

Quality Assurance of the Australian Truffle Industry

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Abstract

Australian truffle growing in Australia is small and at the early stages of development. The industry produced approximately 1,500 kilograms in 2009 with a wholesale price of between \$1500 and \$2,000 / kilogram. A high proportion of growers operate on a small scale. As well as increasing area being planted, truffle production is increasing approximately 40 percent each year from existing planted areas to meet the growth in local and overseas demand. Commensurate with this growth is the pressure for the industry to develop its supply chain relationships and associated quality assurance (QA). This paper explores the QA assurance approaches suited to the truffle industry and reports industry stakeholder responses toward the implementation of such QA schemes.

110 industry members of the Australian Truffle Growers Association were invited to participate in the survey with 29 responding (26 percent). 20 of these agreed that the overall benefits to their business obtained from introducing a QA scheme would outweigh its costs. It was also generally perceived that QA would ensure continuous improvement and advance the professionalism of the industry. The study involved the design of a user-friendly online questionnaire made accessible to the member group only.

Introduction

The development of supply chain relationships and related quality assurance (QA) programs is seen as an important step in the overall development of emerging industries. The interest in this paper, QA in the Australian truffle industry, grew from an earlier industry study conducted by the Rural Industries Research and Development Corporation (RIRDC) in July 2008 titled 'Taking Stock of the Australian Truffle Industry' (Lee, 2008). The RIRDC study emphasised the need to evaluate an industry specific QA scheme and assess the benefits association with such a scheme. Specifically, the RIRDC report recommended to "review and assess the benefits associated with an audit and certification process for inoculated seedlings, trees and truffles." (Lee, 2008) More recently, QA was central to the 2009 National Truffle Industry conference discussions on industry sustainability and specifically "quality standards, biosecurity and market research" (Australian Truffle Growers Association, 2009).

One driver for industry change is the fact that the domestic demand for truffles is nearly saturated. Haslam, president of the Australian Truffle Growers Association (pers comm., 2009) stated that Australia's current production of fresh truffle is approximately what the domestic market would consume if fully developed. The export of fresh product overseas is the potential area for industry growth and while exporting the native French Black Truffle back to France, will be a challenge, it is off season and the rest of Europe is a significant market. Selling into the Americas and Asia is also of great importance to the Australian industry. Successfully doing so will require market research and development and building Australia's reputation as a quality truffle supplier (Lee, 2008). QA would be seen as one plank in the development of the truffle export market.

The aim of this study was 'to analyse the perceptions of key stakeholders in the Australian truffle industry in response to the introduction of a Quality Assurance scheme for inoculated seedlings, trees and truffles.' The targeted key stakeholders included, but weren't limited to inoculation nurseries, truffle growers, truffle wholesalers and marketers and buyers of fresh truffles. The membership of the Australian Truffle Growers Association (ATGA) was surveyed for the purposes of this study. The survey attempted to establish:

- The tools currently in use to verify and promote product quality.
- The perceived benefits and drawbacks associated with an industry specific quality assurance scheme.
- Support for and likely adoption levels for a quality assurance scheme developed for the industry.

As a member of the Australian truffle industry, the primary author has a personal affiliation with the industry and its future prospects. While there is an apparent pull within the industry for the development of QA, it was important to understand the depth of this interest across the industry membership. It could be argued that the successful development of any QA scheme would be dependent on the support and ultimately high level of uptake from key stakeholders within the industry. The survey of ATGA members was seen as one way of establishing the 'bottom up' perspective on QA.

The Australian Truffle Industry

What is a truffle?

The fresh truffle is the edible fruiting body of a subterranean fungus known as a Mycorrhiza (Renowden, 2005). Mycorrhizae form a symbiotic relationship with a host tree because they cannot synthesize sugars and other carbohydrates on their own. The tree provides the truffle with a source of carbohydrates and nutrients, and in return the fine thread-like filaments (mycelia) of the truffle, coats the tips of the tree roots to form mycorrhiza which assists the tree to absorb soil minerals and nutrients (Lee, 2008). In effect, the mycorrhiza is able to increase the effectiveness of the trees roots and provide phosphorus and trace elements that would normally be unavailable to the tree.

Truffles are one of the most valued and sought after food crops in the world (Lee, 2008). One major source of their high market value stems from their unique, but extremely desirable, aroma and flavour. Their mystique and associated gourmet experience has been described as second to none (Renowden, 2005). Another reason for their high market value is to date only a small percentage of trees in truffières have yielded truffles. Truffière is the French term for a truffle plantation. The conditions under which truffles actually form and fruit are quite variable (Malajcuk and Amaranthus, 2007). The third reason for their high market value is their short supply. Worldwide production has steadily decreased over the last 100 years.

There are many types of truffles found all over the world. The four of most culinary value are the French Black (*Tuber melanosporum*), the Italian White (*Tuber magnatum*), the Bianchetto White (*Tuber borchii*) and the summer truffle (*Tuber aestivum*) (Hall, Bryan and Byars, 2001). Almost all of the Australian truffle industry is focused on growing the French Black and hence it is the most highly cultivated in Australian plantations. According to food wholesalers in Australia the French Black can fetch market prices of over AU\$3000 per kilogram (Lee, 2008).

Industry Trends

Truffles are a relatively new crop in Australia (Lee, 2008). The first plantings began in the 1990s in Tasmania and Western Australia with the first truffles being harvested in 1999. Truffières have now been established in Victoria, New South Wales, the ACT, South Australia and southern Queensland.

The industry is entering a new phase of growth and investment (Lee 2008). Australian truffle production could grow by as much as ten times by 2013 (Australian Food News, 2008). Whilst the exact annual production of fresh truffle in Australia is unknown it is estimated to have been approximately 1.5 tonnes for the 2009 harvest season (RIRDC, 2009a). Given that the industry is still relatively young local production is increasing by approximately 40 percent each year.

A high proportion of Australian growers are small-scale growers. In 2010 the total area planted in Australia is estimated to be 550 Ha distributed among an estimated 130 plantation sites nationally (Lee, 2009). Table 1 shows the estimated number of truffières planted in each state and also by type of operation. Approximately 110 of these are members of the ATGA. The highest producing states are Tasmania and Western Australia due to the industry being established in these states first.

Table 1: Types and numbers of truffières planted in the states of Australia

Truffles Growers and Planted Areas in Australia 2009										
Grower Type	Description	WA	SA	Tas	Vic	ACT	NSW	Qld	Total Growers	Area Totals
1	Larger scale corporate truffière,	2	0	2	0	0	0	0	4	100
2	Larger scale investment truffière, MIS	1	0	3	0	0	0	0	4	200
3	Smaller scale contracted grower truffière	0	0	>10	>10	1	>20	0	>40	100
4	Smaller scale independent grower truffière	>10	2	>10	>20	1	>40	2	>85	150
	Total	>13	2	>25	>30	2	>60	2	>130	>550
	Total Area Estimate Ha	>110	>5	>200	>100	>7	>120	>5	>550	>550

Data source: (Haslam, 2010 adapted from Lee, 2009)

Traditionally truffles have been harvested out of wild forest areas in France with very rudimentary harvesting techniques. Over the last century the harvest of wild truffles has declined significantly, from over 1000 tonnes in the early 1900s to around 100 tonnes per annum during the 1990s (Garvey and Cooper, 2001). The destruction of natural growing areas especially during the world wars, changes in urban land use, pollution, loss of population to the cities and climate change are considered to be the main causes of this decline (Amaranthus, 2007). As a consequence of this truffles are increasingly being produced on cultivated farms planted with inoculated trees (Garvey and Cooper, 2001). Recent data from the Ministry of Agriculture in France shows that in 2007-08 production volumes were around 13 tonnes (Lee, 2008).

