yr to management and land

\*\*OSB is the commodity market

\*\*\*VA is 1/3 to value added market (rest to commodity market)

### Summary

The significant challenge to realizing a return to the production of hybrid poplar is the large front end costs and 20 year wait until a return is realized. The net return model with the four scenarios indicates the potential to almost break even in two out of the four scenarios with only one of them generating significant profits. It is evident that maintaining flexibility in production will be important. Thus, pruning to ensure a higher value product seems prudent given the future market and price uncertainties.

In addition, it is evident that utilization of the lower costs of the range would change the net results and the profitability substantially. As a result, actions that reduce front end costs and increase value will enhance the profitability. There are several policy issues that require additional work to place hybrid poplar plantations on an equal footing with other agricultural crops. Issues such as applicability of crop insurance, role of farm income programs, and other risk sharing programs and finance require development. But from the analysis above, a substantial opportunity exist to lower cost across three specific areas:

- Develop local planting crews and/or develop an automated multi-row planter. If planting costs were reduced to one half, it would save almost \$100/ac in 2004 dollars.
- Vegetative management is critical but the significant drawback to cost reductions is the lack of registered herbicides. Several are registered for shelterbelt use but it is not clear that this registration can be applied to plantations. Expanding the registration for pre and post emergent herbicides will lower vegetative management costs from the high of \$240/ac to \$150/ac.
  - Replicate the rapeseed to canola success for trees with a focused commercial poplar research and development program. It could in one instance reduce the need for pruning if tree development simply focused on tree form (self-pruning). This would eliminate a \$180 per acre cost item.

In total, these actions would save \$370 per acre basis 2004 dollars and substantially change the economics in the model. The Poplar Council of Canada is working to expand

the registration of herbicides. In the other two areas, and given Saskatchewan's capabilities in genetics and farm machinery development, achieving the results required above should not be difficult.

In addition, a focused research and development program might work towards enhancing yield and/or shortening the rotation time. Success in this area will further positively affect the economics of hybrid poplar plantation farming.

Lastly, it is important that the province continue to build out the Crown forest and reach the annual allowable cut to create demand for wood fibre based on scarcity and a competitive market.