

Canadian Grape and Wine Research Strategy

Championing a Winning Example for Canadian Agriculture

May 2007

Acknowledgements

A range of wine grape and wine industry stakeholders were consulted during the preparation of this report. The goal of the consultations was to build a framework with a shared vision, clear communications, collaboration between stakeholders, and advice on future challenges.

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Summary

This report documents the need to:

- Support a national grape and wine research strategy that encompasses the entire grape and wine production value chain, capable of focusing on issues of national importance to provide opportunities for all growers and wineries.
- Support a national grape and wine research strategy that focuses on the following priorities:

Sustainable Viticulture Management Practices

- Environmental sustainability
- Economic sustainability
- Enhanced value promotion
- Identification and capture of market opportunities

Pursuing Consistency and Premium Quality

- Improved consistency of Icewine quality
- Improved consistency of table wine quality
- Improved consistency of grape quality

Pursuing an Improved Business Environment

- Crisis avoidance management
- Access and quick response to new business options

Plant Certification Program

- Establish research expertise to support the development of grape plant certification in Canada

Wine and Grape Genomics

- Establish a national genomics/metabolomics strategy

- Establish a National Wine Sector Research Advisory Council to work in partnership with Agriculture and Agri-Food Canada to provide industry driven direction to research efforts to strengthen the grape and wine value chain through a supportive business environment (see Appendix A).
- Increase Agriculture and Agri-Food Canada investment in wine and grape research and development to ensure the industry is properly equipped to enable quick response to current and future trends to seize opportunities that impact the value chain. National funding should be incremental to existing regional research efforts, but contribute to local, regional, national and international goals of the grape and wine sector (see Appendix B).

Introduction

The Canadian wine and grape industries have grown remarkably since the early 1990s as a result of a successful strategy to develop premium quality grapes and wine. The Canada-US Free Trade Agreement became the catalyst for reviving the Canadian grape and wine industry.

On January 2, 1988, the trade barriers and protection offered to Canadian wine ended and mediocre wines could no longer compete with global Chardonnay or Cabernet Sauvignon. The industry was forced to reinvent -- acres of vines were pulled across Ontario and British Columbia (BC), some wineries closed and others turned to *Vitis vinifera* varietals with a commitment to producing wines of globally competitive quality.

Long term sustainability and the future of the industry will be determined by its ability to adapt to changing market conditions while remaining competitive in the global market.

Canadian wine has demonstrated tremendous success over a relatively short period of time, by attracting world class winemakers, taking tremendous risks, and establishing and supporting research institutions in both BC and Ontario. By better linking research and development and Canada's innovative culture with a strategic industry direction, we can address the many challenges and opportunities that will strengthen all parts of the grape and wine value chain. To achieve this, both industry and government must be prepared to invest in future research requirements of this important agricultural sector.

Canadian Wine Production

Wine is the highest value-added agri-food product in the world, capturing more of the revenue stream by not only crushing grapes and producing wine, but also by packaging, marketing and sales to wholesalers or foreign importers. From vineyard development and grape cultivation to the final sale, wine is a highly complex process that involves numerous suppliers, distributors and service providers throughout the value chain, compounding the economic benefits.

The process requires considerable direct and indirect capital and labour inputs, which leads to the final product leaving the farm gate to be marketed within the domestic and international market. While not all Canadian regions are suitable for premium wine grapes, the limits are continually being tested in different regions across the country. There remains significant potential for the establishment of new grape wineries in BC, Ontario, Quebec, Nova Scotia, New Brunswick and Prince Edward Island. Today, Canada is home to more than 325 wineries and 1,000 grape growers, with dozens of winery licence permits pending across all wine producing regions.

Roughly 90% of Canada's wineries are small or medium-sized businesses (SME), producing less than 500,000 litres of 100% Canadian wine per annum, representing half of VQA (Vintners Quality Alliance) wine production. In 2005, annual retail wine sales were valued at \$4.2 billion and domestic interest in wine continues to grow. Yet, only 29% of wine sales value and 40% of sales volume are devoted to Canadian wine. The remaining 71% of sales value and 60% of sales volume are dedicated to imported products.

The supply of VQA wines has been increasing at a rate of up to 20% annually, (with weather exceptions in Ontario in 2003, 2005 and BC in 2005). Domestic sales of these wines have expanded at a strong pace, increasing from about 4 million litres in 1995 to 20.6 million litres in 2005. Ontario VQA production peaked at 10.4 million litres in 2004, a 50% increase over 2000, while BC VQA production peaked at 6.5 million litres, an increase of 115% or 3.5 million litres over the year 2000. Non-VQA wine production has grown by 4% over the period 2006-2007.

The small size of most domestic wineries and multiple short crop years have limited annual exports to 1.3 million litres in 2006. Domestic wine exports are currently valued at \$19 million compared to wine imports of \$3.0 billion or 304 million litres -- a significant wine trade deficit. However, new plantings, award winning wines, greater international exposure and a large 2006 crop will increase both volumes and export opportunities.

Total domestic wine sales in 2005 of 145.6 million litres were valued at over \$1.42 billion at the retail level. Approximately 16% of Canadian production was dedicated towards the production of high quality VQA table wine, Canada's fastest growing segment of domestic wine production. Over the period 1994-2005, VQA table wine production increased 295% compared to 57% growth for non-VQA table wine.

Production of *Vitis vinifera* grapes dropped 51% in 2005, resulting in a 42% reduction in marketed production value. Total domestic wine sales in 2005 were valued at over \$1.42 billion (145.6 million litres) at the retail level, with approximately 16% of Canadian production dedicated towards the production of high quality VQA table wine, Canada's fastest growing segment of domestic wine production. Over the period 1994-2005, VQA table wine production increased 295% compared to 57% growth for non-VQA table wine.

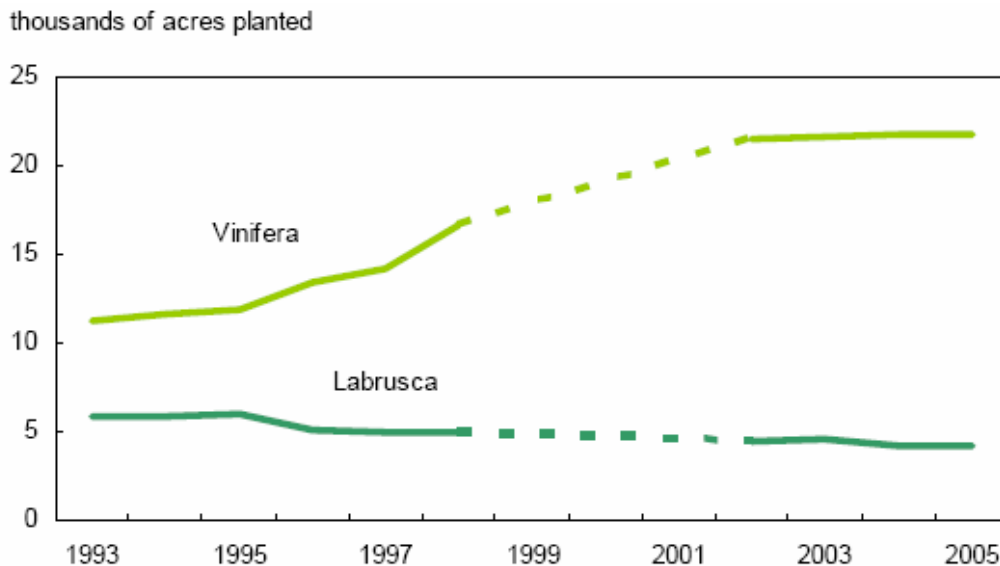
Poor harvests resulting from bad weather negatively impacted production levels in Ontario in 2002-2003, resulting in a 42% drop in production. Ontario experienced similar conditions in 2004-2005, which added to the problem with a 63% production decrease over the previous year. While less severe, BC also experienced below normal weather conditions, resulting in a 9% reduction in crop yields in 2005.

Production levels in 2006 have recovered with higher than average production yields offering significant opportunities for export escalation. Improved practices, research and development and a dedicated focus by grape growers to produce premium grapes will continue to drive quality production over the short, medium and longer term. The Wine Council of Ontario (WCO) and the BC Wine Institute (BCWI) both project that grapevine plantings and VQA wine production will continue to increase over the next five years.

