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DIFFUSION OF INNOVATIONS IN THE AUSTRALIAN WINE INDUSTRY: A PILOT STUDY OF CONJOINT ANLAYSIS METHODS FOR PRETESTING ADOPTION OF INNOVATIONS

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ABSTRACT

Many innovative products and services can be thought of as bundles of product attributes. Adoption may be determined by the consumer's relative valuation of alternative bundles of the product attribute. Conjoint analysis is a sophisticated computer analysis method that allows us to assign utility values to the various attributes of an innovation and to redesign and optimise the mix of attributes in an innovation for particular target markets. The method also allows quantitative forecasting of initial market shares for alternative innovation concepts. This study reports on an exploratory pilot application of conjoint analysis to the adoption of innovative practices to control Botrytis in high risk grape growing regions in Australia. The results for the high risk target group indicate that growers perceive spur pruning and chemical sprays as the most important management practices. However, a bundle of more holistic management practices that could reduce chemical sprays but include biological sprays with pruning, shoot thinning, bunch thinning and leaf thinning has the potential for an initial adoption by almost 30% of the surveyed growers. This forecast potential adoption rate would indicate that research and extension into these new management practices for Botrytis should be worth supporting.

INTRODUCTION

One of the major risk factors in research and development expenditure is uncertainty about the adoption of the innovations that are the outcomes of the research process.

Many previous studies on adoption of innovations have focused on adoption models that ignore the competitive effect of the existing alternative substitutes for the innovation. This exploratory pilot research study addresses this weakness by applying conjoint analysis with competitive simulations to determine the potential adoption of innovative management practices to control Botrytis in high risk areas of the Australian wine industry.

Conjoint analysis has been used successfully to measure, analyse and predict responses to innovations such as new products or new features added to existing products (Wittink and Cattin 1989, Green and Srinivasan 1978, Green and Srinivasan 1990, Anderson et al. 1993)

It allows researchers to decompose consumers' preferences for products and services (provided as descriptions or visual images) into part-worth utilities associated with each option of each attribute or feature of the product. The part worths can be recombined to develop an optimal product concept, to identify market segments that value a particular product concept highly and predict preferences in a competitive simulation for the innovation.

To apply this method to innovations in the wine industry we need to:

1. identify the major attributes of the innovation through focus groups
2. omit those attributes common to existing competing innovations
3. provide at least two options for each identified attribute
4. generate a set of innovations for adopter evaluation – each innovation is described as a combination of attribute options
5. assess adopter preferences through ranking of innovations to establish relative weights for attributes and attribute options
6. simulate the adoption of the optimised innovation in a competitive setting

Conjoint analysis is a sophisticated computer method that has to be applied within certain limitations. These include:

1. it is not applicable if the innovation attributes are non-compensatory
2. limitations of the completeness of the attribute set
3. the market share simulation assumes that adopters consider all available alternatives

Despite these limitations the conjoint analysis method can be used to optimise existing innovations and predict the adoption of innovations in competitive settings against existing innovations.

The study reported here is a preliminary pilot study of the application of conjoint analysis methods in the Australian wine industry.

The study focuses on only one innovation – Botrytis control in high risk grape growing regions in Victoria.
Botrytis control is a significant challenge in these regions and a variety of management practices have been researched for its control. The study gives information on the current adoption of these practices in the defined target group and allows an investigation of the likelihood of future adoption of innovations such as biological sprays.

IDENTIFY MAJOR ATTRIBUTES OF THE INNOVATION THROUGH FOCUS GROUPS

A focus group of eight vignerons from the Mornington Peninsula region discussed Botrytis management practices. The Mornington Peninsula region is regarded as a high risk region for Botrytis.

The discussion involved both informal and semi-structured sessions over a four hour period.

The group first discussed the factors they considered important for Botrytis infection and damage.

These included:

- Wet weather at flowering or harvest
- Berry damage due to wind, bird and hail damage
- Susceptible varieties such as chardonnay, riesling and sauvignon blanc
- Heavy canopies that increase humidity
- Tight bunches limiting aeration and spray penetration
- Vineyard sites with high vigour

The discussion then centred on the types of management practices for Botrytis control, in particular the use of chemical sprays and ways of opening up canopies and reducing bunch congestion to improve air circulation and penetration of sprays. Discussions about chemical sprays revealed concerns about the number and cost of sprays and the development of resistance. Bravo, Scalar and Rovral where the most commonly used sprays. Only limited use of biological sprays such as “Trichodex” was discussed.

Growers discussed a broad range of practices that they believed help to control Botrytis including:

- Chemical sprays
- Cane pruning
- Spur pruning
- Vine nutrient management
- Trellising systems
- Biological sprays
- Leaf thinning
- Shoot thinning
- Bunch thinning

Following from the detailed discussion of the focus group the following factors where used to develop the conjoint analysis:

- Pruning – cane and spur
- Biological sprays
- Chemical sprays
- Shoot thinning
- Bunch thinning
- Leaf thinning

PRODUCE A SET OF INNOVATIONS FOR ADOPTER EVALUATION

The attributes identified by the focus group where entered into the conjoint program with at least two options for each attribute. The conjoint program then generated a set of orthogonal product profiles. Sixteen alternative profiles where generated and incorporated into the survey form as detailed below.

BOTRYTIS MANAGEMENT SURVEY

PART 1

Distribute 100 points among these management practices for botrytis control, giving more points to the more important practices and fewer points to the less important practices in *YOUR* botrytis management program. Point allocation should total 100.

Next you should indicate *YOUR* perception of the importance of each option in managing botrytis by allocating the corresponding management score between the options.

For example if you gave PRUNE a Management Score of 40, you need to then divide this score of 40 between CANE and SPUR eg. CANE 30, SPUR 10 would indicate that you think cane pruning is more important than spur pruning for botrytis management.

