# Diffusion of R&D within the Australian Wine Industry

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ABSTRACT The Australian wine industry's popular image as a leader in  $R \mathfrak{SD}$  can indeed be substantiated. Its oenological and viticultural innovation and technical expertise have set new international benchmarks. The coordination of this  $R \mathfrak{SD}$  has ensured that the industry remains at the leading edge. However, the findings of this paper also substantiate concerns that this  $R \mathfrak{SD}$  is concentrated in what appears to be a South Australian  $R \mathfrak{SD}$  'epicentre'. Regions and wine operators not connected to this epicentre can be disadvantaged. This paper examines the diffusion of  $R \mathfrak{SD}$  to regional operators and suggests mechanisms for improvement of the current structure.

Keywords: wine, R&D, diffusion, collaboration, innovation, training.

## Introduction

Research into the process of innovation and the diffusion of knowledge has focused on the growing significance of collaborative research arrangements among universities, public sector organisations, industry-funded R&D corporations and business. An interesting feature of this collaboration is the role of government in stimulating these alliances. Governments around the world are increasingly concerned with directing national research efforts towards commercial outcomes, and with constructing the appropriate research infrastructure for supporting innovation. Gibbons *et al.* have approached this issue by addressing the larger discussion of knowledge intensity and diffusion and the interesting theoretical debate that is arising about knowledge production in the context of application.<sup>1</sup>

Most detailed studies of the collaborative role of government in R&D have focused on manufacturing. While some studies have looked at the role of government in supporting the diffusion of knowledge in agricultural sectors, few have investigated the role of R&D in sectors such as the wine industry. Yet, the Australia wine sector currently exports around \$2.0 billion worth of wine, has a significant growth rate relative to the country's other leading exporters, and is considered a world leader in wine making and viticultural innovation. It is, however, an industry that is widely dispersed geographically, dominated by a small number of large firms with a very large number of small firms creating significant market, product and structural diversity. These strange characteristics prompted investigation of how knowledge is

diffused within the industry and how effective that diffusion is. These issues have been identified as problematic by the industry's intermediary body, the Grape and Wine Research Development Corporation (GWRDC), which is the major research and training coordinator and R&D funding body for the Australian wine industry. One of its main priorities is to establish mechanisms for effective knowledge diffusion.

# Aims of the Study

The present study concerns itself with the various mechanisms and their effectiveness in diffusing viticultural and oenological research, as well as training knowledge throughout the Australian wine industry. The central question relating to this is: do smaller, regional wine operators have the same access to this knowledge as those located in the industry's R&D 'epicentre', South Australia. Four specific objectives focusing on this question have guided the study:

- 1. to examine the extent to which the research system is supplying the industry as a whole;
- 2. to provide a preliminary comparison of R&D knowledge and awareness levels among large, medium and small industry operators outside the epicentre;
- 3. to investigate the concern raised by the Committee of Inquiry into the Winegrape and Wine Industry, that the benefits of national R&D may not be flowing through to the regional operators; and
- 4. to provide a brief analysis and comparative breakdown of training issues and trends and how these may be influenced by company size and positioning within the industry.

## **Industry Overview**

There are now approximately 1,320 wine operators in Australia,<sup>2</sup> with the number growing almost exponentially.<sup>3</sup> Of these 1,320 operators, the vast majority (around 1,100) are boutique/small operators. These range from husband/wife teams with one or two employees crushing under 50 tonnes of grapes a year, to established private operators with 10–20 employees, crushing up to 1,000 tonnes annually (see Table 1).<sup>4</sup>

Most of these operators are both grape growers and wine makers, a changing trend from 20 years ago, when it was usually one or the other.<sup>5</sup> The other noticeable trend is the export orientation of the industry. This is no longer reserved for the larger, well-established companies. Even the smallest boutique wineries are now actively pursuing the export market, although with varying degrees of success. As of December 2000, there were roughly 146,177 hectares under vine in Australia, with a vintage of 1,147,018 tonnes. Total wine produced for 2000 was 806.4 million litres. Domestic sales of Australian wine were a record 369.3 million litres, while exports accounted for 310.5 million litres, a volume rise of 20.3% over the previous year's exports (see Table 2).<sup>6</sup>