New grapevine plantings in 2006-2007 are forecast to increase by two million new plants across Canada, doubling the *Vitis vinifera* plantings over the period 1996-2006. In 2005, Ontario *Vitis vinifera* plantings represented 14,000 acres or 70% of total grape vine acreage. This represents an increase of 38% over the past decade. It is estimated that Ontario *Vitis vinifera* grape acreage will increase by an additional 6,000 acres reaching 20,000 acres by 2015. In BC, grape wine acreage increased by 234% from 2,100 acres in 1995 to 6,632 acres in 2006. It is forecast that BC grapevine plantings will rise by 1,300 acres or 20% by 2009. Overall, increased plantings and new wineries will deliver higher tonnage and higher value over the next decade.

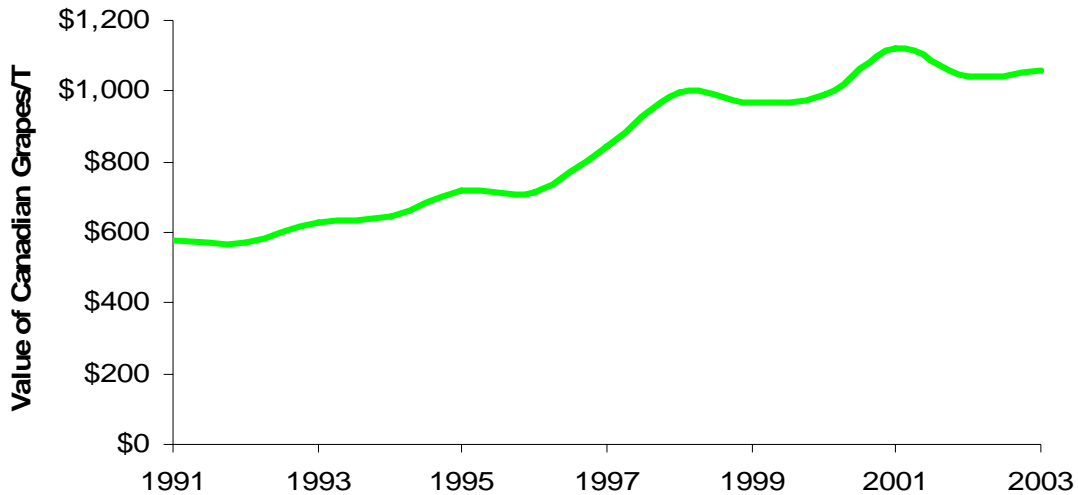
The significant growth in higher value *Vitis vinifera* grapes resulted in a 40% increase in grape value, with a resultant contribution to farm revenues. Increased production value confirms that the federal government focus on value-added production for Canadian farmers is both a success and a reality.

Figure 1: Canadian Grape Plantings 1992-2005



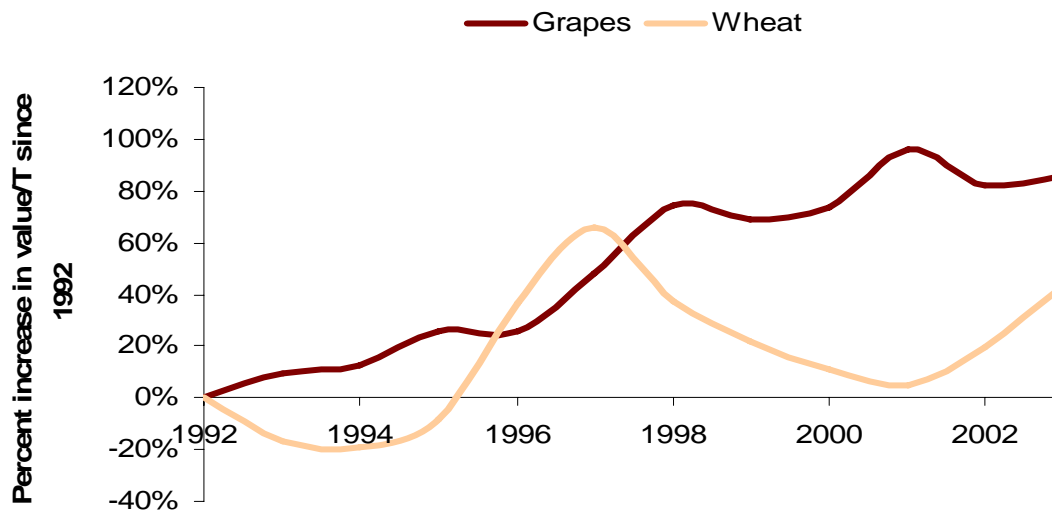
Source: Vine to the Glass, Canada's Grape and Wine Industry (Statistics Canada, October 2006)

Figure 2: Canadian Grape Value per Tonne: 1991-2003



Source: FAOSTAT, 2005

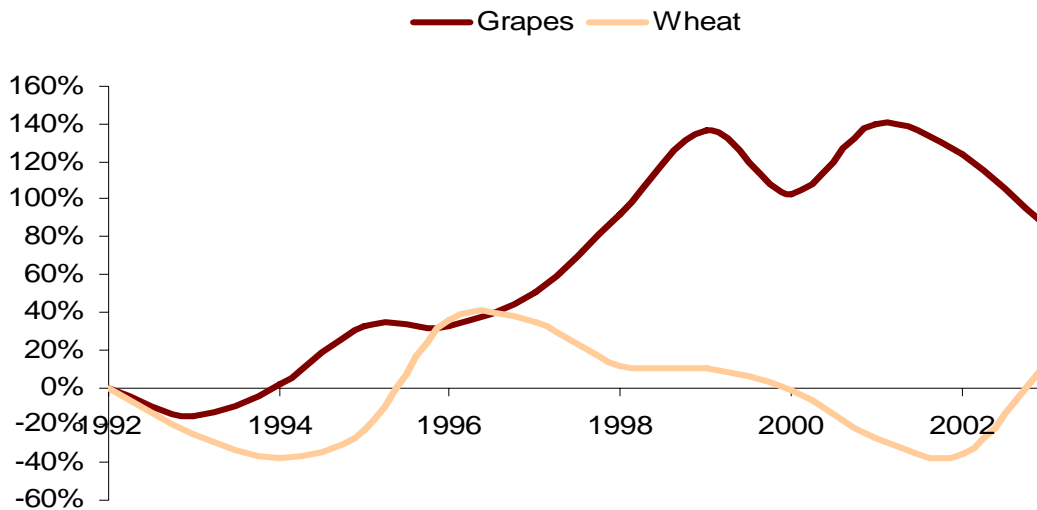
Figure 3: Comparison of Percentage Growth in Grape and Wheat Production Value: 1992-2003



Source: FAOSTAT, 2005

Figures 3 and 4 provide an important feature of value-added production, illustrating that grape production growth has exceeded wheat and maintained a positive production value, compared to the wide variations evident in the production of Canadian wheat. Further, grape production has increased by roughly 40% whereas production value has increased by about 80% over the same ten year period. The farm gate value for the grape sector increased at a greater rate and without the peaks and troughs experienced by Canadian wheat.

Figure 4: Canadian Grape and Wheat Production: 1992 - 2004



Source: FAOSTAT, 2006

Note: Ontario experienced short crops in 2003 and 2005, and BC experienced a short crop in 2005 due to severe winters and high levels of bud damage resulting in low production levels.

Global Competition

An important feature of the world wine market is an excess of production over consumption. Global wine stocks have been increasing and indications suggest that it may be several years before there is any significant easing of the downward pressure on prices.

In 1993, both Canada and New Zealand produced approximately 42,500 tonnes of grapes. By 2004, New Zealand had increased total production by almost 300%, reaching 165,500 tonnes. Over the same time period, Canada increased production by 78,000 tonnes, or 84%.

New Zealand grape growers and wineries have joined forces with national research organizations to establish a combined check-off fund to drive industry quality.

