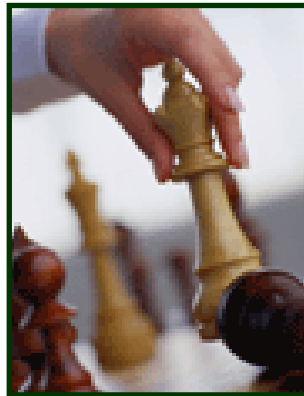


SOMATIC EMBRYOGENESIS



MARKETING PLAN

**MBA 823:
BIOTECHNOLOGY MANAGEMENT
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1.0 Introduction

In order for somatic embryogenesis (SE) to be commercially viable, capitalizing on the process requires high technology, skilled and involved innovators and implementers, supportive management staff, and development of knowledge regarding future value gains. As a developing technology, the costs for implementing SE currently remain high, at about \$0.12 per plantling, and incomparable to conventional methods, at under \$0.02 per seedling. However, if future values of product include the gains realized through enhanced genetic traits, this too can be calculated to present value and considered in consumer decisions.

This analysis seeks to detail a marketing plan applicable to a start-up forest biotechnology firm specializing in somatic embryogenesis (SE). The study follows a 13-step marketing plan that explore the situation analysis, a marketing strategy, the financials and controls that are used to determine strategy. Each section details the factors that are most important to a firm offering SE as a commercial process to enhance woodlands operations.

2.0 Forest Biotechnology Issues

One of the most critical success factors to the implementation of somatic embryogenesis (SE) is the ability to compete commercially with a process that creates value for the consumer. Currently, the intensive skills and experience required to execute SE, combined with costly lab equipment and lengthy nursery costs, cannot create a product for less than conventional seedling regeneration methods. Forest biotechnology offers value through the full and proper assessment of, not only present values for commercial product, but for future value of realized financial gains through a superior product, such as genetic enhancements and selective breeding that enhance quality, growth-to-maturity, and yields. Yield can be accurately estimated based on site index curves that project growth curves of a given species and correlate volume to years of growth through the development of mathematical models that use forest monitoring data, or permanent sample plots (PSP's). Future wood prices and their cost of capital can also be estimated to help determine investment return. It is through the commitment to environmental sustainability that forest product manufacturers can incorporate the costs of sustainability into their management planning. Likewise, the inclusion of value gains in

future forest products can be included in management planning. Thus, determining these value gains through empirical modeling become a critical tool in marketing SE.

Consumer sovereignty is the notion that consumers ultimately determine what goods and services are produced and how limited resources are used based on the purchases they make¹ or by registering their “dollar votes”. Three important criteria in assessing consumer acceptance, leading to consumer sovereignty, should be explored in relation to forest biotechnology, namely information, trust and choice. Information is used to develop consumer comprehension about the service and provide critical knowledge about the value enhancing characteristics of the service. Trust is more difficult to quantify but can be correlated to reliability of information, company image and corporate social responsibility, and experiences of other consumers. Choice provides the consumer the ability to compare services and goods and arrive at a decision about what is most preferred or suitable. In combination, these three elements can lead to consumer sovereignty and independent consumer choice through the recognition of value. In forest biotechnology, many producers seek to codify the future value enhancing capabilities of the product and create more defensible information that reflects these value gains. While little choice currently exists for the consumer, firms can develop a sense of trust through investing effort into creating more information and relating that information to the consumer in ways that help create a better understanding of value gains. And since forest growth results take such a long time to perceive, the realized value gains will have to be determined through analysis and forecasting and thus information becomes an important driver in creating a better understanding of the value enhancing properties of the product. However, that is not to say trust and choice are not equally critical to consider. Forest biotechnology firms will want to ensure they maintain a quality and responsible image as well as maintaining capable and skilled staff to ensure they are implementing “best practices” and remaining accountable to the public, in turn building trust. Likewise, firms will also want to continue to develop new applications of forest biotechnology, such as the application of SE to other species, so that consumer feels comfortable with the product offering and can identify what best suits their needs, in turn building more choice for the consumer.