As is shown in Table 2, the UK, USA and NZ markets now account for around 74% of all exports (by volume), with the UK alone consuming 48% of Australian wine exports. The UK market is expected to reach maturity within the next five years, and the United States represents Australia's next big export market. Other emerging and strategically important markets include Germany, Canada and Japan. In 2000, there were 571 wine operators in Australia registered as exporters. However, the 20 largest exporters account for over 95% of export value. This percentage is decreasing as

Wine production	No. of operators	
Under 20 tonnes	371	
20-49 tonnes	296	
50–99 tonnes	199	
100-249 tonnes	169	
250-499 tonnes	75	
500–999 tonnes	49	
1,000-2,499 tonnes	49	
2,500-4,999 tonnes	27	
5,000–9,999 tonnes	29	
10,000 or more	42	
Unknown or unspecified	12	
Total	1,318	

Table 1. Australian wine production 2000

Source: Australian Wine Online 2000.

more operators seek export markets for their product and become more adept at securing longer term contracts, rather than the one-off style contracts that currently dominate small operator trade. Because export activity is leading to greater levels of innovation, it is envisaged that the increase in both the levels of export and the numbers of operators involved will act as a trigger for greater diffusion of R&D throughout the industry.

Country	Wine exports for 2000—volume, value and percentage change in value		
	Volume (ml)	Value \$A (m)	% change in value over previous year
UK	149.6	626.2	14.1
USA	59.8	382.1	49.4
NZ	20.5	74.2	10.1
Canada	14.9	88.9	56.3
Germany	9.7	41.8	41.1
Netherlands	9.4	39.7	29.4
Ireland	7.7	41.5	24.6
Japan	5.5	30	18.2
Sweden	4.9	18.8	6.7
Switzerland	4.5	28.7	22.1
Belgium-Lux	3	13.9	-0.07
Denmark	2.9	12.6	18
France	2.6	6.8	13.3
Norway	2.6	10.3	4.9
Singapore	2.3	16	20.5
Rest	10.6	55.9	7.6
World	310.5	1,487.4	24.5

Table 2. Wine exports from Australia for 2000

Source: Australian and New Zealand Wine Industry Directory 2001.

## Industry R&D Overview

R&D, namely oenological and viticultural R&D, is seen as the Australian wine industry's great advantage. Australia is still one of the smaller wine producers and exporters, accounting for about 3% of the world's production, but its spectacular rise from mediocrity throughout the 1970s and 1980s to perhaps the world's leading producer in terms of quality and value for money, is a result of this leading edge R&D. The industry's high-tech approach to wine making through computerised monitoring and adjustment at every stage of the process, linked to the same high-tech approach to vineyard management and soil analysis, is very different from the Old World approach. The coordination of this R&D through the GWRDC has ensured that Australia remains at the forefront of oenological and viticultural R&D, with no other country (with the possible exception of New Zealand) demonstrating the same unified approach.<sup>7</sup>

However, the wine industry in Australia is now largely characterised by small operators who are unable to undertake their own R&D. Oenological and viticultural R&D is carried out by qualified scientists, staff and institutions, almost all based in South Australia. The Australian Wine Research Institute and the University of Adelaide carry out a significant amount of this R&D and are contracted directly through the GWRDC. Although they often sub-contract parts of the R&D, such as vine and soil analysis, this is usually carried out in South Australian institutions. This situation is feeding a cultural gap in R&D knowledge.