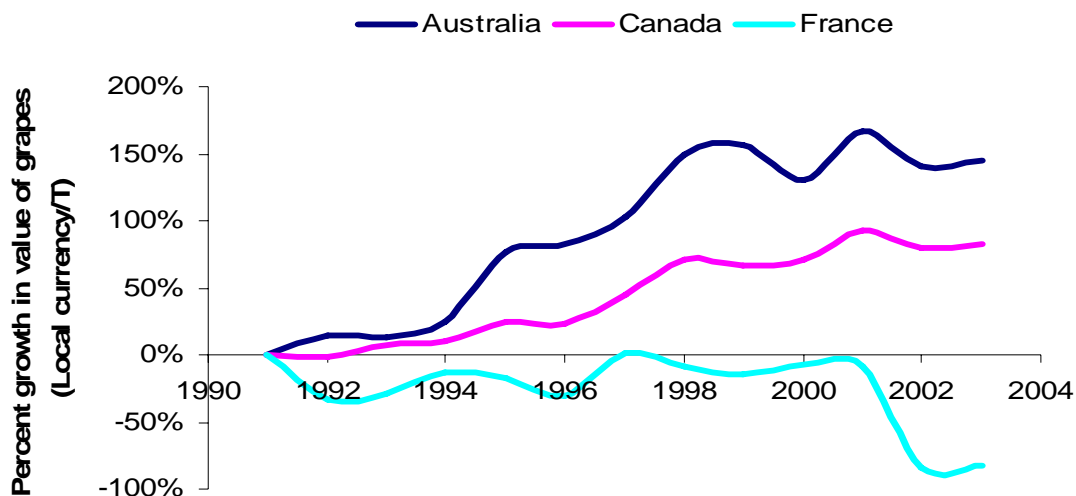
Australia has also been extremely proactive in developing a national research strategy in partnership with industry and government. The Australian government matches industry research investment contributing \$C6 million annually to grape and wine research¹. This commitment to research and development on the part

¹ The BC check-off system based on \$C10.00 per tonne is greater than the research contribution of Australian growers. However, the comparatively lower Canadian production level creates a smaller total contribution. The federal matching contribution is generally twice the producer contribution, creating a \$600,000 research budget based on a \$200,000 industry contribution.

of industry has enabled Australian grape growers to capture increased value per tonne of grapes. These efforts have held Australia's rapid global expansion and domination in the New World Wine category, displacing France in the top position for retail wine sales in the attractive UK market.

Figure 5 provides a general illustration of grape value growth by country. Chronic overproduction in France and other EU Member State countries, together with a consumer shift away from old world style wines, creates a clear opportunity for Canadian wine. Long term sustainability will require industry to display flexibility, innovativeness and a willingness to make changes. The future of the industry will be determined by its ability to adapt quickly and proactively to the complex range of factors determining current and future consumption.

Figure 5: Country Comparison of Percentage Grape Value Growth: 1991-2004



Source: FAOSTAT, 2006

The Canadian grape and wine industry has considerable growth potential with substantial opportunities for expansion. Change can be expected to remain a long term concern for the wine and grape industry, and while short term measures may address short term problems, they will not be effective in addressing the overall directions that industry will need to pursue.

Research and development, whether undertaken by individual business or funded through a levy on all grape production coupled with government support, is critical to remaining globally competitive.

From future market requirements to the adoption of new technologies, the Federal government through AAFC has a unique opportunity to demonstrate leadership and invest in the future of the Canadian grape and wine sectors through increasing its involvement in applied research. This will result in increased returns to both government and industry.

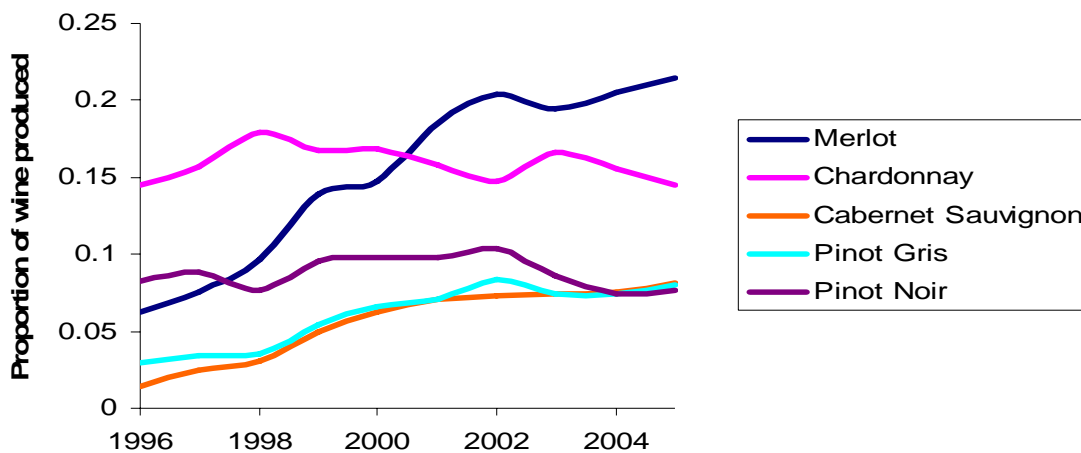
The remainder of this report lays out an overall strategy for significantly increasing federal research investment in the national grape and wine value chain.

Background on Trends in Grape Production in Canada

Grape and wine research is primarily conducted in Canada’s two main producing regions, Ontario and BC. Research activities in both provinces are directed towards local production opportunities and constraints. While Niagara and the Okanagan regions continue to be the foundation of these two wine producing regions, new regions have opened within the lead provinces, in particular along the north shore of Lake Erie, and Prince Edward County in Ontario, and on Vancouver Island in British Columbia.

Wine production is not limited to Ontario and British Columbia. The research station in Kentville, Nova Scotia began grape trials almost as soon as it opened in 1913, and there is a long history of production in the Annapolis valley and Northumberland Strait, with 9 wineries, 22 commercial grape growers and almost 300 acres of wine grapes. Equally, the cold climate and passionate Vignerons of Quebec produce wine with grapes grown on 220 acres near the eastern townships.

Figure 6: Top Varietal Growth in British Columbia: 1966-2005

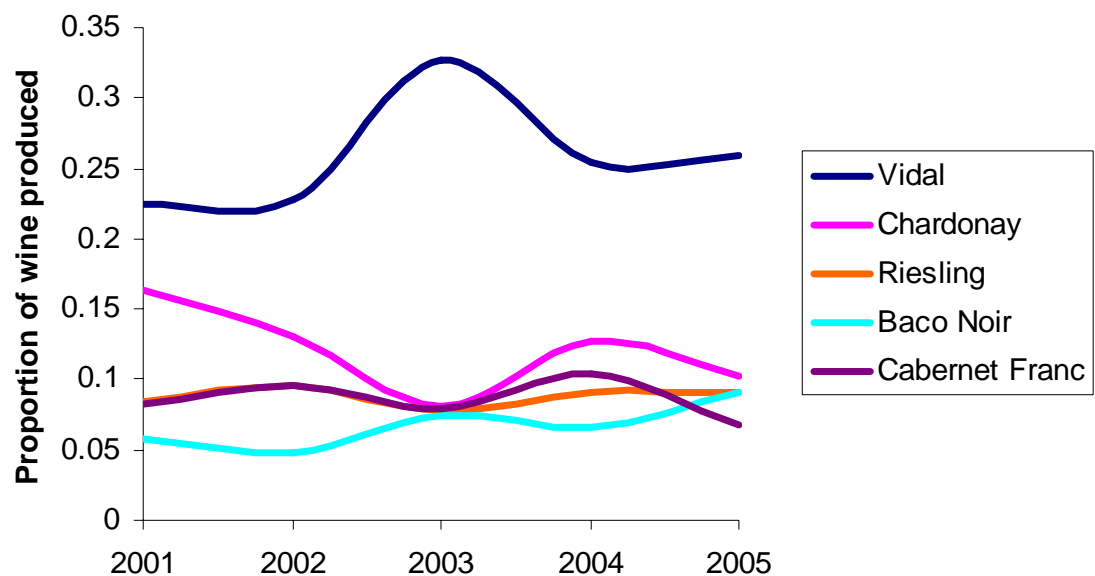


Source: British Columbia Ministry of Agriculture and Lands, 2005

Total grape production in BC increased 219% over the past decade, rising from 6,387 tonnes to 20,369 short tons, over period 1997-2006.

As BC wine growers unravel their terroir, the wines produced will provide a key research strategy perspective. Presently, the most widely planted red grape is Merlot; the most widely planted white is Chardonnay. Merlot has risen from 7% of total production to over 17%; chardonnay has remained relatively stable. Other strong varieties include Pinot Gris, Pinot Blanc and Pinto Noir. Taken together, these top five grapes represented 43% of total BC grape production in 1997, compared to 55% in 2006.

