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## **SUBMISSION TO THE JOINT SELECT COMMITTEE ON TRADE AND INVESTMENT GROWTH**

### **Inquiry into Australia's Future in Research and Innovation**

#### **1. About AUSVEG**

AUSVEG is the National Peak Industry Body representing the interests of Australian vegetable and potato growers. We represent growers around Australia and assist them by ensuring the National Vegetable Levy and the National Potato Levy are invested in research and development (R&D) that best meets the needs of the industry.

AUSVEG also makes representations on behalf of vegetable and potato growers to ensure their interests and concerns are effectively communicated to all levels of government, in the public sphere, and throughout relevant areas of the private sector.

Yours sincerely

Andrew White  
Acting Chief Executive Officer

## Contents

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<b>1. About AUSVEG .....</b>	<b>1</b>
<b>2. Queries .....</b>	<b>1</b>
<b>3. Summary .....</b>	<b>3</b>
<b>4. Responses to specific terms of reference .....</b>	<b>4</b>
4.1 How the research and innovation sector can better assist in overcoming Australia's economic challenges .....	4
4.1.1 <i>Managing energy usage</i> .....	4
4.1.2 <i>Managing the supply chain</i> .....	4
4.1.3 <i>Managing other costs of production</i> .....	5
4.2 How the research and innovation sector can better assist in overcoming Australia's labour challenges .....	6
4.2.1 <i>Remote monitoring and drones</i> .....	6
4.2.2 <i>Mechanisation and robotics in harvesting</i> .....	6
4.2.3 <i>Other technologies</i> .....	7
4.3 How technology imports and exports could be further facilitated .....	8
4.3.1 <i>Investment in the vegetable industry</i> .....	8
4.3.2 <i>Commercialising emerging technologies</i> .....	9
<b>5. Conclusion .....</b>	<b>9</b>

### 3. Summary

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The Australian vegetable industry is a vital contributor to Australia's economy, with a gross value of production of \$3.5 billion in 2014-15. However, the financial performance of individual vegetable growing operations is heavily damaged by having to compete with cheap imported produce while growers struggle with increasing costs of production.

The vegetable industry therefore stands to benefit hugely from technological innovations which can reduce production costs, and in particular reduce the need for manual labour (and thereby lessen labour costs). Using the money raised from the research and development (R&D) levies on vegetables and potatoes, Horticulture Innovation Australia Limited ("HIA") funds projects to help accomplish these goals in the industries for which AUSVEG is the Peak Industry Body.

A key area in this regard is the use of mechanisation and robotics to automate on-farm operations, such as harvesting, spraying, and field monitoring. This can decrease general productivity costs and, in particular, have a significant impact on labour needs. Other levy-funded technological research and development has resulted in improved soil health, increased monitoring and information-gathering capabilities for growers, and more efficient energy usage. This research has the potential to make significant improvements to the overall financial productivity of a growing operation.

These results reflect the overall benefits, and ongoing success, of the levy-funded R&D being undertaken in the vegetable and potato industries. The recently-concluded Inquiry into *Industry structures and systems governing the imposition of and disbursement of marketing and R&D levies in the agricultural sector* found that evidence suggested:

*... that agricultural [R&D extension] and marketing activities carried out by levy-funded organisations on behalf of farmers and the Australian Government have been fundamentally important to the growth of the Australian agricultural sector over the last 25 years, particularly in the face of declining state government support for such activities.*

It is important to note that while levy-funded projects are a vital aspect of R&D within the vegetable and potato industries, privately-funded innovation in the industry also provides individual benefits which can have a positive impact on the industry as a whole. Government support for all research and innovation in the sector, both using levy funds and private funds, is therefore vital for these benefits to continue.

AUSVEG wholeheartedly believes in the future of research and innovation in Australia, including the development of technology through projects using levy funds and technology funded through the private sector, and is grateful for the opportunity to make this submission to the Committee. We hope to see the Government's focus on innovation translate into targeted, effective support for research and development that can provide benefits to Australian industry.

We are happy to provide the Committee with further information on any project discussed in this submission, or to provide evidence to a public hearing upon request.

## 4. Responses to specific terms of reference

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### 4.1 How the research and innovation sector can better assist in overcoming Australia's economic challenges

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In general terms, there are several areas in which innovation could help the vegetable industry overcome economic challenges into the future:

- managing energy usage;
- managing other costs of production; and
- the supply chain.