Funding for the industry's R&D is derived from industry levies collected from the grape and wine producers on tonnes crushed, government matched grants, and government project grants. GWRDC funding allocation is divided into two main groups: the Grape account and the Wine account. For the 1999/2000 year, the Grape account was \$4.54 million and the Wine account \$4.67 million.<sup>8</sup> In addition, a number of state governments and the larger wine companies conduct their own inhouse research. More than \$23 million was spent on R&D in 1999–2000, of which 48% was paid by the federal government (including GWRDC), 28% by industry, and 24% by state governments. It is primarily in this industry-sponsored R&D that links with public sector institutions have been developed through collaborative structures aimed at bringing together experts in oenology, viticulture, compliance, interpretation and strategic planning.

The GWRDC is an intermediary agency, sponsored by both industry and government organisations, and responsible for 'developing, managing and maintaining these collaborative arrangements'.<sup>9</sup> The GWRDC was established in 1991 as a statutory authority under provisions of the Primary Industries and Energy Research and Development Act 1989. The Corporation seeks coinvestors to contribute to both strategic and basic R&D as well as to encourage regional innovation through technology adoption activity.<sup>10</sup> It enjoys a close relationship with other key R&D providers, including the Australian Wine Research Institute, the CSIRO and the various state departments of agriculture. The GWRDC also consults directly with industry service providers, such as the Cooperative Research Centre for Viticulture (CRCV) and the Australian Wine and Brandy Corporation.<sup>11</sup> The two core R&D contractors with which the GWRDC cooperates are the Australian Wine Research Institute and the Cooperative Research Centre for Viticulture (CRCV).

The Australian Wine Research Institute was incorporated under the South Australian Companies Act in 1955. It has extended the activities of the Oenological Research Committee, established under an arrangement between the Commonwealth Scientific and Industrial Research Organization (CSIRO), the University of Adelaide and the Australian Wine Board (now the Australian Wine and Brandy Corporation) to undertake oenological and viticultural research for the Australian wine industry.<sup>12</sup> Its core objectives are to carry out applied research and to service the needs of winemakers, be involved in both undergraduate and postgraduate teaching, and to coordinate information on oenology and viticulture research to the benefit of the Australian wine industry.<sup>13</sup>

The CRCV was established in 1992, initially as a collaborating mechanism for Adelaide and Charles Sturt Universities, three state agriculture departments, the CSIRO, the Australian Wine Research Institute and an agricultural technology company. Research at the CRCV can be classified into biotechnology research, grape quality improvement, viticulture, and education and technology transfer (see Figure 1).

A feature of the industry structure is that many smaller wine makers are entering the export market for the first time. Is the national investment in research



**Figure 1.** Wine industry R&D structure. *Source:* GWRDC.

benefiting this growing number of small but specialised exporters? As part of the study upon which this paper is based, a questionnaire was sent to wine operators. The aim of the survey was to profile the industry's R&D and training and to assess the extent to which the smaller regional operators were able to access these knowledge flows in order to link into the industry's epicentre. Of the 41operators (grape growers and wine makers) surveyed/interviewed, 32 were sole proprietor/ partnerships, five were subsidiaries of larger companies and four were publicly listed companies with a market capitalisation of between \$80 million and \$1.6 billion. A significant majority had fewer than 10 employees, six had more than 100 employees and two had more than 1,000 employees. The vast majority (34) were both wine makers and growers, which is in line with the national trend. Six were solely growers and only one was solely a wine maker. In terms of annual crush, about a quarter crushed less than 50 tonnes, another quarter crushed between 50 and 200 tonnes, while at the other end of the scale, four crushed between 20,000 and 50,000, one crushed between 50,000 and 100,000 tonnes and one crushed over 200,000 tonnes. Three-quarters of all operators surveyed exported their product. The remaining quarter hoped to export within the next three years. As a percentage of their annual turnover, a quarter of respondents claimed that exports accounted for more than 50%, and more than half claimed that export value had risen as a percentage over the past three years.

# Methodology

The study was carried out over a six month period and involved two stages:

- 1. a national pilot survey of wine operators; and
- 2. an analysis based on in-depth phone and field interviews with a smaller sample of respondents across four regions.