Figure 7: Top Varietal Trends in Ontario : 2001-2005



Source: FAOSTAT, 2006

The stability of production in Ontario (Figure 7) compared to BC is interesting given the substantial loss of vines due to severe winter conditions in 2003 and 2005. The difference in approach to wine production is simply another reflection of the differences between the grape and wine industries in these two regions.

The BC industry is based on production in an arid climate zone while Ontario is a leading global example of cool climate grape growing. The BC industry has little interest in predictive forecasting of pest invasion given the relative consistency of annual weather conditions, while Ontario would benefit significantly from such a technology. The primary concern facing the BC industry is water shortage for use in irrigation while the primary concern for the Ontario industry is winter survival.

Basis for a National Grape and Wine Research Strategy

The strategic direction of an effective grape and wine research program will be the same across all regions and incremental to present regional research efforts. A national research strategy must be strategic, take the entire grape and wine production value chain into consideration, and be capable of focusing on issues of national importance to provide opportunities for growers and wineries at all levels. A national research strategy must focus on communication and build partnerships, where common goals and issues have been identified to foster a strong innovation system.

National Grape and Wine Research Priorities

Sustainable Viticulture Management Practices

- Environmental sustainability
- Economic sustainability
- Increased value promotion
- Identification and capture market opportunities

Pursuing Consistency and Premium Quality

- Improved consistency of Icewine quality
- Improved consistency of table wine quality
- Improved consistency of grape quality

Pursuing an Improved Business Environment

- Crisis avoidance management
- Access and quick response to new business opportunities

Plant Certification Program

- Establish research expertise to support the development of grape plant certification in Canada

Wine and Grape Genomics

- Establish a national genomics/metabolomics strategy

These priorities are broad in scope but express sector confidence. Similarly, they incorporate the needs of a national strategy, including the importance of regional components such as irrigation research in the Okanagan to support consistency of grape quality, the use of wind machines in Ontario for cold hardiness, or the use of alternative species interspersed to reduce insect pressure on vines. Advancements in science and innovation are needed to achieve these national priorities.

Responding to the Challenges

Following a decade of expansion, the Canadian wine industry is now at a turning point with a need to work hard on improving its performance at all levels to be economically profitable and sustainable over the longer term. The complexity of issues has created a need for multidisciplinary approaches, where no single research provider can expect to have all the resources. Research and development in other jurisdictions has implications for the Canadian wine industry, and Canada risks falling behind in establishing a competitive advantage in emerging areas. This report provides some clear direction and defined outcomes in providing the right mix of innovation support mechanisms.

Defined Outcomes:

- Place Canadian grape and wine industry at the leading edge of environmental sustainability by 2012.
- Increase the value of *Vitis vinifera* grapes by 20% per tonne and the value of Canadian premium wine by 30% per litre by 2015.
- Focus on value adding opportunities that satisfy changing consumer demands and practices to limit net losses resulting from industry challenges.

Increasing the Value of Canadian Grapes and Wine

The Canadian grape and wine industry has a successful record of operating in the domestic market and entering the intensely competitive international marketplace. It has achieved this success by adapting to change through technical innovation and dedicated leadership. Change is inevitable, from taste profiles associated with demographic trends, emerging markets and enhanced competition from low cost producers – markets are evolving and Canada must be prepared to meet these challenges. Getting to the market smarter and faster requires a robust approach to identify global opportunities focusing on market dynamics, competition, and changing consumer demands.

The Canadian grape and wine industry provides an excellent example of global competition within a domestic market. Canadian annual retail wine sales represent 29% of value and 40% of volume, with the remainder provided by importing nations. Canadian wines compete shoulder to shoulder with global wines, including the top three importers France (21%), Australia (18%) and Italy (17%), with aggressive national marketing machines and costs of production.

As the grape and wine business strives to increase its competitiveness, it will need to deal with the challenge of Canada's cold climate, input costs, the high Canadian dollar and export markets that are distorted by the export programs and subsidies of competitors such as the European Community. To fully benefit from innovation, we need to address aspects of the innovation system that are underperforming.

A big challenge for the Canadian wine industry will be to maintain strong productivity growth, embrace new market opportunities and drive competitiveness through research, innovation, new efficiencies and a better understanding of markets, trends, and changing consumer demands (differentiating and developing new products).

While there is a need to adapt and change, Canada has climatic and vineyard land quality restrictions. Similarly, there are land challenges ranging from residential development and green spaces to cost price pressures of escalating land values.

The Canadian grape and wine industry has taken advantage of its strengths by adding value to the family farm, through wine and culinary tourism. To become more than a commodity competitor requires the development, identification and marketing of incremental value. Marketing based on domestic production alone in the absence of identifiable value may

There are more than 22 million wine and culinary enthusiasts in the US, of which 25% take leisure trips to Canada.

- 18% of the US population live on the Canada/US border, of which 30% are wine and culinary enthusiasts.
- 61% of these wine and culinary tourists travel to Ontario and 29% travel to BC
- >85% take day visits to wineries
- 74% tour wineries
- 70% dine in fine restaurants

produce initial impacts but will not be sustainable over the longer term unless supported in the consumers mind with an associated value.

The Canadian grape and wine industry has made significant strides in building new relationships with consumers. Understanding the needs of consumers and producing quality wines have opened new market opportunities and driven competitiveness and profitability, to gain an edge over the growing foreign imports.

Part of our success has been introducing Canadian consumers to local vineyards and wineries. This is an advantage that must be leveraged into higher value for grapes and wine. The development and adaptation of new technologies will be critical to maintaining profitability. Grape and wine research support will be

crucial to remaining globally competitive while developing an economically and environmentally sustainable means of wine production. The application of research and development will result in the introduction of new wine products that respond to market opportunities and changing consumer demands. This is the new reality of the marketplace. As the business becomes more sophisticated, the wine and grape sector will require new skills such as information technology, risk management and market awareness to supplement its traditional knowledge. In part, federal scientists and academic institutions in BC have already laid a foundation with projects aimed at increasing both quality and end products while decreasing the environmental footprint of the value chain. All successful business models recognize that knowledge and agility are a key part of competitive advantage.

Improving the Consistency of Wine Quality

By 2010, global wine sales will reach \$117 billion. Canadian retail wine sales grew 20% over the past decade, and we currently rank the 9th largest retail wine market in the world. Wineries are doing an increasingly good job of making consumers feel more comfortable, cultivating retail management and moving consumers towards higher priced wines.

Demand for wines will continue to evolve as consumer tastes and preference change. To respond to these market signals, will require coordination of the value chain – from retail stores back to the grape grower and estate vineyard gate. Good market information and business skills will be a vital prominent prerequisite for the wine industry of the future.

Innovation must be knowledge driven and market oriented. Adding value to meet consumer demands is becoming increasingly important for grape growers, wineries and retailers. Retail prices reflect what consumers are willing to pay, while farm gate prices reflect prices that can be achieved at the consumer level less the cost of production.

The highly competitive nature of the wine business requires consistent wine quality which begins with consistent grape quality. To achieve this outcome requires several integrated efforts including:

- characterization of the biochemical basis of quality;
- characterization of the terroir effect on the biochemical basis;
- increased understanding of the effect of viticulture on quality; and,
- improved vineyards that reflect production quality.

Research led by viticulturists but integrated into a wide variety of other disciplines including oenology, soil science, pathology, entomology and biochemistry are essential elements to achieve these outcomes.

First, we need to understand and establish an agreed understanding of Canadian quality wines before it is possible to assess the impact of viticultural practices on quality.

The use of advanced information management tools as a guide to all grape and wine research would be the single most important step towards increased competitiveness across the grape and wine industry.

While subjective in nature, the various attributes of wine are demanded by consumers and can be translated objectively by defining parameters of quality. This type of analysis can be accomplished through the use of modern information management tools and bioinformatics (statistics). To properly define quality requires research into sensory evaluation coupled with chemical analysis, both of which have been initiated in Ontario and BC, but requires sustained efforts to address and appreciate the complexity of the task.