3.0 Marketing Plan

As noted, this plan follows a 13-step analysis to determining the marketing strategy and plan for a start-up forest biotechnology firm specializing in SE. While not all steps in the plan are relevant, each is been explored for the sake of clarity.

3.1 Market Analysis – Diagnostic Steps

3.1.1 Step One: Past Performance of Forest Biotechnology Firm

This step is not particularly relevant for a start-up firm with no historical performance. Forest biotechnology currently remains in research and development phases and field-testing so commercial applications and market results of products are difficult to forecast. As the firm becomes more established and the product or service becomes more defined and accepted, the firm will want to re-evaluate their service or product continually in relation to other competitors in the market.

3.1.2 Step Two: The Forest Regeneration Market

The forest biotechnology market is a burgeoning one, where developments and enhancements to operations continually generate new ways to enhance value for the consumer. The Food and Agriculture Organization of the United Nations (FAO) states that global trade in forest products for 2001 was over \$140 billion.² Of this global trade market, reforestation is estimated to be \$11 billion for North America and over \$50 billion for the world market. Extensive opportunity exists for supplying superior planting stock to land managers interested in the value gains forest biotechnology offers, where regulatory approvals exist.

This forest biotechnology firm would require an active supply chain to meet the needs of supplying planting stock to a client. Relationships should be fostered with the cryogenics laboratory and nurseries, as well the land manager. Figure 1 shows the positioning of the firm in the SE value chain supplied by the tree breeder and serving the nursery and land managers.

3.1.3 Step Three: Forest Biotechnology Competition

There are few firms active in commercial forest biotechnology. Competition primarily consists of large vertically integrated resource powerhouses, such as Weyerhaeuser and Westvaco, and smaller independent biotechnology firms with skilled and experienced research scientists, often supported through institutional or government funding. Figure 2

illustrates an analysis of the competitive forces model as it applies to a start-up forest biotechnology firm, which shows that opportunity may exist with the smaller to medium sized land managers. Large and powerful buyers exist as both consumers and competitors while other forces seem negligible.

3.1.4 Step Four: Forestry Market Research

Forest biotechnology has not yet received viable commercial production in comparison to conventional methods and, as a result, sales and opportunity are currently limited due to the high cost of operations. However, as discussed previously, opportunities do exist with land managers seeking to maximize their value gains for future resource development. Market research should first identify which operational or functional germplasms exist that can utilize SE to create plantlings and correlate this information to the geographical regions that support these species. Further research should identify specific demographics of all plantations and land managers in that geographic region and determine the following subset of consumer interests from targeted consumers:

- ▶ Seeking value enhancing characteristics in next generation of planted stock;
- ▶ Integrates the future value gains of the resource into management planning;
- ▶ Maintains a commitment to environmental sustainability and due diligence; and,
- ▶ Has a sizable plantation operation to realize the gains in value.

Table 1 details specific considerations in analyzing some plausible strengths and weaknesses of a theoretical forest biotechnology firm as well as detailing the opportunities and threats most relevant in the market. The primary strengths of the product include the value enhancing characteristics it offers consumers as well as the skilled and often tacit knowledge needed to execute successful SE, making the firm's capabilities rare and inimitable. Weaknesses would most likely include the lack of business management experience within the firm and the importance of intellectual property and the ramifications this has on human resources and security. Strong external opportunities exist in this large market where land managers seek to enhance their return on investment, however regulatory restriction and high costs of operations hold considerable weaknesses in this very cost conscious industry.

3.2 Market Analysis – Mission Statement Steps

The situation analysis shows that a sustainable competitive advantage can be established, provided the firm considers the importance of reducing operations costs and

providing consumers with more trust about the value gains provided by the product. This competitive advantage can now be developed into a detailed plan that focuses on plantations where SE is currently operational.