The study focused on potential users of research, rather than the research institutions within the industry. As end users of the R&D, their perspective would provide greatest value in determining the extent to which knowledge was being diffused within the industry. A literature review was first conducted in order to establish the parameters of inquiry and to help refine survey and interview issues. The survey was developed and delivered to 41 industry respondents. These respondents were selected to provide a broad cross-section of geographic regions, various levels of industry concentration and operator size. Preliminary results then fed into the qualitative aspect of the study, providing background information and guidelines for the 11 in-depth interviews. These field interviews were carried out with participants in the Mudgee, Hunter, Shoalhaven and Canberra regions, focusing on small, medium and large operators in areas considered regional to South Australia—the wine industry's R&D epicentre.

## Canberra District

The Canberra wine district consists primarily of small boutique wineries, including fairly well known names such as Doonkuna, Lark Hill, Clonakilla and Kyeema Estate. These wineries are clustered in two major groups, the Yass Valley around Murrumbateman, and around the shores of Lake George. In 1997, BRL Hardy established a 2,000-tonne winery surrounded by 250 hectares of vines. It now

dominates the region in terms of size, technical sophistication and as a tourist attraction.  $^{\rm 14}$ 

Although enjoying a relatively high profile as a wine region, the Canberra district is fairly new, with first plantings in 1971. Many of the region's wineries have been established by ex-bureaucrats, doctors and lawyers from Canberra with little oenological, viticultural or marketing knowledge. Until recently, there has been little technical qualification in the region, with much of the technical work being outsourced to consultants. The arrival of BRL Hardy promises to change this as wines from its new centre come onto the market in 2002–03.<sup>15</sup>

#### Shoalhaven

In national terms, Shoalhaven is one of the smaller and less well known wine districts. It is also relatively new, its first wineries dating from the early 1970s. Despite these factors, it is already gaining a reputation for producing quality wines, with at least one of its wineries regularly winning prestigious wine awards.<sup>16</sup> All the region's wineries are very much in the boutique category, each with fewer than five employees and all but one crushing under 100 tonnes annually. There are currently four established estates; Coolangatta, Cambewarra, The Silos and Jasper Valley Wines. A fifth is opening soon. The region relies heavily on cellar door sales to tourists. Prospects for the region seem limited as most new wineries and vineyard developments are emerging west of the Great Divide, 100 miles from the coast in NSW.<sup>17</sup>

#### Mudgee

Mudgee, with first plantings in 1858, is one of Australia's oldest wine regions. However, despite its age and the presence of such companies as Poet's Corner and Montrose (both now owned by Orlando Wyndham), Mudgee has never enjoyed the reputation of the Hunter Valley.<sup>18</sup> Poet's Corner and Montrose dominate the Mudgee region in terms of hectares under vine, sales, employment and tourist attraction. With the exception of these two, Mudgee's wineries are classed as boutique or small. These include Huntington Estate, Steins, Craigmoor, Mirimar Wines, Pieter Van Gent, Platt's, Botobolar and Thistle Hill. Their annual crush averages between 50 and 150 tonnes. Employment averages fewer than five employees per operator and a number of owners work in town for extra income. Surprisingly, while Mudgee wine appears to struggle for the recognition of the Hunter, Margaret River and the Yarra Valley, many operators around Australia source at least a percentage of their grapes and even wine from the Mudgee region. It has a long history of producing good quality reds and now, with the technical expertise of Orlando Wyndham, the region's wine quality potential has been given a significant boost.

### Hunter Valley

Vineyards first appeared in the Hunter Valley with the arrival of James Busby at Kirkton in the mid-1820s. George Wyndham followed soon after in 1830 and so began the development of Australia's oldest continually planted wine region.<sup>19</sup> The Hunter Valley produces 31 million litres of wine annually, valued at approximately \$230 million.<sup>20</sup> The region is one of Australia's best-known wine regions, largely

because of its history and tourism, and is home to a diverse collection of private and public operators. There are long-established family and public companies with capitalisation of up to \$150 million and a history of more than 100 years. But the area is also dotted with new, boutique wineries and vineyards with no history and little expertise. The Hunter Valley Vineyard Association, established in 1847, is commonly seen as the vehicle for bringing together the interests of this diverse group. Nevertheless, there are different interests to be served. Tensions exist between larger and smaller operators, as they do between older and newer operators.