At present about half of Australia's truffle supply is sold to the domestic market, especially for the restaurant and fine food wholesale market segments (Lee, 2008). Some of the larger growers within the industry have developed dedicated resources for sales and marketing of truffles, while the majority of smaller growers sell privately or outsource the marketing and distribution to wholesalers. A few of the larger growers have successfully sought stable export markets (RIRDC, 2009b).

The Australian truffle industry is at a natural advantage in that the Australian climate is six months apart from the climate of the northern hemisphere producers. Therefore, Australia's harvest season does not line up with that of these international competitors. The industry in this sense enjoys a significant competitive advantage in the export of fresh truffle, which has a shelf life of only two weeks, to countries in the northern hemisphere during their summer period.

The significant weaknesses of the industry which pose risks for its future development include:

- The limited size of the local market and the underdeveloped supply chain relationships into the overseas markets.
- Contamination of imported inoculum (*Tubers* or *Tuber mycorrhizae*) used for inoculation of tree stock (Lee, 2008).
- Variability of truffle yield and low numbers of producing trees. This threatens guarantee of supply (Hall, Brown and Zambonelli, 2007).
- Variability of quality standards for markets.
- Lack of communication and transfer of technical knowledge along the supply chain. (Nicholas, 2001).

The threat of contamination occurring during the inoculation process is a significant one for the industry. Much of the inoculum used for inoculation of seedlings is imported from overseas (Hall, Brown and Zambonelli, 2007). Hall, Brown and Zambonelli (2007) state that inferior species of black truffle such as the Chinese *Tuber indicum* and *Tuber sinense* have very little market value and can be substituted. Furthermore, there is also the threat of competing mycorrhiza such as *Scleroderma* taking the place of potential infection sites for the desired fungus. In the field they reproduce prolifically and can out-compete the French Black Truffle fungus – leading to a very low or even absent production. To find out after several years that much of the desired fungus has been displaced would be disastrous for growers. The damage that these contaminants can cause may also ruin the reputation of Australian grown truffles, particularly when marketing the product overseas. QA is one mechanism for controlling contaminants, ensuring they are kept out of the country and most importantly out of inoculation nurseries and truffières.

On farm practices such as nutrition, weed suppression and soil moisture levels have a significant impact on the size, quality and volume of truffles produced. This is still an area of scientific uncertainty and much research on the cultural techniques is still being undertaken (Hall, Brown and Zambonelli, 2007).

Quality Assurance

The Australian truffle industry is not unlike other industries seeking to explore QA as a means of developing customer confidence in the industry. QA can be seen as an important element underlying the credibility and competitiveness of individual firms and industries overall. In the context of truffles, Garvey and Cooper (2004) explain that QA encompasses all planned and systematic actions and programs that are designed to provide confidence that the product (i.e. inoculated trees, fresh truffles or value added products) or service (e.g. agronomic consultancy) will meet customer expectations.

Internationally, there are no truffle industry-specific QA schemes in use; however, standards for grading truffles do exist. The European Union (EU) standard was developed by the United Nations Economic Commission for Europe (UNECE) in 2004 and titled 'Recommendation Standard for Fresh Truffles'.

More recently, the New Zealand Truffle Association (NZTA) launched its own version of a grading system based on that of the EU (Hall and Nelson, 2009). The system was completed largely by the NZTA with input from committee members of the Australian Truffle Growers Association. The purpose of the standard is to define the quality requirements of truffles at the export control stage, after preparation and packaging and a recommendation for local sales. The document clearly sets out the requirements of the following important provisions:

- Provisions concerning quality: Truffle minimum requirements, maturity requirements and classification (e.g. Grade A, B, C or D)
- Provisions concerning sizing: size is determined by the weight of the truffle
- Provisions concerning packaging: Uniformity and packaging
- Provisions concerning labelling: Identification, nature of the produce, origin of the produce and commercial specifications

The document was developed with the interests of Australian growers in mind also. Both the NZTA and Australian Truffle Growers Association are closely aligned so an Australian version of the grading system is likely to be very similar.

There is considerable literature on growing and cultivating truffles (ATGA 2009; Malajcuk and Amaranthus 2007, UNECE 2004). In addition to Lee's (2008) assessment of the industry, as previously mentioned, RIRDC has also supported several other studies into the industry. These include investigations into "Evaluation of the potential of growing *Tuber melanosporum* as a crop on mainland Australia for export and domestic consumption" (Stahle and Ward 1996), "French Black Truffle. Establishment and production in Tasmania" (Garvey and Cooper, 2001) and "Increasing the productivity of truffières in Tasmania" (Garvey and Cooper 2004). These papers variously highlighted the importance of quality assurance and, specifically:

- The importance of the highest quality truffle produce in maximising the economic benefits for farmers (Stahl and Ward, 1996).
- The protection of the integrity of the industry, and ensuring the production of a certified quality truffle, being dependent upon the inoculation nurseries being able to guarantee the quality of trees distributed to growers (Garvey and Cooper, 2001).
- The marketing potential of the Australian truffles being underwritten by both the best technology available and a quality scheme that certifies the quality and species of the Australian grown French black truffle (Garvey and Cooper, 2004).

More recently, the 'Australian Truffle Industry R&D Strategic Plan 2009-2011' (RIRDC 2009b) set out five major objectives for the industry as part of a set of three year industry priorities. Objectives 3 and 5 in particular focus on industry quality related requirements. The objectives include:

- **Objective 1**
 - Establish an action group to work with AQIS on Import
 - Legislation covering Chinese or other identified truffle varieties
- **Objective 2**
 - Understanding, strengthening and developing market analysis
 - and market drivers for Australian truffles
- **Objective 3**
 - Establishing a Grading Standard for Australian truffles

- **Objective 4**
 - Research into diseases with a focus on affects of rot in truffles
- **Objective 5**
 - Consumer education, industry communication and engagement,
 - and advancement of accreditation standards for Australian truffles

Whilst there is not yet a quality assurance scheme specifically for truffle cultivation in Australia there are several QA systems and standards in use for other horticultural product. One is SQF2000 which is very sophisticated and requires a strong market link (Rudge, pers. comm., 2009). Another is Freshcare which, unlike SQF2000, has relatively low costs of implementation and maintenance, but is primarily focused on food certification rather than the growing processes (Bennett 2005).

The ISO9000 series of standards define minimum requirements for business quality assurance schemes (Handy and Atkinson 1997). Whilst the certification system is internationally recognised it is not industry specific and is most appropriate for the manufacturing industry. It is also too complex for small operations and expensive to implement and maintain.

The Nursery Industry Accreditation Scheme, Australia (NIASA) for production nurseries outlined in the NGIA's Best Management Practice Guidelines manual (Nursery and garden Industry Australia 2003) is adopted by many inoculation nurseries (Blakers per. comm. 2009). Whilst it is cost effective and in the most part applicable, truffles require different cultural and growing practices to a traditional pot plant, in that the focus is more on growing the fungus than the plant. It is clear that conventional practices for things such as pest and disease control will need to be modified and industry guidelines developed specifically for truffles. Another downside of NIASA is that it is strongly business process based and appears to be more of a marketing tool than a practical, quality driving set of procedures (Rudge, pers. comm., 2009).