3.2.1 Step Five: Target Forestry Markets

Target markets will include all well developed sub-tropical countries that can support Eucalyptus and selected Pine species for growth-to-maturity. Further identification of all plantations and small to medium sized land managers in these areas should detail the location, size of landholdings, sustainable cut allowance, and total sales for each consumer. It is assumed that the forest biotechnology firm would have first-mover advantage and could capture the greater part of market share through establishing professional relationships with interested consumers. However, the most critical hurdle of regulatory approval must also be intensively managed prior to the direct marketing of products resulting from SE. Anticipated market share, assuming regulatory approval, would be 3% to 5% of the total \$50 billion reforestation market, or \$1 billion to \$2.5 billion.

3.2.2 Step Six: SE Product/Process Features

Determining the specific value gains that are realized through using the SE produced plantlings is undoubtedly the most attractive feature of the product. However, due to the long periods required for trees to reach maturity, much of this information is built through monitoring data modeled into the future. These value gains include enhanced wood quality or fibre strengths, quicker growth-to-maturity or rotation lengths, enhanced nutrient uptake and virulence to disease, or developments of new strains of species that can tolerate a wider range of environmental conditions. Currently, SE offers only a superior natural stock of plantlings that achieve a better site index, or faster growth and volume over time.

3.2.3 Step Seven: The Opportunity

Offering small to medium sized land management enterprises the value gains that can be realized through harvesting mature planted stock that hold superior genetic traits. This can be accomplished by focussing on tropical and sub-tropical markets where operational SE species can flourish. It will also be critical to develop positive working relationships with land managers in addition to acquiring regulatory approval.

3.3 Marketing Plan and Implementation

The remainder of this analysis focuses on the realization of the opportunity identification.

3.3.1 Step Eight: Sales and Profit Objectives

Sales and profit objectives will be based upon the contingent factors of regulatory approval and client interest in higher current costs. Intentional market share is estimated to be \$1 billion to \$2.5 billion based on 3% to 5% of the total forest regeneration market. Profitability will be a direct function of the costs of operations and the size of contracts awarded.

3.3.2 Step Nine: Channels of Distribution

The SE process, as illustrated in Figure 1, begins with the source input from a germplasm owner or tree breeder with superior stock. The forest biotechnology firm then manages the germplasm sample to produce the unlimited supply of somatic embryos contracted by a client. Strong relationships with renowned tree breeders and germplasm developers should be maintained to ensure access to superior product is always available. As well, strong relationships with nurseries and plant stock caretakers should be fostered to ensure the outputs are well managed and the end consumer, the land manager, truly receives a superior value-enhancing product. Costs of acquiring germplasm and negotiating costs for nursery development should be closely managed so that competitive and fair prices are established for both suppliers and distributors.

3.3.3 Step Ten: Pricing Policy

A market-based price premium approach to pricing should be implemented, to offset the high research and development costs. However, this should be implemented with close correlation to the value gains anticipated from future realized return as well as correlation to the fair market value, present day, of those value gains. Figure 3 details the specific considerations that a forest biotechnology firm should include in pricing policy determination. It is critical the firm conduct a break-even analysis on operations to ensure the proper pricing levels are used.

3.3.4 Step Eleven: Selecting a Market Mix

Figure 4 details the factors that should be considered when determining a marketing mix for a forest biotechnology firm. However, given that a forest biotechnology firm would offer a very select set of species to apply to forest regeneration, and carry very high operations costs, a marketing mix is not fully relevant. With the exception of the

identification of which geographic markets to pursue and which land managers and plantations qualify for use.