Members of the vegetable industry also deal with significant financial pressure imposed by labour costs; however, as one of the terms of reference for this Inquiry is to investigate how the research and innovation sector can better assist in overcoming Australia's labour challenges, this submission will address that point in a separate section.

#### 4.1.1 Managing energy usage

Many levy-funded projects focus on identifying the scope for further improvements to the industry's productivity by increasing the efficiency of its energy use.

For example, levy-funded project VG09124 *Increasing energy efficiency and assessing an alternate energy option for Australian protected cropping* aimed to make it easier for greenhouse growers to reduce costs and make better energy investment decisions, thereby increasing the productivity and profitability of their farms. By performing a cost/benefit analysis for two emerging technology options, the project identified the scope for efficiency improvements in greenhouse energy usage – including a 10-year saving of over \$140,000 by using a geothermal heat pump over liquefied petroleum gas (LPG).

Similarly, project VG13054 *Economic evaluation of on-farm energy audits and benchmarking of energy use on vegetable farms* identified potential energy savings based on audits of 22 vegetable-growing farms. The key areas of potential industry improvement in energy use included efficiency improvements for diesel plants, refrigeration and irrigation, as well as improved design of irrigation systems – all areas in which technological development can help increase farm productivity.

Future investment in projects which could have further positive impacts on energy use on Australian vegetable farms could help alleviate some of the economic challenges faced by Australian growers in this area.

#### 4.1.2 Managing the supply chain

Project VG13084 *Investigating the physical supply chain to improve transport efficiency* is working to find possible improvements in the physical supply chain to maintain vegetable quality and increase transport efficiency. By reducing waste along the supply chain and increasing consumer satisfaction with Australian vegetables, the project hopes to improve the profitability of the industry. These

improvements may include better supply chain technology, such as more efficient and effective cold storage.

#### 4.1.3 Managing other costs of production

The Australian horticulture industry has a reputation for clean, green and safe produce, and the rise of wealthy middle classes in key overseas markets in Asia and the Middle East provides excellent trade and export opportunities for Australian growers. As such, continuing investment in efforts to protect Australia's biosecurity from plant pest and disease incursions is a major factor in the economic success of the Australian horticulture industry overseas.

This makes research and innovation in the biosecurity and pest control space a vital aspect of the continued productivity and profitability of Australian horticulture. One key area of concern for the industry is the continued impact of fruit fly and the effects of various fruit fly control methods on access to international markets, particularly following the ban on the use of dimethoate and fenthion in Australia and its key markets.

The new structure of HIA includes a Strategic Co-Investment Fund Pool ("SCIFP"), designed to pool seed funds which can allow for long-term investments in large, key strategic projects. One of the funding pools included in this structure is intended to identify fruit fly solutions which can negate the impacts of the pest and enhance market access for Australian produce.

Other emerging innovative ways of dealing with plant pests and diseases could also reduce costs of production for growers while increasing the overall health (and marketability) of their produce. For example, integrated pest management ("IPM") is a method of controlling pests using a suite of methods, including biological controls (such as beneficial insects which consume pests), mechanical controls (such as hand-picking or traps), and use of soft chemistry that does not impact beneficials.

IPM is internationally accepted as the best approach to manage plant pests<sup>1</sup>, and effective IPM could greatly enhance international perceptions of Australian produce as being inherently clean and safe.

However, there is currently neither the manpower nor the resources to have specific IPM strategies for all vegetable commodities. Previous benchmarking in this field has identified that co-ordination of IPM priorities for ongoing investment is vital to address the issues posed by the limited funding available in this area. Considering the economic benefits that it could deliver to the Australian vegetable industry, AUSVEG would like to take this opportunity to highlight the value of this area of research to the Committee.

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<sup>1</sup> *Benchmarking vegetable integrated pest management systems against other agricultural industries*, NSW Department of Industry and Investment (2007)

## 4.2 How the research and innovation sector can better assist in overcoming Australia's labour challenges

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### 4.2.1 Remote monitoring and drones

The ability to undertake repeated, high-resolution monitoring activity across a growing operation – especially at times inhospitable to human activity, such as the earliest hours of the morning – could result in massive productivity boosts. By developing autonomous remote monitoring which can be undertaken on a far larger scale than would be possible with human labour, investment in robotics enables better land management, more responsive pest control, and more productive operation overall.