## Findings

### Knowledge of Industry R&D

The Australian wine industry is highly concentrated among four big operators. However, there are another 1,300 smaller operators throughout the country, a number which is growing rapidly. The critical question of this study is: how effectively is new knowledge reaching these producers (see Figure 2)?

The findings from this study confirm first impressions, and concerns raised by the Committee of Inquiry into the Wine Industry (GWRDC) back in 1995, that diffusion of the substantial R&D being carried out within the industry may be uneven and restricted. As expected, knowledge of, and participation in, industry R&D activities are largely dependent upon what Turpin *et al.* often refer to as a 'close coalition of interests',<sup>21</sup> or proximity to the R&D epicentre.

First, there is a strong concentration of awareness and knowledge within the South Australian wine regions and more particularly, Adelaide. The vast majority of industry R&D is carried out by the Australian Wine Research Institute, based at the University of Adelaide. Substantial research is also carried out by the South Australian Department of Agriculture and the Commonwealth Research Centre for Viticulture, also based in Adelaide, although there is a node at Wagga. Little R&D takes place outside this region and what is is often contracted to consultants from these bodies or the GWRDC.

Second, this concentration is associated with the largest wine operators. Even so, smaller operators in and around the R&D epicentre register higher levels of awareness than their regional counterparts. Two thirds of survey respondents (29) claimed to be aware of industry R&D. However, at least 12 were larger operators. They were either public, large private companies or subsidiaries of public companies in regional areas, who often subsidise research and who have strong links to the epicentre. In other words, only half of the small to medium operators claimed to be aware of industry R&D. Of the 12 larger operators, at least 10 had high levels



Figure 2. Perceived current pathways of knowledge diffusion.

of awareness of industry R&D, although a number still claimed to be operating on the periphery of R&D decisions taking place in Adelaide. They claimed that although they were involved in R&D, and utilised industry bodies regularly, they were rarely included in the industry's R&D decision-making processes. The study found that there is a direct and strong association between geographic location, operator size and knowledge of industry R&D.

#### Perceived Benefits of R&D

Fewer than half of the respondents claimed that they had benefited directly from industry sponsored R&D. Those benefiting directly and regularly from industry R&D were almost exclusively the larger operators. What do operators expect of industry R&D? To explore these expectations, we asked respondents how well they thought industry R&D was servicing regional operators. The majority (22 of the 37 who responded to this question) claimed that the service was either poor or needed improvement. All respondents with this view were small operators, who felt that industry R&D catered primarily to the large operators. It appears that while small operators have only limited knowledge of R&D and feel they receive limited benefits from that which is carried out, they hold strong opinions about their need for better access to new and specialised know-how in the wine industry.

#### Funding the Industry's Research

In addition to government funding and other industry contributions, the wine industry's R&D is funded through a levy paid by all operators and based on tonnage crushed and volume of wine.

We asked respondents to the study whether they believed the industry R&D levy gave them value for money. Although all operators pay the levy at the rate of \$4 per tonne, the large operators contribute the most, in absolute terms. It might, therefore, be argued that they should be the major recipients of research sponsored by this levy. However, the majority of respondents argued that the wine industry was a broad-based industry and that industry R&D should provide assistance at the regional and boutique/small operator level. Almost half the respondents thought they were not receiving value for money with the R&D levy. Again, the majority of these were small operators.

Many of the boutique/small operators had limited R&D skills and industry training, were unaware of the opportunities for industry-sponsored R&D, and unfamiliar with the correct procedures for pursuing such opportunities. While they conceded that the large operators should logically receive the lion's share of R&D attention, they argued that peripheral regions and operators were being deprived of the opportunity to benefit from much of the new knowledge. This, they believed, would undermine the current 'frontier' culture of the industry as well as future diversity.