Second, there is a need to increase Canada's capacity to perform effective and meaningful research on viticultural practices aimed at improving both the consistency of quality and quantity of grapes harvested. Wine quality is partly governed by grape quality, therefore vineyard management influences grape quality and ultimately the quality of the wine produced.

The primary factor influencing wine quality has always been the conditions under which the grapes are grown. Consistency in the potential of grapes to produce high quality wines requires that research increasingly include a holistic approach to viticulture practices. The impact of production practices on grapes produced today and the same grapes grown 5-10 years from now, needs to be considered to quantify the influences of individual vineyard management practices.

The targeted enhancement of research efforts in these areas is aimed at enhancing the competitiveness of Canadian wine. Success will lead to increased value per tonne of grape produced and increased value per litre of wine sold. There is no reason why the value of Canadian grapes and wine cannot continue to increase. However, to continue to grow will require improved performance and unrelenting change with clear research strategies. Change will remain a long term constant, but the Canadian wine and grape sector believes that an opportunity exists through a range of long term targeted research options described in Appendix B. To maintain and increase growth will require a focus on aligning our science and innovation investment with national/regional priorities, building partnerships, and securing access through science and innovation to improve quality.

The development and adoption of new technologies will drive a culture of innovation, but requires a commitment from both industry and government to remain globally competitive.

Improving the Consistency of the Business Environment

Successful innovation is knowledge-driven and market-oriented. Business management in the grape and wine sector must reflect market realities and focus on new value chain mechanisms, market intelligence and market access, not crisis control. The Canadian grape and wine sector must be prepared to adapt to changing market requirements at all points in the supply/demand chain. Addressing the challenges of the future will require the right mix of support to foster an innovation culture, recognizing that a lack of confidence and optimism will discourage entrepreneurship.

From the ladybug to cold winters and short crops, our domestic industry needs to confront its challenges to fully benefit from innovation. We need to identify successful business models which recognize knowledge and agility as key sources of competitive advantage. We can evolve to meet these challenges through a coordinated industry response to foster those aspects of the business innovation system that are underperforming.

Existing research infrastructure can be used to support the development and expansion of grape production in Nova Scotia, Quebec, as well as non-traditional areas within Ontario and BC. A coordinated effort aimed at assisting this development is in the best interest of our national wine industry. We must not only do the right things, we must also do things right through excellence in science and science management.

The Way Forward

In an increasingly competitive and global marketplace, improving the industry's ability to compete will be fundamental to remaining economically and sustainably viable over the long term. All stakeholders have a real interest in the development of the Canadian wine and grape sector including industry suppliers, researchers, academia and the regional and national economy.

To provide the operating framework and strategic direction for national research and development investment decisions for the Canadian grape and wine industry we recommend the following:

- Establish a National Wine Sector Research Advisory Council to work in partnership with Agriculture and Agri-Food Canada to provide industry driven direction to research efforts to strengthen the grape and wine value chain (see Appendix A).
- Increase Agriculture and Agri-Food Canada investment in wine and grape research and development to ensure the industry is properly equipped to respond to current and future trends and seize opportunities that impact the value chain. National funding should be incremental to existing regional research efforts, but contribute to local, regional, national and international goals of the wine and grape sector. (see Appendix B)

Appendix A

National Wine Sector Research Advisory Council (NWSRAC)

Mandate: To drive innovation in grape and wine research in Canada and to deliver sustainable outcomes for the national grape and wine sector and all Canadians.

Vision: A Canadian grape and wine industry that has a global reputation for the successful implementation of innovation through market leadership.

Structure: The NWSRAC governance and operations are geared towards ensuring that both the industry and Canadians receive the best possible return on future research and development investment. To ensure national research and development programs remain highly relevant to industry, the NWSRAC would be representative of a range of industry bodies:

NWSRAC Members (Voting)

- British Columbia Wine Institute (1)
- British Columbia Wine Grape Council (1)
- Wine Council of Ontario (1)
- Grape Growers of Ontario (1)
- Canadian Vintners Association (1)
- Ontario Government (1)
- British Columbia Government (1)
- Canadian Food Inspection Agency (1)
- Senior AAFC Manager (ADM/DG) (1)

NWSRAC Technical Advisory Committee (Non-Voting)

- British Columbia Wine Research Scientist (1)
- British Columbia Viticultural Research Scientist (1)
- British Columbia Business Academic (1)
- Ontario Wine Research Scientist (1)
- Ontario Viticultural Research Scientist (1)
- Ontario Business Academic (1)
- Canadian Vintners Association President (1)
- AAFC Secretariat (1)

NWSRAC positions will be appointed for renewable two-year terms (for a maximum of six years). The advisory council can expand the membership as it sees fit.

The NWSRAC Technical Advisory Committee will bring expertise to NWSRAC discussions and as a group of researchers/extension specialists and business advisors will be tasked with bringing forward initiatives, advice,

recommendations, reviews etc related to specific technologies or business opportunities to the Advisory Council for consideration. This would place an onus on the technical group to meet and discuss issues in detail and on a regular basis for efficient presentation and follow up at NWSRAC meetings, while permitting the NWSRAC to manage strategic priorities.

Reporting:

The NWSRAC would be sustained by the ongoing confidence of the BC Wine Grape Council, the British Columbia Wine Institute the Wine Council of Ontario, the Grape Growers of Ontario and the Canadian Vintners Association. All members of NWSRAC would be appointed by the above organizations. NWSRAC Reports would be prepared by the Agriculture and Agri-Food Canada (AAFC) Secretariat.

Meetings: The NWSRAC would meet semi-annually, or as deemed necessary.

Responsibilities:

The NWSRAC Panel would add value by:

- Developing a national research and development strategy;
- Providing national level industry research and development strategic support with the direction and interests of the regions and AAFC;
- Bringing together skills and resources from various organizations to provide guidance on strategic research direction decisions and evaluation of ongoing delivery on strategic objectives;
- Providing a review and support network to ensure that benefits flow to stakeholders with national outcomes reflected in economic, environmental and social benefits to the wine and grape sector; and,
- Bringing a national business perspective to federal research and development to ensure appropriate knowledge development and adaptation requirements of the grape and wine sector.

The NWSRAC would support the establishment of a national plant certification program.

- Establish research expertise to support the development of grape plant certification in Canada

Timelines for NWSRAC Goals

NWSRAC members would participate in strategic teams to accomplish the following goals:

- Establish a national genomics/metabolomics strategy;
- Establish a national wine and grape sustainability vision;
- Ensure benefits flow to regional stakeholders;
- Develop criteria and indicators to measure the return on research investment, help evaluate success, and provide a framework for the development of ongoing research agenda.

All of these goals should be achieved within two years of the initial meeting of the National Wine Sector Research Advisory Council.

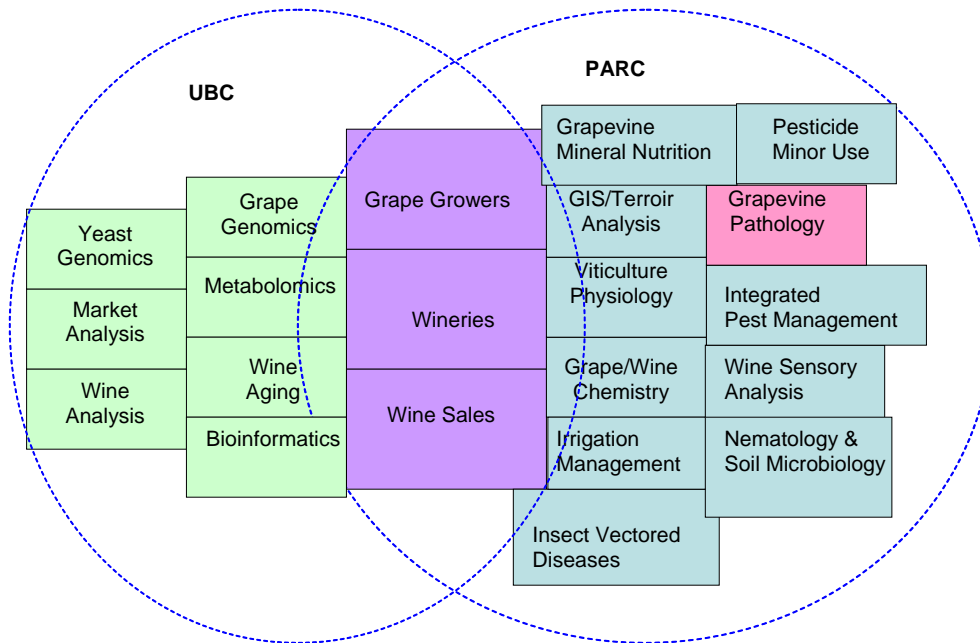
Appendix B

Detailed Research Strategy

Portions of value chain oriented research teams exist in the primary wine production regions of Canada. In both regions capacity for viticulture exists in conjunction with wine quality testing and integration with existing commercial vineyards. This is a strength that remains the foundation for the future. A national wine and grape research strategy is important to ensure that staffing decisions are made within a value chain framework. An opportunity exists to fill gaps in the existing research value chains, and to expand capacity to a level where Canada can be globally competitive in grape and wine research.