An example of this kind of investment in the vegetable industry is the development of the 'Ladybird' modular field robot, funded through vegetable levy-funded project VG12104 *An intelligent farm robot for the vegetable industry*. This robot uses GPS coordinates to decide the most efficient path for monitoring crops, and has been designed with the ability to attach modular components to vary the sensory data gathered.

A key aspect of this enhanced remote monitoring is the capability to combine information gathered from on-ground robots (such as the Ladybird prototype) with lower-resolution but broader-scale information gathered from in-air robots (such as drones). This will enable growers to create multi-level maps of their operations, which will in turn make it easier for them to identify key areas which need attention.

Additionally, emerging and future technologies in autonomous decision-making will assist in cutting through potential "information overload" from these advances in information-gathering.

Anecdotal evidence gathered by AUSVEG in discussions with researchers and academics in the area indicates that the next step in automating on-farm operations is the "codifying" of decision-making – that is, the use of algorithms to sort the information gathered and present a range of simplified decisions for growers to incorporate into their planning. This will greatly increase farm productivity by streamlining the planning and decision-making process for growers.

### 4.2.2 Mechanisation and robotics in harvesting

Beyond the areas of remote monitoring and information gathering, increased automation of on-farm processes which would otherwise require manual labour are an area of strong interest, and potential huge benefit, for the Australian vegetable industry and the broader horticulture industry.

The vegetable industry's continued need for dedicated manual labour, particularly for the vegetable crop commodities which require manual harvesting to avoid damage, means that labour costs make up a significant portion of overall costs of production. In 2014-15, the average Australian vegetable grower spent \$109,000 on hired labour, a figure twice as high as any other cost category tracked by ABARES. When combined with contracts paid (which covers labour contracted for specific, seasonal

tasks), this cost jumped to \$178,000 – nearly 30 per cent of total cash costs for the average vegetable farm.<sup>2</sup>

With the majority of manual labour used in the industry employed on a seasonal basis (such as contracting backpackers and other temporary workers for harvesting and picking), being able to mechanise manual labour – including harvesting requirements – could greatly reduce labour costs and greatly improve farm productivity.

There are already growing operations which employ mechanised solutions for particular crop commodities, including leek, baby leaf greens, and lettuce. However, given that manual labour is so prevalent in the vegetable industry because many vegetable crop commodities require careful handling to avoid damage, developing mechanised systems which can handle sensitive crops appropriately is a lengthy process.

In 2006 a levy-funded project, VG05073 *Mechanical harvesting of selected vegetables – feasibility study*, examined a wide range of vegetable crops and their status (as well as potential) regarding mechanisation. This included examining systems which could harvest *all* biomass and allow for grading and processing to be made off-field (such as those used for broccoli, lettuce and carrots) and systems which use sensing devices to determine the fitness for harvest of individual crops in the field prior to cutting and in-field processing (some of which are currently being developed for lettuce and cauliflower). Significantly, the project also found that while growers were generally aware of technologies like robotics and visual imaging, they had a very limited understanding of the potential capability of these technologies in mechanical harvesting. This may have evolved over the last 10 years, with AUSVEG extension activities continuing to promote the benefits of technological improvements.

More recently, VG13081 *Prioritisation of vegetable crop commodities and activities for mechanisation*, benchmarked the suitability of particular crop commodities for mechanisation and identified key criteria for this purpose. This project incorporated economic concerns, such as the overall value of production for particular commodities, to determine the overall value of returns from investing in mechanisation for those commodities.

#### 4.2.3 Other technologies

There are many other emerging technologies and innovations being developed, both domestically and overseas, which could provide major productivity benefits to the Australian vegetable industry. AUSVEG has worked to highlight the research being taken overseas and ensure that the Australian vegetable industry is aware of emerging technologies around the world.

These emerging technologies include:

- vertical farming, in which vegetables can be grown with no soil or sunlight and produce about 70 times more product per hectare than traditional farming;
- the use of lasers as bird control, as a harm-free method of protecting crops;
- creating value-added foods from fruits and vegetables and their co-products; and

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<sup>2</sup> *Australian vegetable growing farms: An economic survey, 2012-13 and 2013-14*, Hayden Valle/ABARES (2014)

- agile, localised agricultural meteorology which can help growing operations.