#### Barriers to Knowledge Diffusion

Operators place much of the responsibility for lack of awareness of R&D benefits on the GWRDC and the industry's R&D bodies. However, the issue is more complex. There are structural barriers, which are historically complex in nature, are common to most industry sectors and require concerted action by all stakeholders. These barriers include lack of time, innovative inertia, absence of a research culture, demands of business priorities, and limited knowledge capacity.

It became evident from interviews that part of the responsibility for interruptions to knowledge flows rests with the operators. There was evidence of what we call 'innovative inertia', particularly among the boutique and smaller operators. This type of 'innovative inertia' has been well documented in other industry sectors.<sup>22</sup> The fact that they viewed R&D as extra curricular illustrates a facet of the innovative inertia which inhibits the development of research culture. A significant number of respondents admitted that they had made little or no serious attempt to raise their awareness and knowledge of industry R&D opportunities, or procedures required for eligibility. Some of this group also responded that they would not follow up R&D opportunities in the future unless approached by a collaborator who was prepared to shoulder the responsibility for such collaboration. It appears that the short-term viability of their business was their main priority and that R&D and its longer term implications for business activity were peripheral concerns. Another factor influencing attitude was relative inexperience and unfamiliarity with research and education in the industry. Some felt uncomfortable in an area in which they had little expertise. This perceived lack of technical expertise is a further inhibiting factor in creating a dynamic research culture and linkages with research agencies.

## Sources of Knowledge

While the smaller operators experienced barriers to new knowledge and access to leading edge research in their field, the larger operators appeared better connected to the knowledge epicentre. All large and medium sized operators, together with a few smaller operators, claimed that industry information on R&D outcomes was regular and up-to-date. They reported that industry journals, newsletters and special 'releases' featured the latest R&D outcomes and technical innovations, as well as problems being confronted by the industry. If information was unavailable from these sources, respondents claimed that the Australian Wine Research Institute had an excellent reputation for responding to operator concerns and carrying out any appropriate vine and soil tests or evaluations, for a price. These tests and evaluations were prompt and appropriate to the client's needs, although the smaller operators claimed that, for them, the costs were often prohibitive. Respondents mostly echoed popular opinion that in terms of information dissemination the Australian wine industry compared favourably with wine industries in other countries. Further, the ability to respond quickly to technical and agricultural problems had enabled the industry, as a whole, to overcome many of the problems that had plagued other countries for years.

## Perspectives of Small Operator Importance to Industry

All respondents (small, medium and large) were asked to comment on the importance of boutique and small operators to the future of the Australian wine industry. Boutique and small operators argued that they play an important role in the industry's development and that it is in the industry's interest to broaden and increase services to them. The argument for the importance of boutique and small operators is based on two distinct perceptions. First, is their perceived ability to operate outside the traditional wine-making parameters adopted by larger companies, with established markets and customers. Smaller operators argue that

they break new ground in terms of product, experimenting and innovating in an industry where, they believe, wine making and product range are becoming increasingly standardised. Smaller operators tend to place less emphasis on market demand, have few established product lines and no quotas to meet. They, therefore, have the luxury of product experimentation and variation. In short, they are the ones who take the risk. This, they argue, keeps the industry dynamic and creative. The second perception is that a healthy wine industry requires more than a booming export market. It requires a domestic base that is sufficiently broad to accommodate a variety of products, techniques, markets and future strategies. Without this broad domestic base, it is argued, the export drive will eventually falter, unable to meet growing demands for variety and complexity. These perceptions present an interesting paradox. On the one hand, small operators see themselves at the leading edge of the industry in terms of product innovation and experimentation. Yet on the other hand, they also perceive themselves to be peripheral in relation to where new knowledge and training are taking place.