Some industry sectors have their own specific quality standards. One example of this is Australian Persimmon Export Company (APEC) which was in a similar situation to that of the present Truffle Industry a few years back (Rudge, pers. comm., 2009). APEC consists of about 30 growers so industry penetration is low, but it is entirely grower owned and controlled (Australian Persimmon Export Company 2009). APEC adopts quality standards which must be followed by all members.

Other certification models do exist. For example, the Organic Growers of Australia (OGA) has its own certification system (Organic Growers of Australia 2009). This system is designed to ensure authenticity of an organic product. It is aimed at small operations with reduced certification fees and less complexity than those designed for large scale business (Organic Growers of Australia 2009). One of the concerns with the system relate to control and certification regarding non-organic inputs being used on organic farms.

Industry Survey

As part of the process of developing a model for QA for the Truffle industry, key stakeholders including growers, inoculation nurseries, truffle wholesalers and marketers, were surveyed to establish their likely levels of support for a the concept of an industry based QA model and its associated elements. For any implementation to be successful and gain a high level of uptake from key stakeholders within the industry an analysis of the thoughts of these key stakeholders is critical. The survey was designed to elicit views on any issues and costs, but also the benefits that members feel are important so these can be taken into consideration when a QA scheme is developed.

The survey also presented to the stakeholders a sense of what an industry based QA model might involve for the truffle industry. This was developed after discussions with people within the Australian truffle industry and the wider horticultural industry. This QA 'construct' enabled stakeholders to respond in a more informed way on the elements that would be contained in a system of QA for the industry. The five QA elements included:

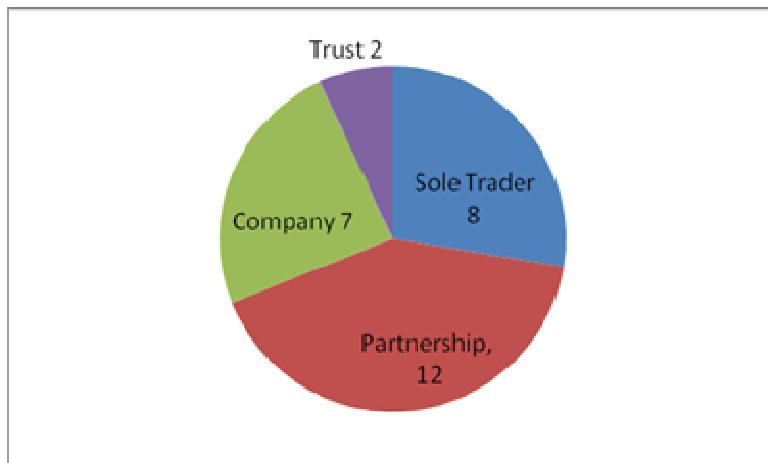
1. A grading system to ensure final product meets specifications
2. Grower and inoculation nursery certification. Whilst the methodology and theory associated with the inoculation of host trees is usually confidential the integrity of the process is crucial for the industry.
3. Environmental certification (e.g. ISO 14000, Freshcare environmental Code)
4. Annual audits - many documents have suggested the need for an audit process. Most have focused on inoculation nurseries, in particular to certify that trees have been successfully infected with *Tuber melanosporum* and free of competing mycorrhizal fungi. Also of importance is DNA analysis for true to type *Tuber melanosporum* and infection is with both mating type loci.
5. Good Agricultural Practice. This appears to form grounding in most industry specific QA schemes (Kingwell, 2003). This would cover the process of benchmarking such as industry best practice techniques. Technical support to growers is also an important issue which would need to be covered under Good Agricultural Practice.

During August 2009, 110 members of the Australian Truffle Industry were invited to complete an online questionnaire. The survey was issued after consultation with industry stakeholders, pilot testing and under the governance and protocols of The University of Melbourne's Human Ethics policy. 29 (26 percent), 25 of which were 25 truffle growers. Other interests included inoculation nurseries / growers, agronomic consultancy business and distributors of fresh truffles.

Business profiles

The dominant legal or ownership structure of the organisations surveyed was the partnership structure (12 or 41 percent) followed by sole traders (28 percent) and companies (24 percent)(Figure 1). All respondents nominated themselves as 'owner / director' within their operations.

Figure 1: Ownership structure of respondents (n = 29)



The largest concentration of respondents (16) was from New South Wales (Table 2). Western Australia and Tasmania had the lowest participation rate with only one from each state. This was not unexpected since while

these are the two states in which the industry was pioneered and are the two highest producing states in Australia, the numbers of growers are small.

The most common size of operation was between 1 and 5 hectares with 15 respondents in this category (Table 2). The high incidence of smaller operations seems consistent with the data presented in 'Taking Stock of the Australian Truffle Industry'. One reason for the high incidence within the industry of smaller scale of operations is that it appears that many growers have planted one hectare on a trial basis. As a new industry requiring much research into the cultural and growing requirements under Australian conditions, the moderate scale of operations may be due to grower conservatism in light of the range of risk factors. Five respondents had a growing area greater than five hectares. The bigger producers were distributed evenly throughout the States.

Table 2: Number of operations by size / State

SIZE/STATE	NSW	VIC	ACT	WA	TAS	TOTAL
< 1ha	4	3	0	0	0	7
1 - 5ha	10	4	1	0	0	15
> 5ha	1	1	1	1	1	5
Other*	1	1	0	0	0	2
TOTAL	16	9	2	1	1	29

Other* includes the two operations which are not growers of fresh truffle but key stakeholders in the industry.

The most common age of operation was between four and ten years with 52 percent in this group (Table 3). 12 operations (41 percents) were in the youngest category (less than four years). The lack of operations greater than ten years is consistent with the view that the industry is still young.

Table 3: Matrix of size and age of the operation

SIZE/AGE	< 4yrs	4-10yrs	> 10yrs	TOTAL
< 1ha	5	2	0	7
1 - 5ha	5	10	0	15
> 5ha	1	3	1	5
Other*	1	0	1	2
TOTAL	12	15	2	29

Quality systems currently in place for the business

Respondents were asked to identify internal production techniques and external production standards or certifications employed by their businesses.