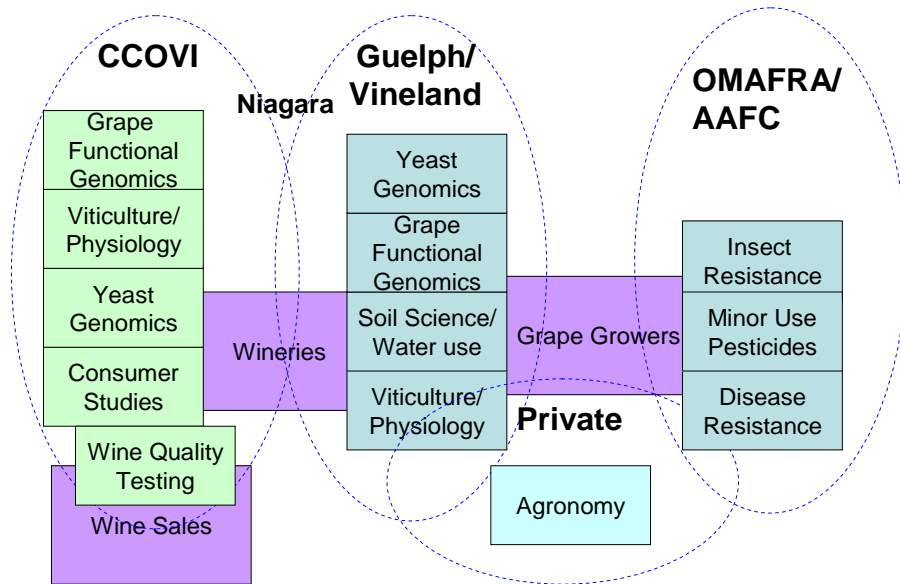
In BC there are three primary institutions with capacity in grape and wine research, University of British Columbia (UBC), Vancouver, UBC in Kelowna, and PARC at Summerland.

Snapshot of Existing Grape and Wine Research Programs in BC



In Ontario, grape and wine research capability resides within the University of Guelph system (Guelph/Vineland) with support from AAFC at Vineland, at CCOVI at Brock University, Niagara College and through the presence of private industry consultants.

Snapshot of Existing Grape and Wine Research Programs in Ontario



There are two significant gaps in both regionally based value chains. There is a need for enologists in both BC and Ontario. The physical presence of an enologist in both regions would provide a valuable resource for industry, providing access to technology and expertise. As such, it is crucial that an enologist be staffed within research institutes that are physically close to the wineries.

Enologists and viticulturists should become pivotal points within the research value chains, through which all wine and grape research programs are integrated to ensure relevance. Enologists would have the capacity to expand the research imagination space and drive the creation of value chain integrated projects.

The staffing of enologists in both BC and Ontario would represent a major step forward in accelerating the implementation of innovation by establishing a complementary research value chain that mirrors the industry structure.

It is vitally crucial that enology positions have the freedom necessary to establish dynamic relationships with wineries; are provided the ability to perform both basic and applied research; and establish working relationships within the global research community.

All successful companies drive research and development in conjunction with market analysis. In the private sector it is standard practice for marketing experts to define opportunities and threats on a dynamic basis, and to communicate these targets to the research teams.

Research and development responses are then prioritized on the basis of the relative importance and the probability of success. This ensures that more resources are applied to development than to research as the probability of technical success increases.

The public sector grape and wine research teams in both BC and Ontario would be enhanced by the staffing and integration of market analyst research staff. The direction of such positions should be integrated into the activities of existing marketing agencies such as regional VQA programs and organizations such as the Liquor Boards and global markets.

Market research will enable existing research value chains to move beyond being relevant to industry by addressing concerns of the past and present to establishing the capacity to proactively develop solutions for the future. Market research enables a shift in focus from reacting to industry concerns to working in partnership with industry to establish visions for the future that are based on market realities.

The establishment of research value chains in each region must take into account regional differences in the industrial value chains. For example, in Ontario, the presence of a grape marketing board imposes a constraint on the development of label specific value chains between growers and wineries, with the exception of wineries that produce their own grapes or contract production according to individualized specifications. Alternatively, the absence of a grape marketing board in BC provides additional market impetus for growers that are eager to implement innovation to create a competitive advantage. In this regard, research value chains in BC have a greater capacity to work on a more granular level to enhance value within individual streams, while the Ontario focus is based on generic value enhancement. Ontario research success could be enhanced by winery specific value chains, with a market research focus within the existing marketing board infrastructure.

Canada has a first class level of research expertise which justifies further investment by significantly enhancing their likelihood of success. There is an opportunity to use what currently exists as a foundation for the establishment of globally competitive research capacity in Canada. Grapes are the highest value-added agricultural commodity, and since the signing of the Canada-US Free Trade

Grape and wine research scientists in both BC and Ontario have developed excellent working relationships with industry and have developed research programs that are strong scientifically with a focus on relevant results.

Agreement, the grape and wine industry has led the reinvention of agriculture, consistently delivering increased value per unit of production.

The grape and wine industry has undertaken rapid development, found focus through experimentation, and demonstrated the enormous potential for premium quality Canadian wine. Global competition continues to increase, imports represent the lion's share of domestic retail wine sales, and only 16% of total wine production is 100% Canadian/VQA. This represents significant opportunities and growth potential if we are willing to compete with the best that the world has to offer. To continue to compete domestically, we must compete globally, and to do this effectively we must be competitive in terms of research and innovation. This is achievable by strategically building on our existing research infrastructure and expanding our value chain approach to research.

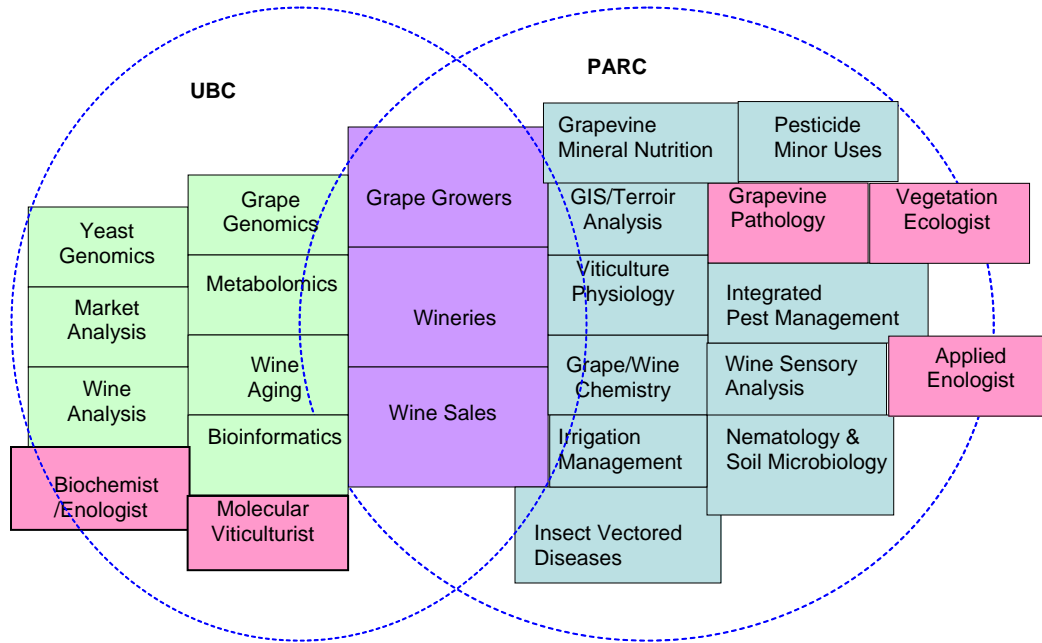
In the early days, there was no awareness of Canadian wines and their potential to stand alongside the world's finest. Today, we have demonstrated through prestigious international competitions and awards that we can deliver fantastic quality and great wines. While in many ways our industry has arrived, the obstacles to our future development range from research to regulation -- and not just our cold winters.