3.3.5 Step Twelve: Selling and Advertising

As forest biotechnology develops into more commercially viable applications, regulatory approvals and social perceptions of the industry will change. It will be crucial for firms to develop accurate and defensible models that calculate the future value gains offered by the product. Building on consumer sovereignty, the firm will also want to address how the firm is fostering trust, offering choice, and providing information to the consumer through continually defining which of these three aspects provides the greatest benefit to the firm. The firm may also wish to celebrate regulatory approvals, however it is important that this does not become a selling feature of the product. The product must offer an enhanced value to the consumer that is better than current offerings not merely be considered allowable by the government. The strong personal relationships and communication with land managers and regulators will be critical to success, as word-of-mouth tends to be the strongest advertising impact in the somewhat parochial forest industry.

3.3.6 Step Thirteen: Marketing Plan Budget

Table 2 itemizes an estimation of marketing costs for conducting surveys and market research and the costs of developing and implementing the marketing plan, and further identifies both the fixed and variable costs associated with each.

4.0 Conclusions

The importance of determining future value gains is critical to the successful marketing of products created through SE. A start-up forest biotechnology firm should focus on codifying and modeling this value gain, both internally and externally, and sharing their findings with consumers. Further focus should maintain a strong personal selling staff and maintenance of good working relationships with germplasm suppliers, downstream nurseries, and all relevant land managers as well as ensuring regulatory approval processes operate smoothly with good communication and feedback. Marketing research should include a break-even analysis, analyses updated at defined intervals, determination of value gains, determination of geographic markets where operational SE may apply, and determination of specific plantations and land managers in the identified markets.