It is vital that the Australian vegetable industry, as well as the broader agricultural industry, continue to have access to technological innovations which can increase their productivity and improve their competitiveness, both domestically and in the global marketplace.

### 4.3 How technology imports and exports could be further facilitated

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Despite agriculture playing a major role in Australia's economy, the Australian market for technology, machinery and chemistry is seen as relatively small by international corporations. This can make it difficult for members of the Australian agriculture industry, as well as members of sectors within the industry, to access innovations which could contribute greatly to their productivity and profitability.

There are two major barriers to the adoption of emerging technology in the vegetable industry:

- the price imposition on growing operations to invest in new technology on-farm; and
- the work and funding necessary to commercialise emerging technologies and bring them down to an accessible price point.

#### 4.3.1 Investment in the vegetable industry

The average Australian vegetable growing farm suffers from poor profitability, which makes it difficult for growers to invest in new capital assets, including emerging technologies which may not have proven return on investment or rely heavily on long-term returns.

This problem is amplified by the nature of the vegetable industry – the bulk of growing operations are small farms, who (regardless of relative profitability) simply do not have access to the levels of capital necessary to make long-term investments in emerging technologies.

Investing is particularly problematic when cash receipts are increasingly being used to service interest on debts. This situation peaked in 2012-13, when vegetable growers were spending more, on average, to service their debts than they had at any point over the course of ABARES' data collection. While debt can be an important source of funding for ongoing farm capital and investment, at the time the data was released, AUSVEG identified that growers were accruing debt on day-to-day operations instead of using it as an avenue to invest in capital assets.

This inability for growers to make these investments individually therefore presents a significant barrier to the importation of emerging technology from overseas, especially if there is a risk of "free-rider" behaviour (where growers who did not invest in the initial importation of the technology are later able to take advantage of its presence in Australia). This is a strong argument for continued public investment in research and development, which can alleviate the free-rider issue by using industry money to provide benefits to the entire industry.

However, the ongoing decline in interest rates, along with measures announced in this year's Budget designed to encourage business investment in assets and infrastructure, may help enable adoption of emerging technologies. The most recent round of a quarterly economic confidence survey



undertaken by AUSVEG showed that of a variety of economic factors, growers indicated the highest net confidence in interest rates, exchange rates, and investing – suggesting that investment in the vegetable industry, which has been lagging for several years, may recover.

#### 4.3.2 Commercialising emerging technologies

The difficulty of commercialising emerging technologies, and bringing them down to a price point accessible to growers, presents a significant obstacle to their adoption by vegetable growing operations.

The significant amount of investment necessary to bring technology out of the prototype stage is a massive hurdle, particularly when R&D and extension in the vegetable industry relies heavily on levy funding. Proving that a technology is commercially viable, and consequently attracting private partnership to develop that technology to the point of being commercially available, requires massive time and resource investment.

Even after attracting partnerships, the further investment from all parties to commercialise that technology is often wasted, with a project proving to not be commercially viable when exposed to the market. In conjunction with the barriers to investment noted above, this can have a chilling effect on investment and damage the chances of future technology being successfully commercialised.

If the Australian vegetable industry (and Australian industry in general) is to benefit from research and development, the Government must be prepared to better support private companies and research organisations throughout the process of transitioning a technology from prototype to commercialisation.

## 5. Conclusion

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If the Australian agricultural industry is to maintain its competitiveness abroad, the damaging impact of high labour costs and the overall cost burden faced by the industry must be alleviated through any means available. Emerging technologies should be a key aspect of any strategy to reduce costs and increase productivity, particularly in the areas of mechanisation and robotics, energy efficiency, plant genomics and agricultural chemicals.

Within the vegetable industry, levy-funded projects are targeted at key areas to make the most from levy investment, including projects which aim to increase farm productivity and manage on-farm resource use.

However, significant obstacles remain. The road to commercialisation is long, and many emerging technologies fail to attract the necessary interest to make it out of the prototype stage, let alone be developed to an accessible price point for Australian growers.

Strong support is required from industry, government and the private sector to ensure that these technologies make it on-farm and that their benefits can be enjoyed by Australian growers and the Australian economy.

By doing so, we can ensure that Australian growers remain at the forefront of horticultural innovation and in turn, remain competitive in the international marketplace.