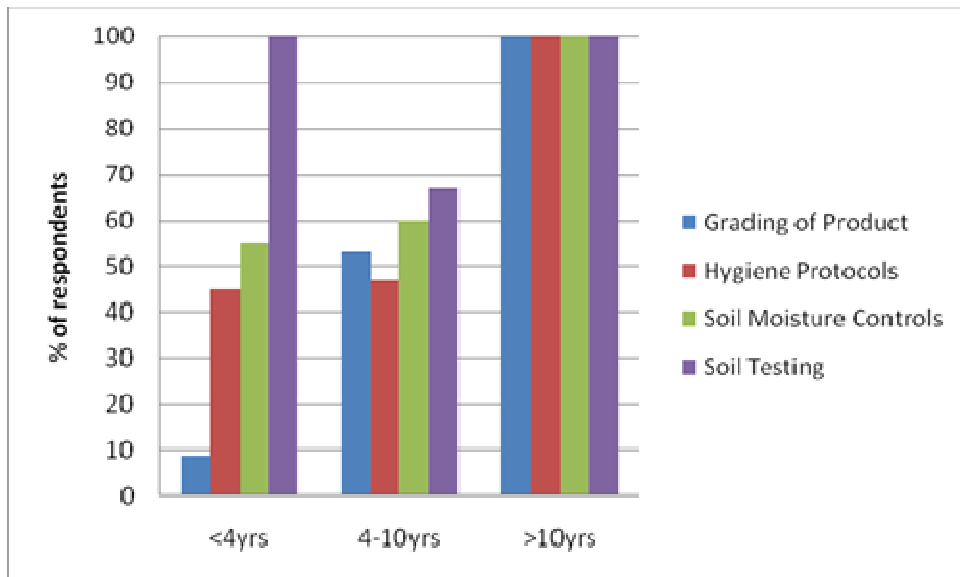
Internal production techniques

Soil testing was the most used internal production technique among the participating growers with 78 percent implementing the technique (Table 4). Business process controls was the least used internal production technique with only five respondents. Of the 27 growers who participated in the survey 37 percent used grading of product as an internal production technique. Only one of the operations less than four years old used this technique, 53 percent in the four to ten year category, and 100 percent of greater than ten year old operations use the technique (Figure 2). This result appears consistent with the earlier assumption that truffles are not usually formed until trees are a minimum of four years of age. The single operation using this technique in the less than four year category was also an inoculation nursery and may use grading of product for use as inoculum. Soil testing was used by all growers in the less than four year and greater than ten year categories with the rate falling away to 67 percent in the intermediate 4-10 year category (Figure 2).

Table 4: Number of respondents using various internal production techniques (n = 29)

Internal production techniques	Count	%
Grading of Product	✓✓✓✓✓✓✓✓✓✓	37
Hygiene Protocols	✓✓✓✓✓✓✓✓✓✓✓✓✓✓	48
Root sampling/analysis for contamination	✓✓✓✓✓✓✓✓	30
Soil moisture controls	✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓	59
Soil tests	✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓	78
Business process controls	✓✓✓✓✓	19

Figure 2: Respondents using various internal production techniques by age of operation (n = 29)



External production standards or certification systems employed

The level of uptake of external production standards or certification systems is considerably lower than internal production techniques (Table 5). Three respondents who are not using any external production standards expressed opinions that the external production standards are not yet applicable to them.

Whilst the number of respondents employing organic certification was low (only 2) several people indicated an interest in participating in an organic certification scheme. One person indicated they will be seeking organic certification once their trees come into production and another stated that they are about to begin starting out preparing for organic certification. The operations of the two respondents who do employ organic certification are both less than four years old (Table 5). The particular organic certification program specified by the two growers was Organic Growers of Australia.

Table 5: Respondents employing various production standards by age of operation (n = 29)

	All		< 4yrs		4-10yrs		> 10yrs	
	Count	%	Count	%	Count	%	Count	%
External production standards								
Industry accreditation	2	7	0	0	1	6.7	1	50
Organic certification	2	7	2	18	0	0	0	0
Customer quality system	5	19	1	9.1	3	20	1	50
Food safety certification	3	11	0	0	2	13	1	50
Environmental certification	0	0	0	0	0	0	0	0

Five (19 percent) respondents used a customer quality system (Table 5). All respondents adopting food safety certification come from the four to ten and greater than ten years of operation categories. This seems reasonable given the assumption that truffles are not usually formed until trees are four years old. With no fruit to sell there is no need for food safety certification.

Industry support for QA

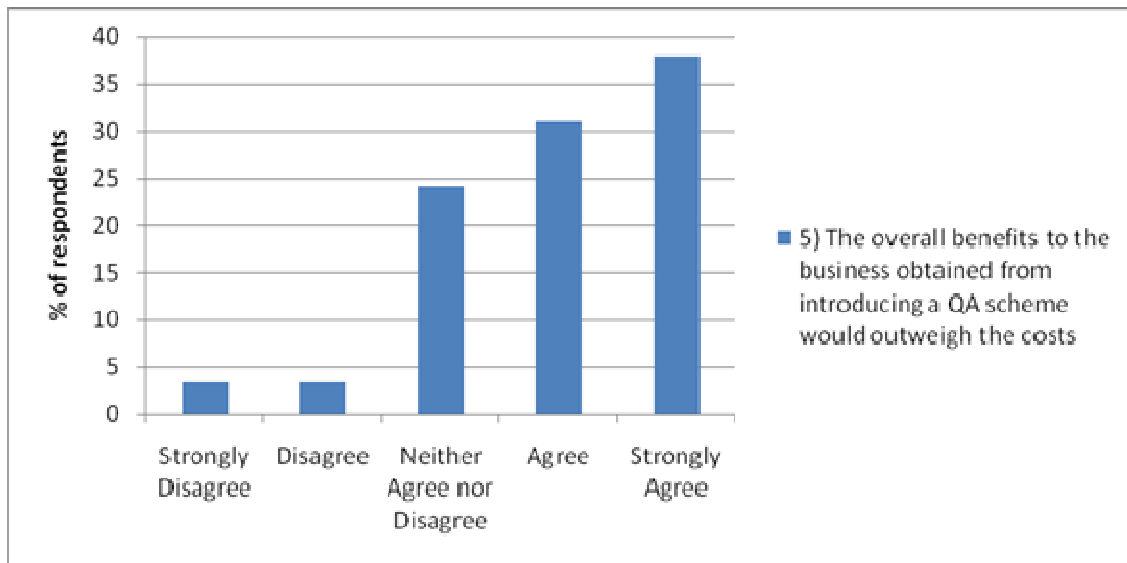
Industry members were asked to indicate their overall level of support for a quality assurance system in response to the following statement:

“The overall benefits to the business obtained from introducing a QA scheme would outweigh the costs”

Using a 5 point likert scale, response choices ranged from strongly agree (5 rating) to strongly disagree (1 rating) with a neutral rating (3 rating). Participants were generally in favour of the statement with 11 respondents strongly agreeing with 20 of the 29 respondents agreeing overall (Figure 3). The mean response was 3.97, median 4 (agree) and standard deviation of 1.05.

Only two respondents disagreed with the statement. One respondent’s reason was that they believed that a QA scheme would take all of “the mystery and magic away from the product and thus lower the value”. The other respondent is not a supporter of regulation in private enterprise and feels it is just an impediment and a cost to production. This respondent believes that producers are individually responsible for quality control at the production end and this will build their standing in the marketplace. Whilst this respondent felt the costs outweighed the benefits they did indicate that they will participate in such a scheme and follow common procedure if required.