British Columbia

In BC we recommend the staffing of an enologist at PARC and a vegetation management specialist with a focus on sustainable systems. Further, it is vital that a plant pathologist be maintained, and a molecular viticulturist and biochemistry fermentation specialist be added to the UBC research team.

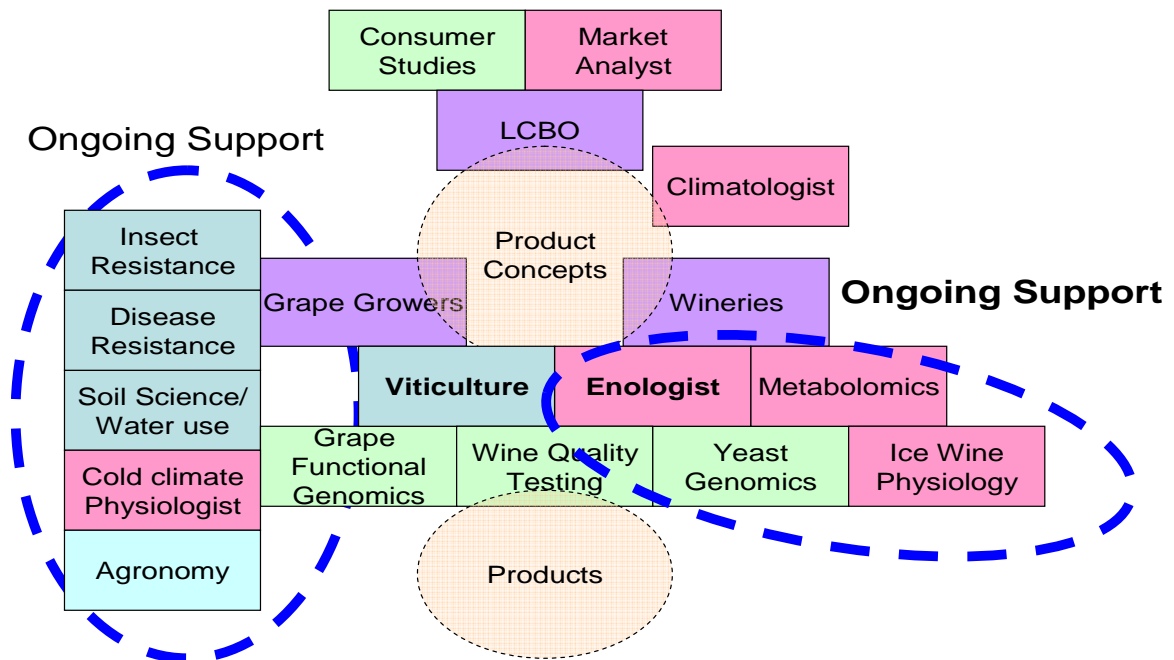
Starting in 2004, Genome Canada and Genome BC have committed \$3.1 million in federal and provincial funding for grape genomics research in the *GrapeGen* project (www.grapegen.org) at UBC. The services of a molecular grape vine biologist are urgently required, and will play an important role in all future grape genomics research.

Proposed BC Research Infrastructure

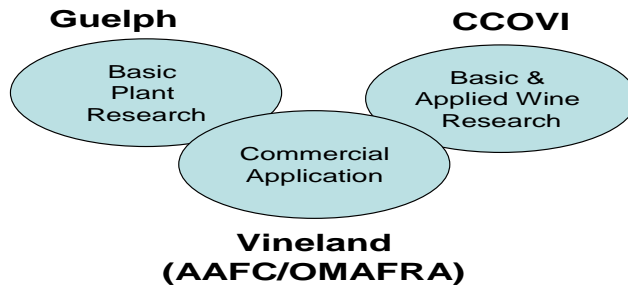


Ontario

Proposed Ontario Grape and Wine Research Infrastructure



Proposed Ontario Grape and Wine Research Infrastructure



In Ontario, in addition to the immediate staffing of an enologist and plant pathologist at CCOVI, the establishment of research teams focused on climatology, physiology of cold tolerance, Icewine grape physiology and fermentation and market analysis are recommended. The establishment of national research teams is required on all the core competencies to ensure the support of industry research priorities.

Overview of New Research

Leaders in Sustainable Development:

Economic Sustainability

The profit margin for all agricultural crops is enhanced by decreasing the cost of production while increasing the value of the crop produced. Grapes are unique in that the management of a vineyard involves decisions made both during a specific growing season, over the vineyards life, as well as the quality of the finished wine produced from those grapes. To be relevant, viticulture research must respect the same unique long term perspective of the grape. For example, inter-planting alternative species as a preferred host for an invasive insect may reduce profitability in the short term, but deliver sustainable profit margins over the life of the vineyard.

Environmental Sustainability

Canadian grape growers and winemakers are stewards of the land with a collective passion for quality grapes and making wine in a sustainable manner. Environmental issues, from air and water quality to energy costs, loom large for

the wine industry.

The primary grape production regions in Canada are under substantial pressure as protected agricultural zones are adjacent to growing urban populations. In all regions of Canada agriculturally based culinary tourism and eco-tourism provide significant opportunities for value added market development. Innovations that embrace economic, social and environmental sustainability are not only possible, they are the only innovations that are capable of being implemented and sustained.

Climate Change

The impacts of climate change are not likely to be uniform across all varieties and regions. In Canada, historical or predicted climate change could push some regions into more optimal climate regimes for the production of current varieties. The need for a climatologist is based on the importance of understanding climate change impacts on agriculture is especially evident with viticulture.

A long history of grape growing has resulted in the finest wines being associated with geographically distinct viticulture regions, where the weather and climate influence the production of quality grapes, and therefore quality wine. The types of grapes that can be grown and overall wine style that a region produces are a result of the baseline climate, while climate variability determines vintage-to-vintage quality differences.

While improved winemaking knowledge and husbandry practices contribute to better vintages, climate has, and will continue to play a significant role in quality variations and must be a well integrated and fundamental element of any viticulture research strategy. While the exact magnitude and rate of future climate change is uncertain, any change can greatly impact the narrow geographical limits of high-quality production viability and will likely bring about related changes in suitable grape varieties and regional wine styles.

The Ontario, Québec, Nova Scotia and potentially the BC grape growing environments are among the coldest for grape production in the world. This represents both an ongoing challenge for the industry and a unique opportunity. The potential exists to establish a research program that goes beyond reducing the threat imposed by low temperatures to the

To prepare for the future, it is critical that the grape and wine sector integrate planning and adaptation strategies to adjust accordingly. To facilitate planning, focused research is needed for assessing microclimates critical for grape growing; and improved knowledge of varietal potential, phenological development, and vine management across a wide range of possible environmental conditions, and translated to a vineyard specific level.

identification of terroir specific opportunities that create wines with characteristics that are distinguishable, and appreciated, by discerning consumers. A research team focused on this important Canadian reality and integrated into a broader grape and wine research value chain is critical to the future of the Canadian wine sector.

Icewine Physiology

Icewine presents a tremendous premium and value added opportunity for Canadian wineries. In 2006, Canada exported 201,000 litres of Icewine valued at \$11.7 million. We have an established global leadership position and Icewine has become the calling card for Canadian wine exports. To maintain leadership we must be able to produce high quality Icewine more consistently than our competition. Reliable quality is as important as an excellent vintage, and trustworthiness will remain the future of this prosperous niche market.

Icewine is wine that is made exclusively from grapes naturally frozen on the vine. The frozen grapes must be picked and processed at a temperature that cannot exceed -8 degrees C., leaving a highly concentrated juice, very high in acids, sugars and aromatics.

Research success on the metabolic basis of Icewine fermentation has been an important element of the Icewine programs established at CCOVI. Unfortunately, there is minimal national Icewine research in the field of viticulture and/or Icewine production. As a global leader with decades of Icewine production, the current understanding of the physiological effects of freezing on grapes remains very limited. A research program that explores the basic physiology of freezing on grapes, while providing answers to immediate and pending questions is a necessary strategic element to maintain the momentum and growth of our global leadership Icewine position.