Figure 1 – Forest Biotechnology Value Chain Model

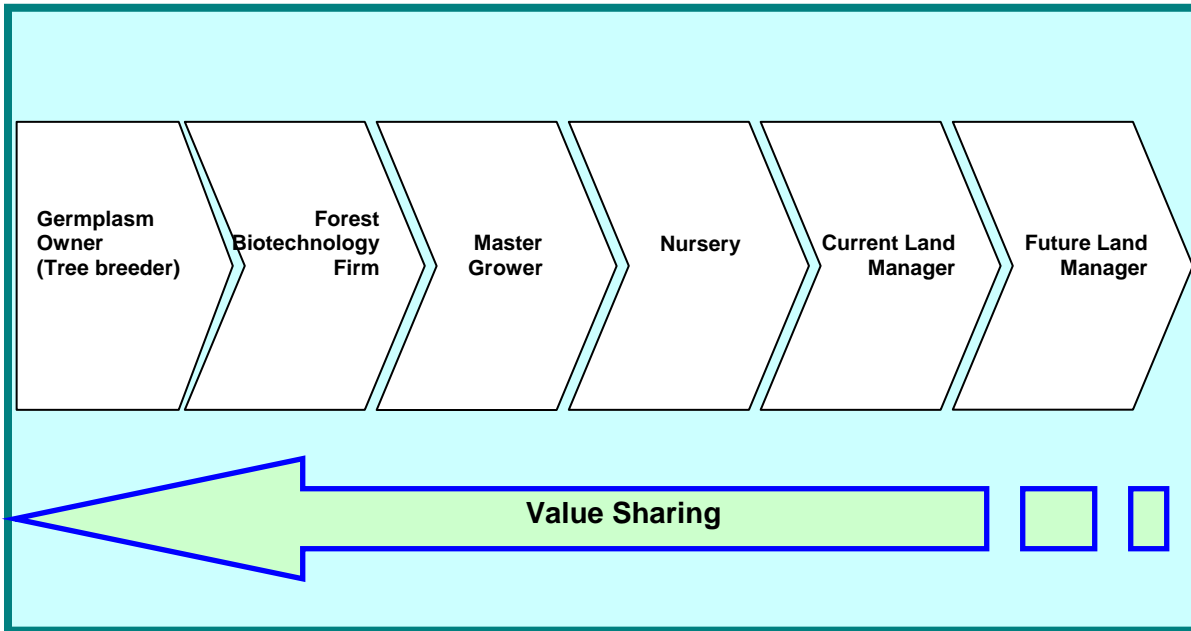


Figure 2 – Competitive Forces Model of a Forest Biotechnology Firm

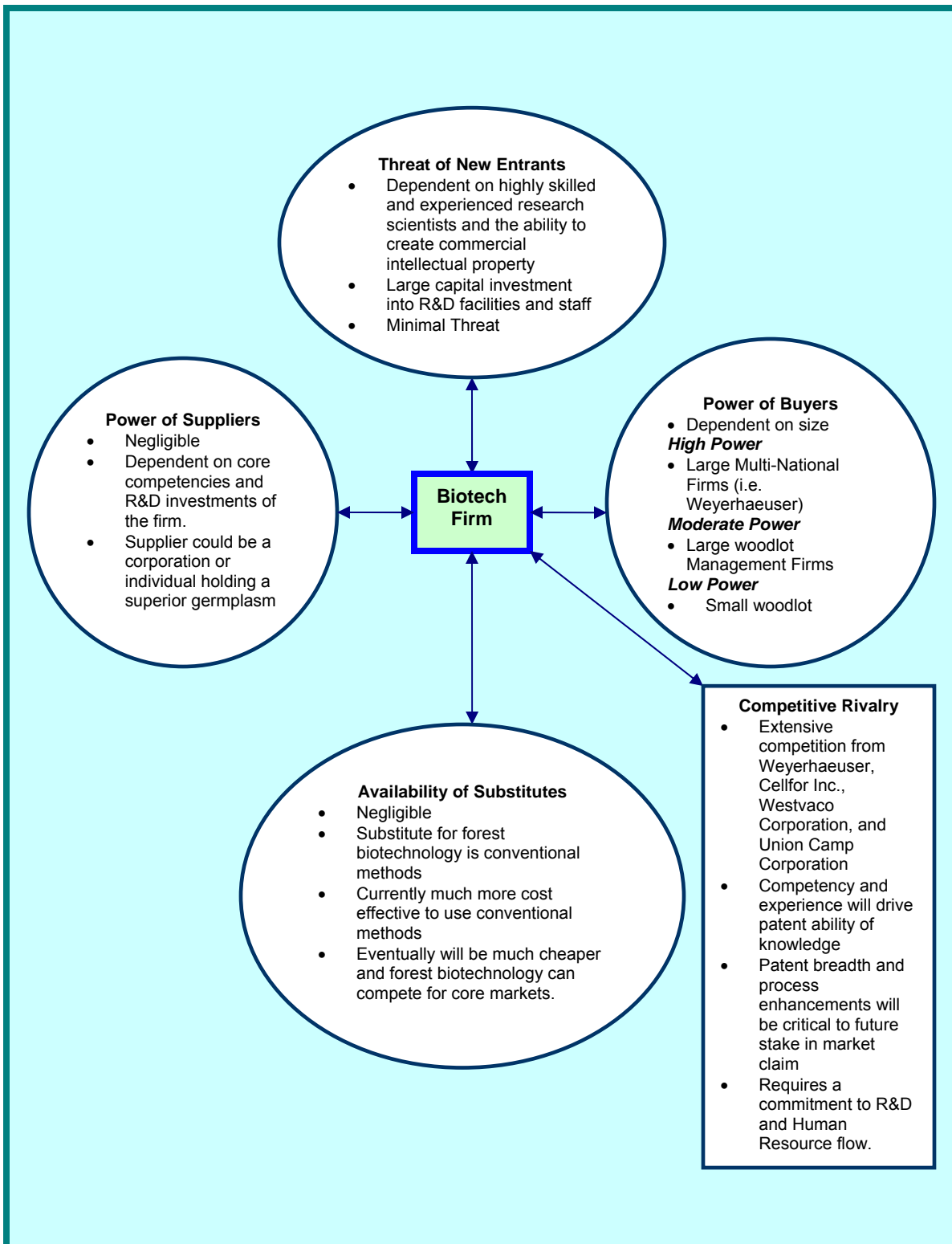


Figure 3 – Forest Biotechnology Pricing Model

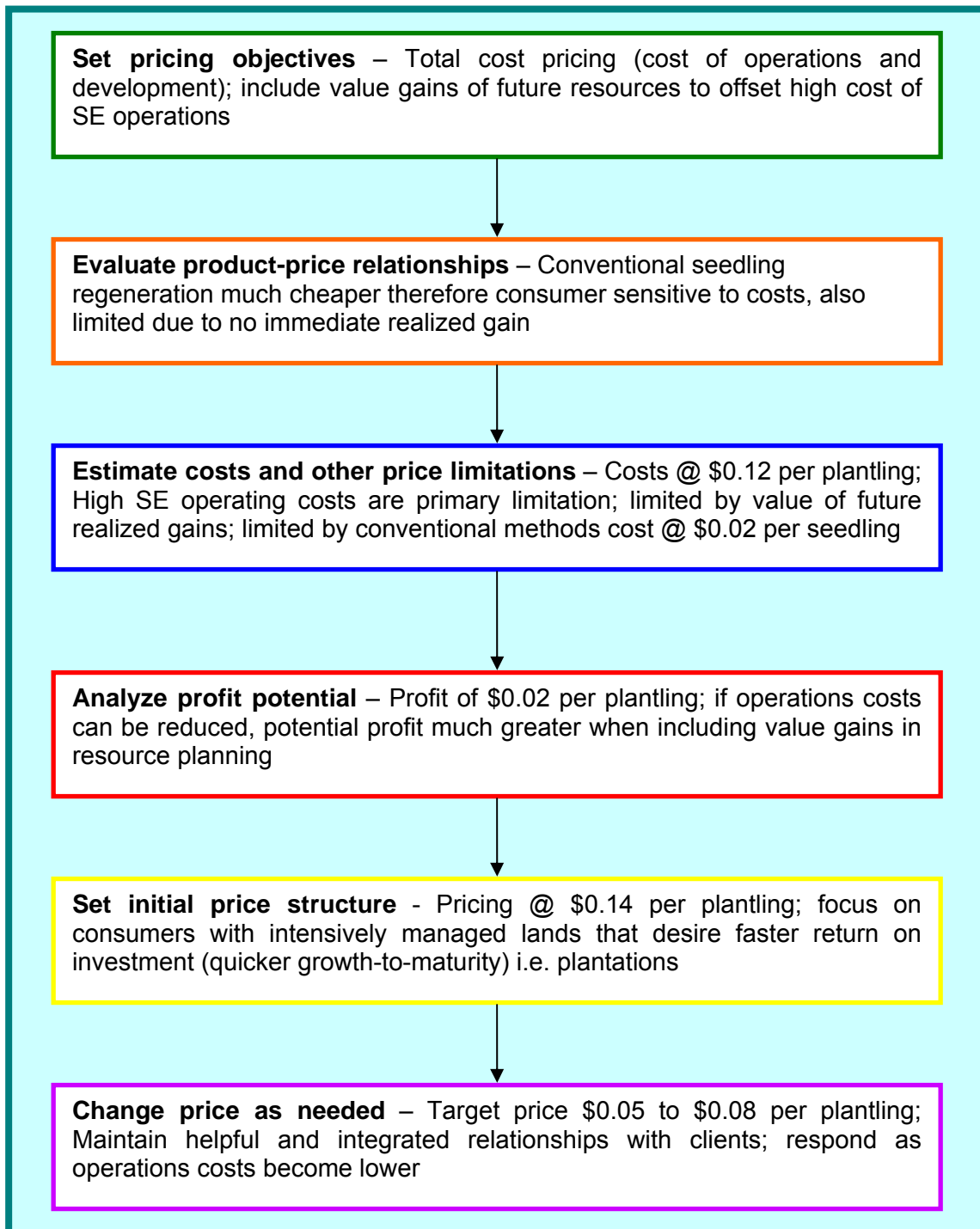


Figure 4 – Forest Biotechnology Market Segmentation Model

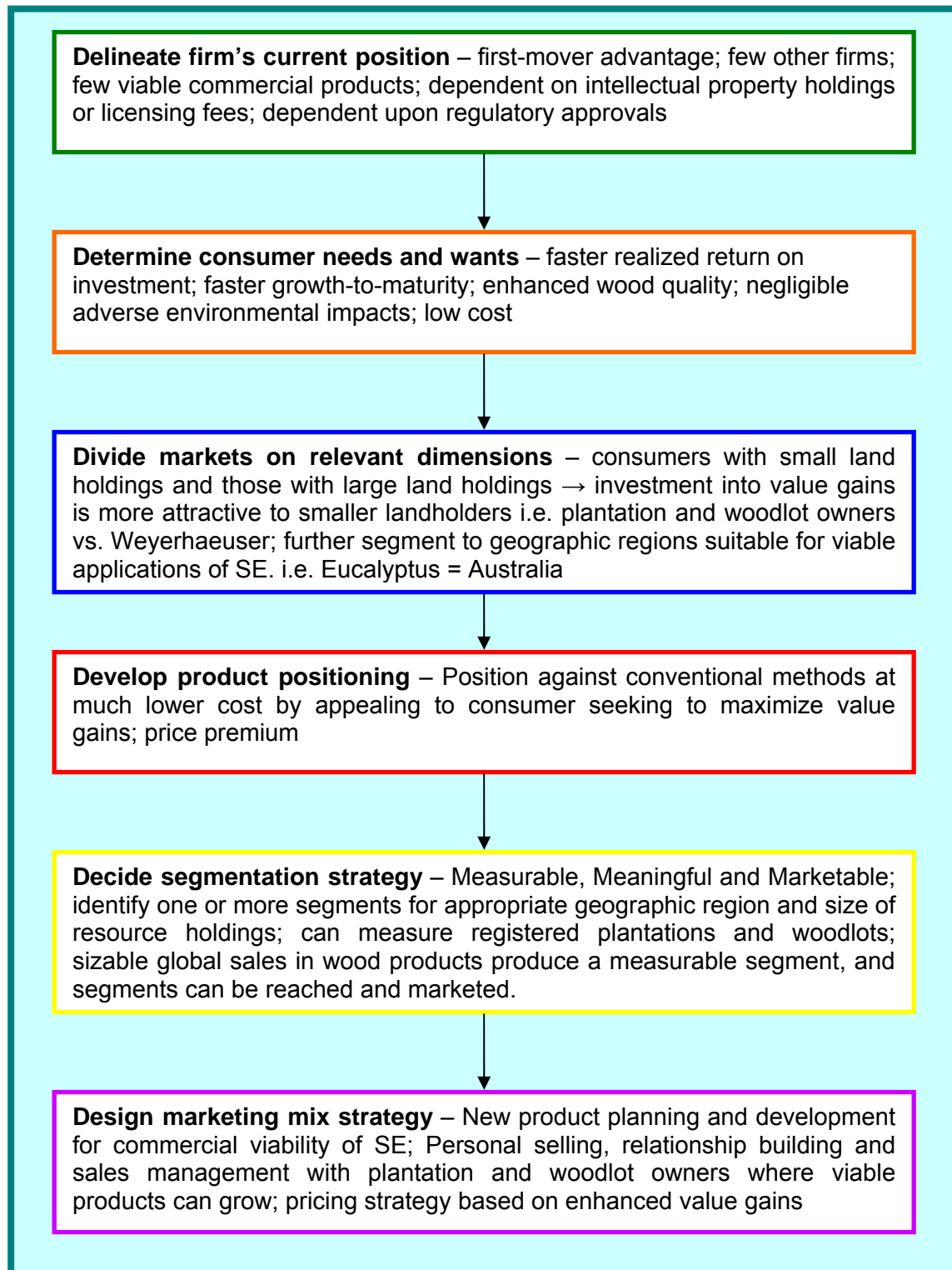


Table 1 – SWOT Analysis for a Start-up Forest Biotechnology Firm in Canada

Strengths Ideal Theoretical Firm	<ul style="list-style-type: none"> • The firm will have to be able to capitalize on joint venture investments of private industry into its industrial application. • They must have a highly qualified and diverse research staff and state of the art technologies to support gene sequencing and trait identification. • They must have a unique and rare product or process that has value enhancing implications to the industry and is patentable • Tacit knowledge is one of their strengths.