Figure 3: Frequency (%) of respondents selecting different levels of agreement towards question 5(a) (n = 29)

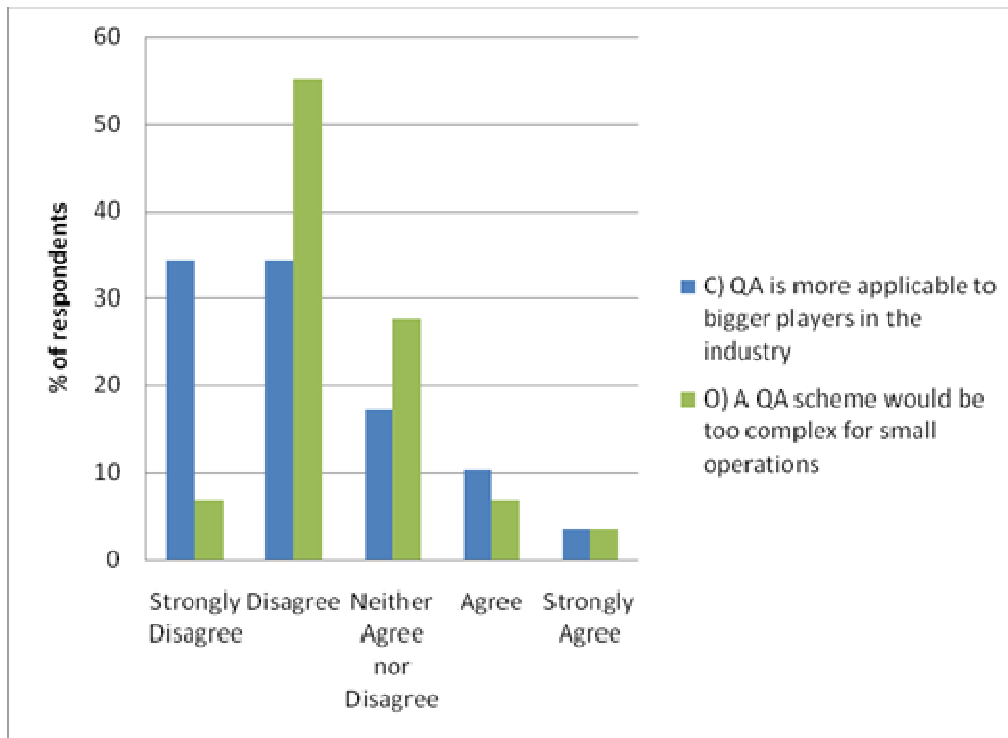


The results were also analysed in terms of whether there were significant differences in the responses of the different groups surveyed. One analysis compared two groups by age of operation. Using the Wilcoxon Rank Sum Test to the ordinal data, there was no significant difference between the growers with operations less than four years old and older operations.

Complexity in administering QA

Industry participants were asked to respond to the notion that QA was more relevant to the bigger industry players. The implication being that QA would be more difficult for the smaller growers to implement and maintain given the likely resources required.

Figure 4: Frequency of respondents selecting different levels of agreement towards questions 4(c) and 4(o) expressed as a percentage (n= 29)



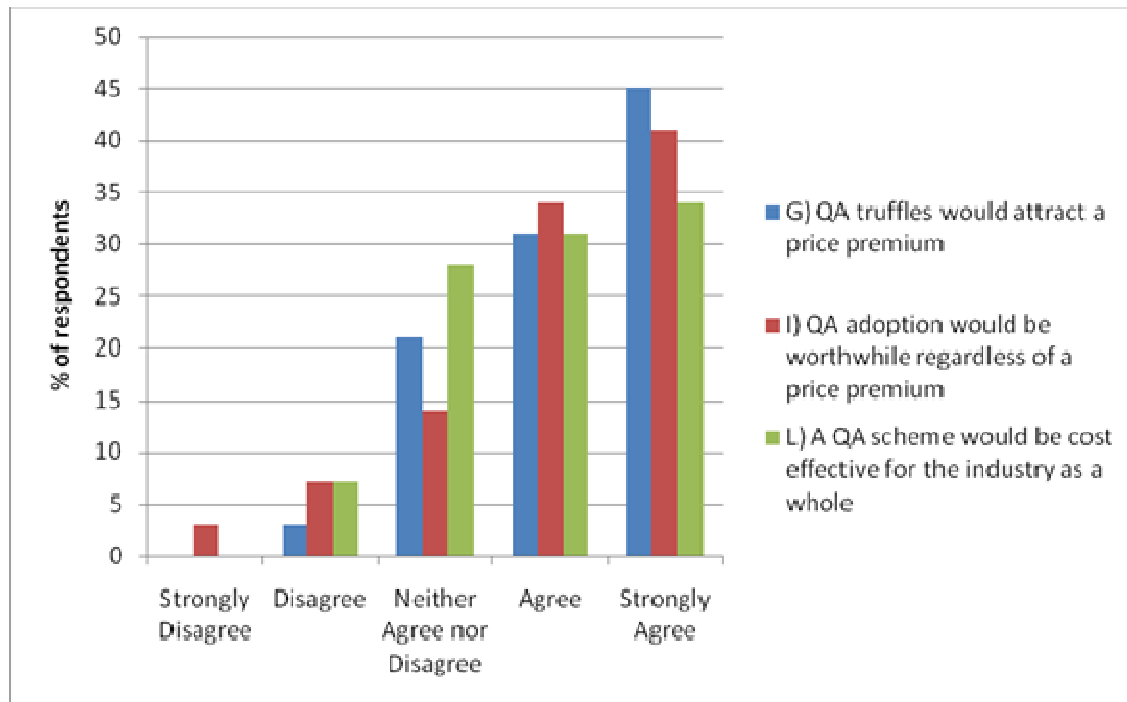
69 percent of respondents disagreed with the statement that QA is more applicable to bigger players in the industry (Figure 4). Likewise, 62 percent disagreed that a QA scheme would be too complex for smaller operators. Only three respondents agreed. It is noticeable that there is stronger disagreement towards statement 4(c) with 34 percent strongly disagreeing compared with 7 percent statement 4(o).

Cost effectiveness in implementing QA

Statements in this group together form a picture about the perceived benefits obtained from the development and implementation of a QA scheme at both an individual business level and the industry as a whole considered in light of the additional resources and costs required.

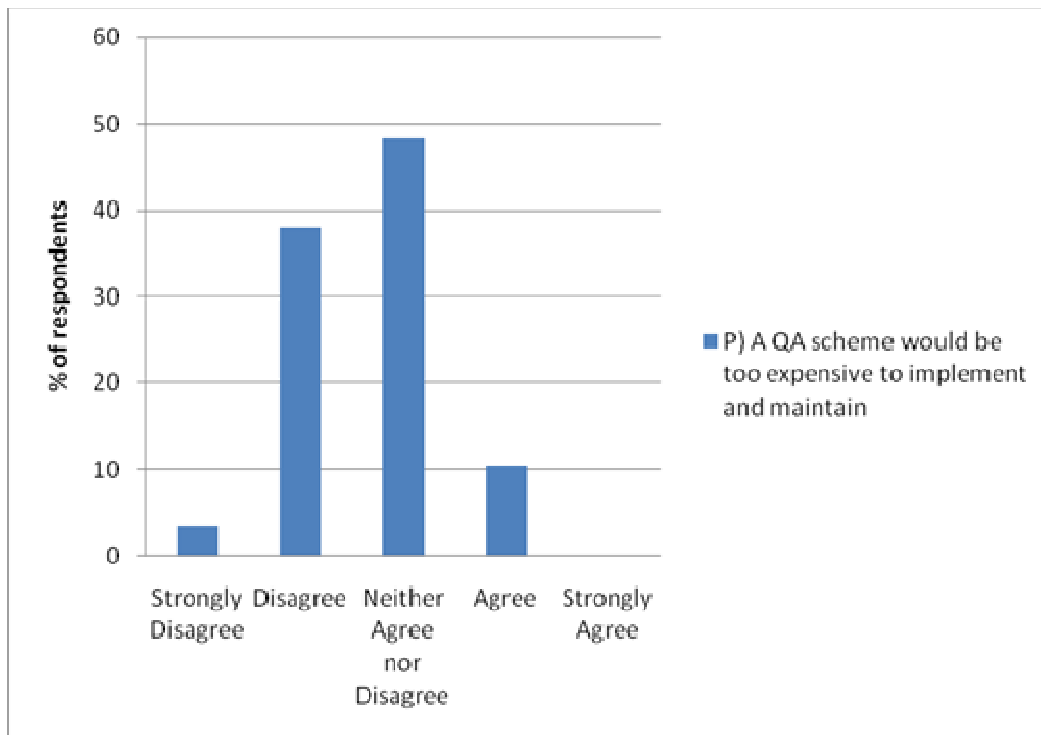
Figure 5 indicates a high level of agreement among respondents towards statements 4(g), 4(i) and 4(l). Not only will a desired price premium be attracted by quality assured truffles this is not the sole reason for adopting a QA scheme. From these results it appears that respondents believe there are other major benefits to be gained by individual operations and the industry, aside from a price premium.