### Industry Training

Training is uniformly touted as one of the industry's most important components. Strategies for future opportunities, access and delivery are constantly on the agenda, with recognition that the future of the industry is very closely tied to the future of its training capability. At least in rhetoric, results from the study support this view. For example, when asked to rank the importance of training to operators personally, respondents answered overwhelmingly that it was either critical or important. Of those who claimed it was not very important, nearly all were sole operators, with no employees, no recognised training and no real ambition to expand their operations. These might be described as non-innovators (see Figure 3).<sup>23</sup>



Figure 3. Importance of industry training to operators.

When we investigated actual training usage however, the story was somewhat different. A majority claimed they had not as yet made any use of industry training schemes. It should be noted, though, that some employees were involved in training schemes at university and TAFE that were related to their employment, while not recognised as industry training schemes by the industry itself. Reasons for not using industry training schemes included lack of awareness about what was available, high cost, difficulty in sparing time or employees, and—in the case of large operators—the alternative of in-house training.

#### Balance between Industry R&D and Training

There was also some concern that the industry had not yet achieved an appropriate balance between R&D and training. More than half of the respondents noted that training had been neglected compared with the funding avenues and opportunities being created for R&D. Highlighting what some claim are pockets where training is under-encouraged is an example from the Hunter Valley. Since the closure of BHP's Newcastle steelworks, the Hunter wine industry is the area's largest employer. Yet, there is no university viticulture or wine-making curriculum within the region. Wine operators must send their employees to Maitland TAFE or utilise distance education for appropriate training. While these mechanisms may provide valuable learning experiences, they lack a strong research and training culture and linkages to research agencies.

The same situation has resulted in pockets of limited training opportunities in the Mudgee region as well as a number of areas in Victoria, Margaret River and Tasmania. Many employees in these regions attend TAFE rather than university courses. For example, almost half of the operators whose employees attend TAFE/ university courses, claimed that the institution was not in their region. What is clear from the study's findings, is that training is an issue that requires attention if the industry is to retain its current international standing. There are areas that require immediate attention, such as course availability in regional areas and appropriate courses for *all* employees. An overriding requirement, however, is that industry bodies and operators work together to lift the level of awareness of training access and opportunities.

#### Public Sector Collaboration

The Australian wine industry, although relatively new to university collaboration, is already recognised as a world leader in establishing productive and sustainable alliances. One of the prime reasons for this success can be traced to the industry's high profile intermediary body, the GWRDC. Other factors include historical ties with the prestigious Roseworthy College, based at the University of Adelaide, and the Cooperative Research Centre for Viticulture, also based at the University of Adelaide with a node at Charles Sturt University in Wagga, NSW. The industry's collaborative model is being used by other New World producers, such as California, South Africa and New Zealand.<sup>24</sup>

Compared with other industry sectors, this level and breadth of industryuniversity collaboration is impressive.<sup>25</sup> Other industry sectors seem to need long and established collaborative track records before they broaden these partnerships to include small to medium enterprises. Historically, relationships have been confined to the largest operators with significant R&D departments of their own. Already the wine industry is showing signs of breaking this pattern (see Figure 4).



Figure 4. Intention of collaborating with university partners in the future.

Although almost half of the respondents have collaborated, or are collaborating, and most intend collaborating in the future, most still believe that collaborative links are limited at the regional level. Although collaboration is taking place within the industry, it is still a relatively new phenomenon for the majority of operators. The collaborative culture is still some way from becoming entrenched within the industry psyche. The respondents who believed collaborative activity was low at the regional level tended to be those operating outside the R&D epicentre, where collaboration is indeed lower. These two points go some way towards explaining the apparent discrepancy in R&D participation, and reinforce previous observations concerning knowledge diffusion. They also substantiate operator concerns over the industry's R&D concentration. R&D in the wine industry is strong, but patchy. There are pockets of significant R&D strength and concentration, but also pockets of weakness and relative neglect (see Figure 5).