New Market Opportunities

The ability to predict consumer wine preferences and to identify new market opportunities has become a fundamental requirement for the growth of the grape and wine industry. The creation of a National wine market research strategy is vitally important to develop the tools and knowledge required to capture new market opportunities and provide actionable guidance to the Canadian grape and wine industry.

The research participants should include academic wine business researchers, specialists from existing marketing agencies such as regional VQA programs, Liquor Boards and other relevant stakeholders. The National wine market research strategy will be closely linked with all other national research initiatives.

Grape Plant Certification

Canada does not have an organized domestic program for the production of virus free or certified nursery stock in Canada. Yet, all imported grapevine material must come from virus certification programs in other countries. This has created a challenge for industry in that Canadian growers must rely on imported nursery stock if they want "Certified Virus-Free" material. Further, there is a significant risk of importing unwanted pests and diseases not presently existing in Canada, with the imported nursery stock.

The question arises as to how Canada, and its growing wine industry, is prepared to find alternatives when faced with similar challenges, perhaps ones that cannot be resolved by application of hot water treatment. With constantly changing grapevine importation protocols and the economic costs and looming risk of importing pests and/or disease, the wine and grape industry supports the introduction of a Canadian Export Certification Program. A certification program can be defined as a process established for the production of plants free from regulated pests and which defines the program participation, plant production, plant identification and labeling, and quality assurance requirements

In response to requests from industry, the Canadian Food Inspection Agency (CFIA) has launched a series of consultations for the creation of a domestic certification program for the production of grapevines in Canada. Industry supports this policy direction, and recommends that an industry sub-committee be developed to work with CFIA, the International Plant Protection Convention (IPPC) and the North American Plant Protection Organization (NAPPO) to develop and implement a certification program that would conform to international standards and which ensures virus-free sources for propagation and ultimately certified grapevines for both domestic and export purposes.

Metabolomics/Bioinformatics (Quality)

There is a minimum of four elements required to understand the effects of variation in grapes on the consistency of wine quality.

- the effects of the chemical composition of grapes on product quality;
- the effects of the environment on the chemical composition of the grape;
- the genetic control of chemical composition; and,
- the interaction between genetic control and environmental influence.

Research directed towards these core elements cannot be prioritized on a chemical component basis until oenologists in both Ontario and BC achieve a better understanding of the

The advent of computing capacity has changed our analytical capability and has the potential to fundamentally change our approach to science.

effects of the chemical composition of grapes on product quality. The metabolomics program established at PARC and UBC represents a significant start in this direction, and is well integrated into existing viticulture and wine quality assessment programs. The chief constraint facing this program is the difficulty evaluating the complex interactions among components on a quantitative basis.

With the support of bioinformatics we will be able to answer questions regarding the interaction of chemical composition with quality in a holistic way, and more importantly in a way that more closely reflects reality. To establish an effective bioinformatics program it is essential that the information technology team be physically integrated into the research and development team.

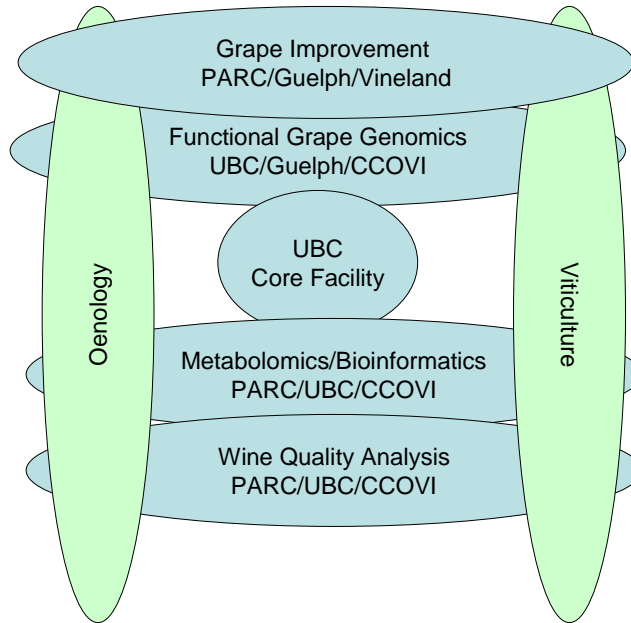
Genetics

With the recent development of new high-throughput sequencing, genomics, proteomics and metabolomics technologies, supported by bioinformatics, research aimed at solving many fundamental questions in biology pertaining to *Vitis vinifera* and wine yeast can be significantly advanced and applied to problems facing the wine industry.

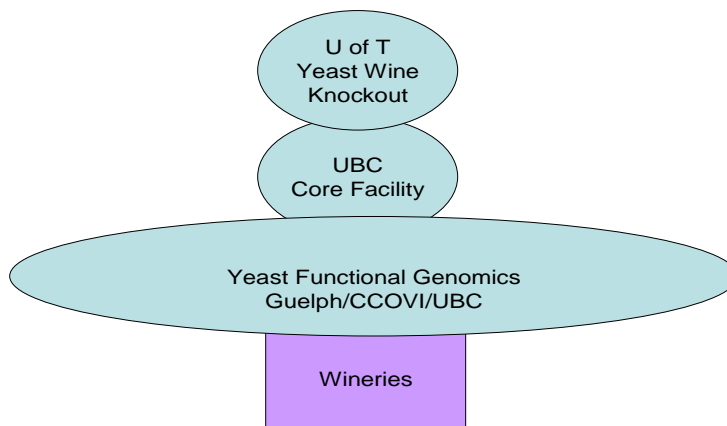
The primary issue of concern to the majority of Canadian wineries is the maintenance of expected fermentation performance, and the avoidance of stalled or failed processes.

Active research programs in both BC and Ontario are focused on understanding the factors responsible for a lack of consistency in wine fermentation. These efforts would be greatly enhanced through the establishment of a wine yeast gene knockout population. The research team at the University of Toronto (Dr's. Brenda Andrews and Charles Boone) have developed such a population within non-wine yeast, and have indicated a willingness to work with the wine industry. The mobilization of this team to create a wine yeast gene knockout population would be equivalent to the creation of a library representing the inner workings of this crucial microorganism.

National Participants in Grape Genomics Research



Proposed National Participants in Wine Yeast Genomics Research



Research Strategy Outcomes

This plan provides the right mix of innovation support mechanisms to seize upon the opportunities offered within the wine and grape value chain, and contribute to local, regional, national and international goals of the Canadian wine sector, with a potential to deliver:

An economically healthier Canadian grape industry based on the implementation of viticulture strategies will ensure:

- A Canadian grape and wine industry that is positioned to cope with climate change through:
 - a regional specific understanding of climatic changes;
 - establishing viticulture practices that are sustainable under probable future environmental conditions;
 - developing capacity for future planning throughout the entire value chain.
- Canadian leadership in cool climate grape and wine production:
 - world centre for icewine and cool climate grape and wine production -- similar to existing world centres for Shiraz (Australia), and Sauvignon Blanc (New Zealand);
 - recognition of Canada as a leader in the production of consistent, high quality dry table wine;
- A Canadian grape and wine industry that continues to provide an example to other agricultural sectors in the following ways:
 - how to work as an effective value chain;
 - how to grow and increase value per unit of production by:
 - integrating innovation with market analysis;
 - maintaining effective partnerships between industry and research;
 - establishing research programs that consider the entire value chain.

A sustainable, innovative and profitable future for the Canadian wine industry will require strategic investment in research and development. AAFC support towards the growth of the Canadian wine industry by planning and funding collective research and development programs will ensure delivery of proposed outcomes. We believe that the benefits to Canada are possible by maximizing the profitability, international competitiveness and sustainability of the Canadian wine industry, and strategically investing in and managing research and

development activities. Further, it is estimated that research will contribute close to half the competitive gains envisioned by delivering appropriate, effective and efficient new technologies, processes and information.

The Canadian grape and wine industry does not have the ability to privately or commercially meet all of its research and innovation needs, but are committed to working with the federal and provincial governments to achieve a national wine and grape research strategy to ensure maximum benefit is returned to the industry and community.