Figure 5: Frequency of respondents selecting different levels of agreement towards questions 4(g), 4(i) and 4(l) expressed (n = 29)



The fourth statement in this group 4(p): A QA scheme would be too expensive to implement and maintain, was included in the survey to ensure a level of consistency with the other elements. High levels of agreement with the first three statements should correspond with disagreement with the fourth. Although there does appear to be general consistency, the strength of agreement / disagreement does differ. For example, 66 percent agreed / strongly agreed with 4(l) (Figure 5), yet fewer respondents (44 percent) disagreed / strongly disagreed with 4(p)(Figure 6). There was more ambivalence among the respondents to 4(p), likely because of a lack of knowledge among members as to the cost involved.

Figure 6: Frequency of respondents selecting different levels of agreement towards question 4(p) (n = 29)



Rationale for International Competitiveness

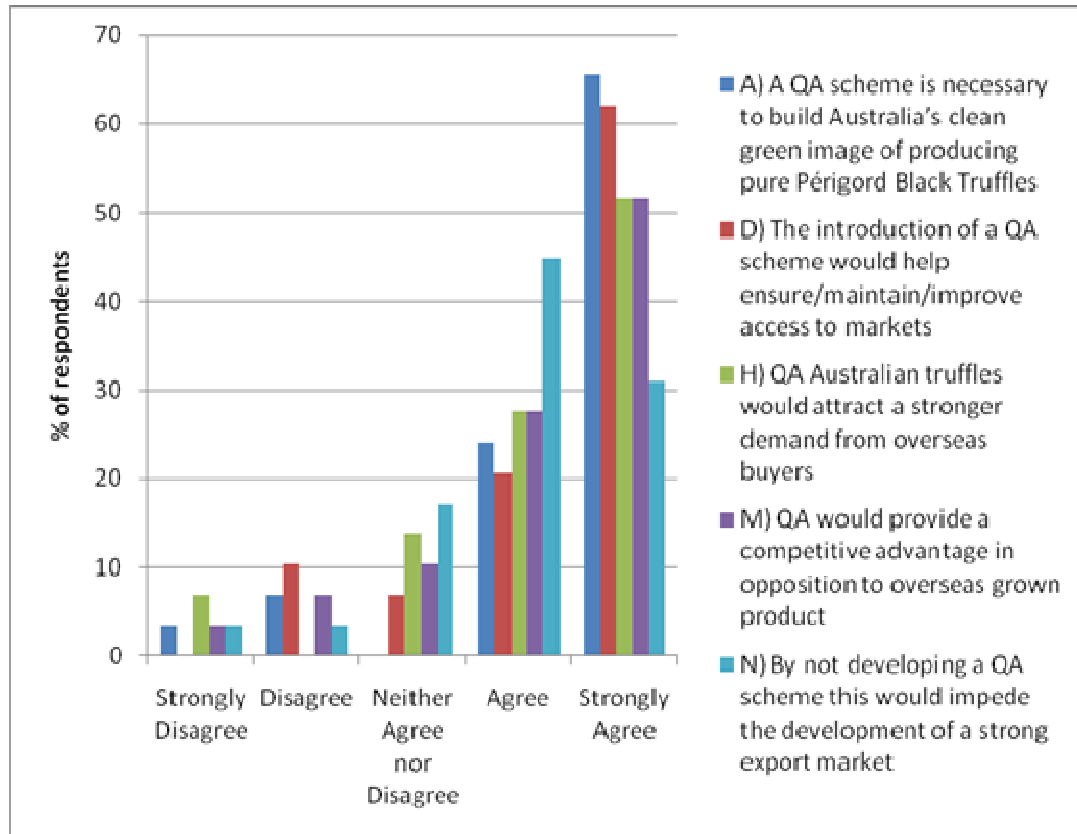
The statements grouped under the theme of international competitiveness refer most strongly to the industry as a whole, but also to individual business. They stem from the capacity of a quality assured product being more desirable and at a competitive advantage relative to internationally produced truffles.

Figure 7 demonstrates that there is a high level of agreement that a QA scheme will improve the performance of Australian grown truffles and open up and maintain markets. The large majority of respondents believe a competitive advantage can be obtained over international competitors with the implementation of a QA scheme.

Once again there appears to be a consistent level of agreement within this group of statements (Figure 7). Statements 4(a), 4(d), 4(h) and 4(m) all have means greater than 4 and medians of 5 (Strongly agree). The frequency of strongly agree for statement 4(a) and 4(d) is extremely high with 66 percent and 62 percent respectively selecting this option.

Four (10 percent) of the respondents did disagree or strongly disagree with Statements 4(a) and 4(d). These all had operations greater than one hectare in size (i.e. 1-5ha or >5ha).

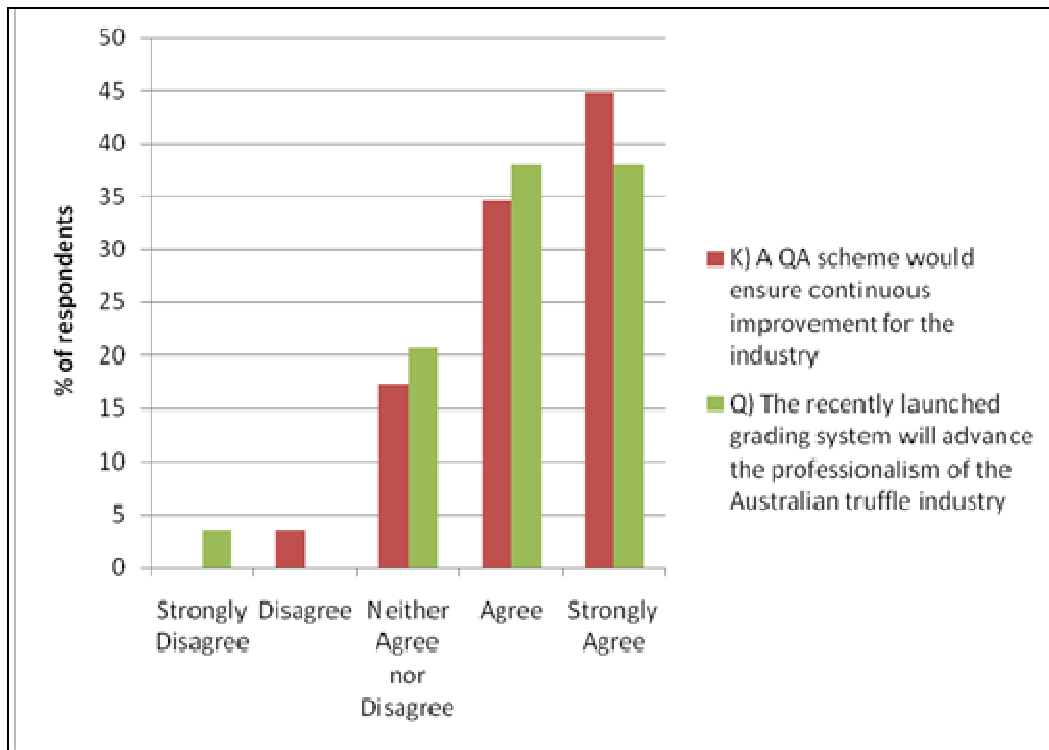
Figure 7: Frequency of respondents selecting different levels of agreement towards questions 4(a), 4(d), 4(h), 4(m) and 4(n) (n = 29)