Botrytis Management Practice	***Management Importance***	***Option***	***Option Importance***
Prune		CANE	
		SPUR	
Bio-Spray		YES	
		NO	
Chem-Spray		1 OR LESS SPRAYS	
		2 TO 9 SPRAYS	
		10 OR MORE SPRAYS	
Shoot-Thin		YES	
		NO	
Bunch-Thin		YES	
		NO	
Leaf-Thin		YES	
		NO	
TOTAL	**100**		**100**

PART 2

Rate the following combinations of management practices for Botrytis control from 0 to 100, giving 0 to the least preferred and 100 to the most preferred combination to achieve Botrytis control in YOUR vineyard. Note your rating column should have one score of 0 and one of 100 with the rest ranked anywhere between.

COMBINATION	PRUNE	BIO-SPRAY	CHEM-SPRAY	SHOOT-THIN	BUNCH-THIN	LEAF-THIN	RATING (0-100)
1	cane	Yes	1or less	yes	yes	yes	
2	cane	No	1 or less	no	yes	no	
3	spur	Yes	1 or less	no	no	yes	
4	spur	No	1 or less	yes	no	no	
5	cane	Yes	2 - 9	yes	yes	no	
6	cane	No	2 - 9	no	yes	yes	
7	spur	Yes	2 - 9	no	no	no	
8	spur	No	2 - 9	yes	no	yes	
9	cane	Yes	10 /more	yes	no	yes	
10	cane	No	10/more	no	no	no	
11	spur	Yes	10 /more	no	yes	yes	
12	spur	No	10/more	yes	yes	no	
13	cane	Yes	2 - 9	yes	no	no	
14	cane	No	2 - 9	no	no	yes	
15	spur	Yes	2 - 9	no	yes	no	
16	spur	No	2 - 9	yes	yes	yes	

ASSESS ADOPTER PREFERENCES THROUGH RANKING OF INNOVATIONS TO ESTABLISH RELATIVE WEIGHTS FOR ATTRIBUTES AND ATTRIBUTE OPTIONS

Growers where surveyed from three regions in Victoria – Mornington Peninsula, Yarra Valley and the Alpine region. A total of 71 usable responses where obtained. The majority of responses where collected in a face to face interview process. Computer analysis of these responses gave the average part worth of each attribute across the respondents as in the table below. Computer programs from Lilien and Rangaswamy (1998) where used to analyse the data. The average part worth gives a good indication of the attribute options that are attractive to the selected target market. In this case spur pruning and 2-9 chemical sprays had the highest score for average part worth.

Attribute	***Option***	***Average Part worth***
Prune	CANE	1.95
	SPUR	24.25
Bio-Spray	YES	5.30
	NO	5.55
Chem-Spray	1 OR LESS SPRAYS	7.05
	2 TO 9 SPRAYS	20.55
	10 OR MORE SPRAYS	5.55
Shoot-Thin	YES	8.70
	NO	3.80
Bunch-Thin	YES	10.05
	NO	4.75
Leaf-Thin	YES	5.75
	NO	5.40

SIMULATION OF ADOPTION OF INNOVATION IN A COMPETITIVE SETTING

Using the maximum utility rule the two most widely accepted combinations of management practices would be:

A – with 51.85% market share

1. spur pruning
2. biospray – no
3. chem.-spray – 2-9
4. shoot thin –yes
5. bunch thin- yes
6. leaf thin – yes

B- with 48.15% market share

1. spur pruning
2. biospray – yes
3. chem. Spray- 2-9
4. shoot thin – yes
5. bunch thin- yes
6. leaf thin – yes

This indicates that growers in these high risk regions still perceive the need for substantial chemical sprays combined with other management practices.
There may also be some impact of contractural growing requirements with the wineries to reduce the risk of botrytis.

Despite this, a competitive simulation of A against an alternative with a reduction of chemical sprays to one or less could still gain substantial initial market share of 29.63% .

Using the maximum utility rule a competitive simulation results in initial market shares of:

A – 70.37%

1. spur pruning
2. biospray – no
3. chem. Sprays – 2-9
4. shoot thin –yes
5. bunch thin – yes
6. leaf thin – yes

New1 – 29.63%

1. spur pruning
2. biospray – yes
3. chem. Sprays- 1 or less
4. shoot thin – yes
5. bunch thin – yes
6. leaf thin – yes

These results indicate that new biological sprays and holistic management practices are worth researching as the initial uptake is potentially substantial at around 30% of the surveyed target market.

In 2002, workshops revealed that growers were unhappy with the efficacy of current management practices particularly the lack of satisfactory control with Botrytis sprays. They were more interested in a holistic approach that incorporates cultural management options suitable for their regional and vineyard environment. Growers were increasingly frustrated because incidence monitoring for Botrytis infection at flowering did not accurately indicate potential losses at harvest (Cole, personal communication 2006)

Since then research by Cole et al, 2004a, 2004b, 2004c, 2004d, 2005; Cole, 2003, 2004; Keller et al, 2003) has given growers a far better understanding of the activity of Botrytis in the vineyard during the whole season. With this information, they may have greater confidence to forego routine chemical sprays for more strategic, as-need programmes incorporating biologicals and soft products.

CONCLUSION

Although the study was only an exploratory pilot study of one innovation in the Australian wine industry, it does demonstrate that the conjoint method may have further applications. In particular it could have application both before and after specific research programs. In the period of project assessment it could be usefully applied to projects incurring high investment levels but for which there is considerable uncertainty about the adoption rate. In the post research phase, it could be applied to projects for which the adoption rate has been significantly lower than expected to determine if additional innovation attributes are required to increase adoption or if competitive innovations are limiting adoption.

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