In terms of collaboration with public sector bodies, the wine industry is now at a critical stage in its evolution. Other industry sector analysis has demonstrated that awareness of opportunity is the key ingredient to developing sustainable partnerships. Our studies have also shown that as opportunity is expanded, particularly to



Figure 5. Perception of regional collaboration.

small and medium enterprises, participation rates increase accordingly.<sup>26</sup> There is a direct positive association between opportunity for, and participation in, collaboration. In a recent study of university–industry links, it was clear that a campaign of raising awareness of available collaborative schemes, together with significant increases in funding from the federal government over an eight year period, encouraged a dramatic rise (eight fold) and broadening in participation.<sup>27</sup>

The wine industry has the great advantage of intermediary bodies such as the GWRDC. It must continue to use such bodies to advantage if it is to overcome the sporadic and patchy nature of R&D so common to institution–industry collaboration. It appears that the great challenge now for the GWRDC and the industry in general, is for it to work with operators to extend and link R&D and training opportunities to the regions outside the epicentre. One option here is to follow the example of Iceland, where there is a requirement that institute researchers (whether government or co-operative) at the centre of R&D activity, spend approximately one day per week visiting small firms to discuss relevant issues.<sup>28</sup>

The breadth, more than the depth, of the industry's R&D culture needs to be strengthened. This will help to create greater consistency in product quality, technical innovation and adoption, as well as provide a broader platform for the industry's increasing export presence. The need for such an initiative is certainly reinforced by the operators themselves, who overwhelmingly support the idea of greater institution–industry collaboration at the regional level. Regional TAFE colleges and industry training programmes, if linked effectively, could promote greater interaction between local innovators and core R&D institutions. Linking regional training institutions into core R&D activity could act as a catalyst, creating seamless knowledge flows between industry bodies and regional operators, and hopefully providing the technical expertise that their innovation requires. This is essential not only for the regional operators, but also for the health of the industry as a whole. To succeed over the next decade, the Australian wine industry must ensure that its leading edge innovation is diffused as broadly and as uniformly as possible.

### Conclusion

While the industry's R&D and training efforts have considerably enhanced the sector's international business, and maintained the industry's image as a world leader in product, innovation and variety, there are also some inherent weaknesses in its organisational structure. These require immediate attention to avoid the fragmentation and dislocation evident in many of its international competitors. The study identifies an interesting paradox. Many smaller operators consider themselves to be at the leading edge of product innovation and experimentation. They see themselves as frontier operators, able to develop niche brands and unconstrained by the standardisation and market demands imposed on the larger operators. Yet these same small operators also see themselves at the periphery of R&D activity within the industry. They are unable to develop and extend the linkages between research and training that the larger operators have developed so successfully.

In terms of innovation, technical expertise and problem-solving capability, the Australian wine industry has set new international benchmarks for R&D. However, this R&D is concentrated in what appears to be an R&D epicentre in South Australia surrounded by the industry's largest operators. Regions and operators not

connected to this epicentre are disadvantaged. It should also be noted that these smaller regional operators have themselves demonstrated a degree of innovative inertia. In some cases, genuine impediments, such as a lack of capital, human resources and awareness, have prevented their involvement. The overriding problem, however, appears to be a dislocation between research and training at this end of the industry.

The Australian wine industry enjoys a very high level of well-trained graduates in Wine Science and Viticulture. These graduates, usually from the prestigious Roseworthy and Charles Sturt campuses, are in demand throughout Australia and increasingly overseas. But again training was viewed as inadequate in regional areas and sometimes inappropriate to the needs of regional operators. The critical issue is the disjunction between the research and training carried out at research institutes, and the training in regional centres. Efforts to encourage linkages between such training and R&D centres will improve and broaden dissemination of knowledge. Where the industry appears to be showing real international leadership is in collaboration with public sector research providers. Although a relative newcomer to collaborative activity with the public sector, the wine industry is already setting benchmarks for other industry sectors and for its international competitors. To sustain this pattern, however, considerably more attention needs to be given to collaboration in regional areas. Regional training and knowledge diffusion centres would help. They would not only enrich the knowledge flows to niche wine operators, but would also help to steer research into new and relevant areas.

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## Notes and References

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