Lever for industry improvement

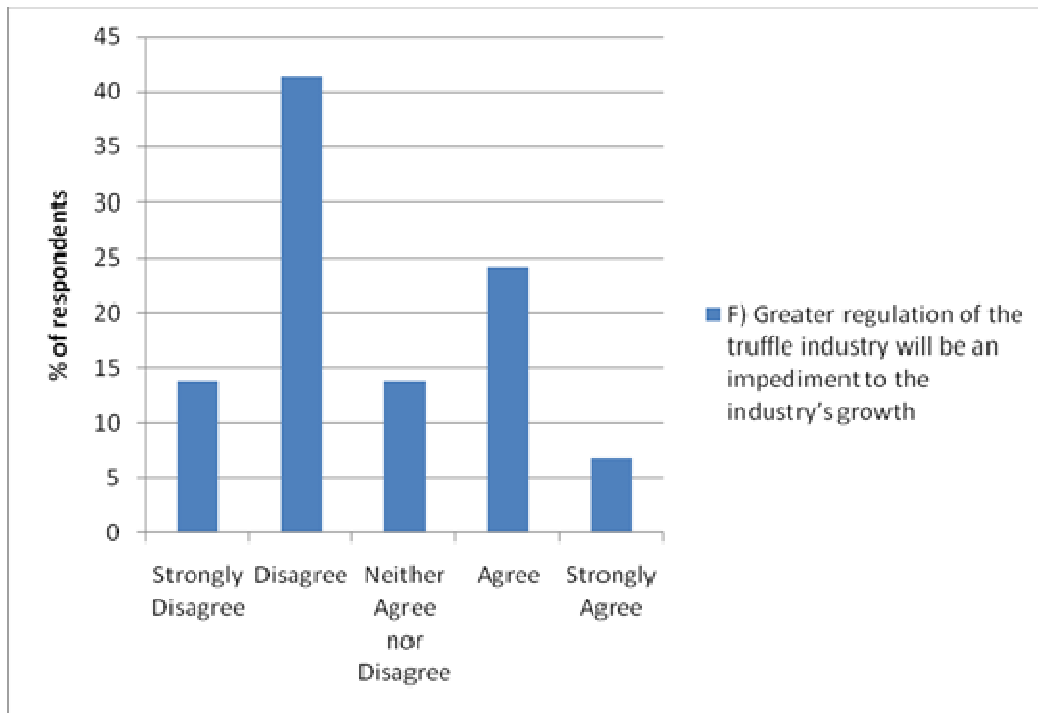
The majority of respondents agreed or strongly agreed that a QA scheme would ensure continuous improvement for the industry and the recently launched grading system would advance the professionalism of the industry (Figure 8). The one person who strongly disagreed that with 4(q) was a grower from NSW and the one person who disagreed with 4(k) was the grower from Tasmania.

Figure 8: Frequency of respondents selecting different levels of agreement towards questions 4(k) and 4(q) (n=29)



The turnaround statement here to ensure validity of responses is 4(f). The results to this statement are widely spread with a standard deviation of 1.20. This can be visually seen in Figure 9 also with each level of agreement receiving at least two responses from participants. Whilst 55 percent of respondents disagreed with the statement nearly one third (31 percent) agreed.

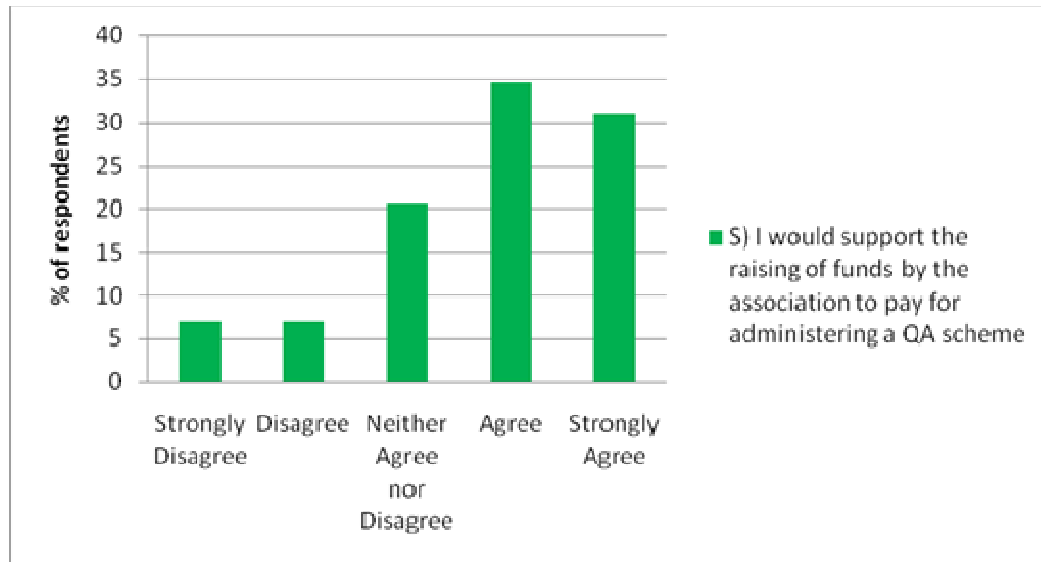
Figure 9: Frequency of respondents selecting different levels of agreement towards question 4(f) expressed as a percentage



Industry willingness to pay and expected uptake

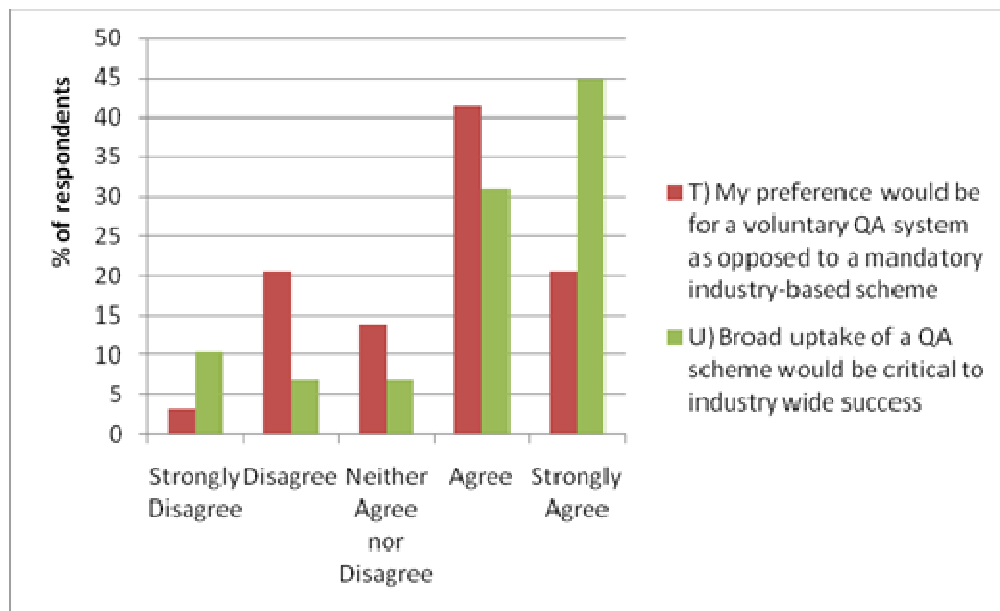
The survey captures different layers of support for QA implementation (Figure 10). Item 4(s) indicates support for the raising of funds by the industry association to pay for QA administration. However, as stated in the comments by growers, this issue was difficult to respond to without knowing the costs of running the scheme and who would bear the cost. Nonetheless, 66 percent supported the raising of funds to administer a QA scheme. There were no significant differences in responses to these items between the managers of younger (<4 years) and older operations.