Weaknesses Theoretical Firm	<ul style="list-style-type: none"> • New competition from firms as the technology and knowledge becomes more implicit. • Much more research is needed into the applications of SE on other species and in other global climates. • Other more superior germplasms will be the ultimate marketable product once the knowledge is implicit.
Opportunities Forest Biotechnology Market	<ul style="list-style-type: none"> • Helping forest companies achieve higher growth rates, better quality wood fiber, better seedling establishment rates, and better tolerance to insects, disease and drought → Value Enhancing • Extensive research network with experienced scientists and professionals • Large natural resource base with Boreal forest and Eastern forests • Established industry infrastructure • High quality Canadian forest products • Innovative and industrious Canadian economy • Primarily English speaking economy makes English speaking European country communication easier • Low cost of professional labor in Canada • Comprehensive and accountable forest management practices in Canada • Ability to capitalize on European markets from established research protocols and regulatory approvals • Companies will have the first-mover advantage.
Threats Forest Biotechnology Market	<ul style="list-style-type: none"> • Extensive forest management regulation • Large firms dominate proprietary knowledge • International patent law only recognizes intellectual property that is registered in their market – no global patent office • Public acceptance and regulatory structures • Currently no legislated policies regarding biotechnology forestry applications • Public concern over environmental contamination and transgenic release impacts are high • Regulatory policies and procedures for application have yet to be developed and could impact detrimentally the specific products a forest biotech firm is investing knowledge into.

Table 2 – The Marketing Plan Budget

	2003	2008
Fixed Capital Costs		
Market Research <ul style="list-style-type: none"> ▶ Value gains modeling ▶ Market segment research ▶ Consumer pricing sensitivities when considering value gains ▶ Determination of potential consumers i.e. land managers, plantations 	\$35,000 ¹	NA
Competitor Analysis <ul style="list-style-type: none"> ▶ Porter's Analysis 	\$2,000 ²	NA
SWOT Analysis <ul style="list-style-type: none"> ▶ Break-even analysis 	\$5,000 ³	\$2,500 ⁴
Variable Marketing Costs		
Input support – Germplasm and tree breeders ⁵	\$5,000	\$10,000
Output support – Nurseries and land managers ⁶	\$10,000	\$15,000
Sales support – Personal selling and relationship building ⁷	\$80,000	\$190,000
TOTALS	\$95,000.00	\$215,000.00

References

¹ Consumer Sovereignty - <http://www.amosweb.com/cgi-bin/wpd.pl?fcd=dsp&key=consumer+sovereignty>

² Food and Agriculture Organization – Forestry Global Trade Online Database – http://faostat.fao.org/faostat/Forestry/jsp/fytf_q_e.jsp?language=EN&version=ext&hasbulk=

¹ Based on market value of consulting fees for developing market research. This figure is purely an estimate based on the anticipation of 700 hours of work at an average consultant fee of \$50 per hour.

² Based on consulting fee of \$50 per hour for 40 hours.

³ Based on consulting fee of \$50 per hour for 100 hours.

⁴ Based on consulting fee of \$50 per hour for 50 hours. Required to update the external perception of opportunities in the industry.

⁵ Based on support of supply chain duties

⁶ Ibid

⁷ Based on Senior Staff at \$80,000 for Year 1 and the addition of two staff members @ \$40,000 each, including nominal pay increase for the Marketing Director.