Figure 10: Frequency of respondents selecting different levels of agreement towards question 4(s) (n = 29)



75 percent of respondents agreed that broad uptake of a QA scheme would be critical to industry wide success; at the same time there was still reasonable strong preference for a voluntary as opposed to mandatory scheme (Figure 11).

Figure 11: Frequency of respondents selecting different levels of agreement towards questions 4(t) and 4(u) (n = 29)



Perceived benefits and drawbacks of a QA scheme

Respondents were asked to comment on the main benefit and then drawback to the implementation of a QA scheme. The benefits can be summarised as:

- Improved marketing opportunities to help producers of all sizes sell their product overseas.
- Stability and maintenance of high prices.
- Formation of clear guidelines for better practice.
- More objective grading of quality and price recognition.

11 of the 26 respondents who commented on the drawbacks of QA raised the issue of cost although the general expectation was that the benefits by way of price premium would outweigh the costs. There was some appreciation of the cost impact on smaller growers and the general scope to alienate such growers.

One respondent stated that “[t]here should be none (drawbacks) in a sound QA scheme. An inhibitive price for annual audits is what causes people within agriculture to avoid QA systems. Small growers can be penalised disproportionately. Signing a code of conduct may help sort out the commitment or otherwise of producers.”

There were some stronger negative responses on the issue of drawbacks. One grower stated “I don't want to be part of a compulsory system. I expect any QA system to be more of a burden than a help.” Another response was “... [v]ery little as we will continue to do what we have done for the past four seasons and would only adopt the QA if forced to.”

Elements of the industry were sceptical of regulation seeing it as an impediment and additional cost. One view was that current systems and facilities in Australia already exceed likely certification requirements. There were countervailing views regarding the overseas experience. For example, one view was that the French have been successfully harvesting and selling pure French Black Truffles for a thousand years without QA so why should the emerging Australian industry. The contrasting view was that the European industry was infested with inferior Chinese truffles with the potential to devalue product. France is one of the largest importers of Chinese black truffle while its import is banned in Spain and Italy.

Respondents commented on the difficulty or subjectivity involved in selecting truffles based on aroma, flavour and shape. The point was made that the end user i.e. restaurant chefs, regardless of certification will be the determinant's of value and mechanism for quality control. One view was that the perfume and flavour of the product was too subtle for the E-nose technology.

Conclusion

The survey of ATGA members indicated there was general agreement with the development of an industry based approach to QA. Yet, the survey also captured the tensions within the industry in response to the QA debate. Some growers took the view that the supply chain integrity has adequately been maintained through the continuity and strength of consumer demand for their product. There were also concerns by members with the impact of QA requirements on the smaller, less established enterprises.

Australian truffle industry reviews have highlighted the importance of ensuring the quality of the Australian product as one of the requirements for strengthening the market for Australian truffles overseas. Such reviews also reflect the changing demands placed on the global supply chains for food and fibre and the need for greater supply chain integrity. At the same time, while a QA scheme will be an important feature in the development of truffle growing as a niche industry, QA is no guarantee of the future purity of Australian produced Truffles.

To date, as a relatively young industry, the focus of the Australian truffle growers has been toward achieving productivity and quality improvement enhancements with a strong focus on the production techniques and the cultural requirements required for truffle growing in Australian conditions. The development of external production standards and certification systems is perhaps the next focus for the development of the industry. This is especially the case as the newer growers' trees come into production.

Within the Australian industry, there is evidence of grower's using different accreditation systems. These include nursery industry accreditation, organic certification, customer quality system and food safety certification. There seems to be little use of environmental certification. The challenge for the industry is to tailor elements of QA to its specific requirements more than likely blending in elements of these other accreditation / certification systems.

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Appendix 1. Statistical analysis of survey data (n = 29)

STATEMENT	Mean						
	Score	Std dev	Median	Mode	% Agree	% Disagree	% NA nor DA
4a A QA scheme is necessary to build Australia's clean green image of producing pure Périgord Black Truffles	4.41	1.05	5	5	90%	10%	0%
4b QA is inevitable as truffles are part of the food supply chain	4.00	1.2	4	5	72%	10%	18%
4c QA is more applicable to bigger players in the industry	2.14	1.13	2	1/2	14%	69%	17%
4d The introduction of a QA scheme would help ensure/maintain/improve access to markets	4.34	1.01	5	5	83%	10%	7%
4e QA is the start of greater regulation of truffle production	3.59	1.02	4	4	55%	17%	28%
4f Greater regulation of the truffle industry will be an impediment to the industry's growth	2.69	1.2	2	2	31%	55%	14%
4g QA truffles would attract a price premium	4.17	0.89	4	5	76%	3%	21%
4h Australian truffles would attract a stronger demand from overseas buyers	4.17	1.14	5	5	79%	7%	14%
4i QA adoption would be worthwhile regardless of a price premium	4.03	1.09	4	5	76%	10%	14%
4j A QA scheme would give me better control over my production systems and prevent problems	3.83	1.23	4	5	69%	21%	10%
4k A QA scheme would ensure continuous improvement for the industry	4.21	0.86	4	5	79%	3%	18%
4l A QA scheme would be cost effective for the industry as a whole	3.93	0.96	4	5	66%	7%	27%
4m QA would provide a competitive advantage in opposition to overseas grown product	4.17	1.1	5	5	79%	10%	11%
4n By not developing a QA scheme this would impede the development of a strong export market	3.97	0.98	4	4	76%	7%	17%
4o A QA scheme would be too complex for small operations	2.45	0.87	2	2	10%	62%	28%
4p A QA scheme would be too expensive to implement and maintain	2.66	0.72	3	3	10%	41%	49%
4q The recently launched grading system will advance the professionalism of the Australian truffle industry	4.07	0.96	4	4/5	76%	3%	21%
4r An ENose (Electronic Nose) would be a worthwhile addition to a QA scheme for distinguishing between truffle species and also ripeness	3.90	0.98	4	4	69%	10%	21%
4s I would support the raising of funds by the association to pay for administering a QA scheme**	3.76	1.18	4	4	66%	14%	20%
4t My preference would be for a voluntary QA system as opposed to a mandatory industry-based scheme	3.55	1.15	4	4	62%	24%	14%
4u Broad uptake of a QA scheme would be critical to industry wide success	3.93	1.33	4	5	76%	17%	7%
5a The overall benefits to the business obtained from introducing a QA scheme would outweigh the costs **	3.97	1.05	4	5	69%	7%	24%

** no significant difference between growers with operations less than four years old and growers with older operations.