Food security discussion paper

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Food security issues for the Australian horticulture industry

AH09009

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Food security issues for the Australian horticulture industry

A report prepared for HAL project AH09009.
11 February 2011

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Media Synopsis

Growcom's review of food security issues for HAL identified a diverse range of threats that may impact on Australia's domestic food security and will have important consequences for the $7.3bn per year horticulture industry.

The report found that Australia is not as food secure as suggested by simplistic examinations of the relevant data. Australia already imports 34 per cent of fruit consumed and 19 per cent of vegetables. The report found that these imports could disappear as the world population heads for 9 billion people by 2050 and countries retain their production for their own people.

The world will need to double food production by 2050 just to ensure that the number of hungry does not increase from its current level of 1 billion people.

The report recommended that this challenge to feed more people with the same or less land and water will require an increase in research and development funding from the current 3 per cent of the gross value of agricultural production to 5 per cent.

The authors of the report stated that for food security to be properly addressed in the Australian horticulture sector, all levels of Government, industry and research and development corporations need to work together in a co-operative and co-ordinated manner to address the diverse challenges with which we are faced.

The report's major recommendation is for a central Food Security Agency to be set up by the Australian Government.

The report also recommends that policy makers and the general public need to be better informed on the current state of food security in horticulture and appreciate that food security is not a form of protectionism.

A number of actions were suggested to address the problem of growers leaving the industry due to sustained low prices and government regulatory burdens, which in turn increases our reliance on imports. One supermarket chain estimated that there were more than 130,000 different laws across Australia relating to horticulture growing

A comprehensive list of recommendations on addressing key issues identified in this review can be found in Section 11 of the report.

Contents

Figure 1: A word cloud derived from the contents of this report (created using www.tagxedo.com).

"To meet tomorrow's needs and address challenges of nutrition and poverty under a changing climate, a second science-based Green Revolution is needed."

Dr Bob Ziegler, International Rice Research Institute.

1 Executive Summary

This scoping study aims to:

- Provide an informed summary of current food security in Australia with particular reference to horticulture.
- Explore possible future scenarios of food security in Australia and assess the threats and opportunities they pose.
- Recommend strategies and actions that the horticulture industry in Australia could implement to address food security, and in particular identify research and development priorities.

To explore these issues, the study has:

- Reviewed data regarding food production, supply, sources and demand in Australia.
- Reviewed domestic and international policies and programs addressing food security.
- Gathered perspectives on food security issues from a range of stakeholders in the Australian food industry.
- Assessed the strengths, weaknesses, opportunities and threats arising from current trends and possible future scenarios in food security.
- Considered possible responses that may be needed in the Australian horticulture industry.

1.1 Our Key Findings

This review of food security issues identified a diverse range of threats that may impact on Australia's domestic food security and that may have important consequences for the horticulture industry. Australia is not necessarily as food secure as suggested by simplistic examinations of the relevant data.

For food security to be properly addressed in the Australian horticulture sector, all levels of Government, industry and research and development corporations need to work together in a co-operative and co-ordinated manner to address the diverse challenges with which we are faced. To achieve this, it was found that a central Food Security Agency should be implemented, as a part of the federal agriculture portfolio.

The challenge to feed more people with the same or less land and water will require an increase in research and development funding, from both private and public sources, to at least 1970s levels of five per cent of the gross value of agricultural production.

Education of policy makers and the general public on the current state of food security in horticulture is required to dispel the myth that equates food security with protectionism. A number of actions were identified that will ensure that government regulatory burdens and sustained low prices to growers do not force producers out of the market, increasing our reliance on imports and harming food security.

A comprehensive list of recommendations on addressing key issues identified in this review can be found in Section 11.

2 Introduction

Food security is emerging as a major global issue. A range of factors such as growing populations, falling agricultural productivity growth, land degradation, climate change and pollution are combining to put increasing pressure on global food supplies. The consequences of food insecurity can be dire, including famine, malnutrition and conflict.

Historically, the issue of food security has become prominent only during periods of international food shortages or following a sharp spike on food prices.

Food security was not in vogue at the beginning of the 21st century. The World Bank noted in 2001 that real prices for agricultural produce during the previous decade were the lowest in 100 years (Thompson 2001).

A surge in world food prices over the period 2007-11, however, has had devastating effects, especially on developing economies. These include widespread poverty, pressures on national budgets, and in some cases civil unrest. Concern is also rising about the ability of the global food production system to meet the demands of population growth. The United Nations Food and Agriculture Organisation (FAO) now predicts significant pressure on food stocks, with global demand estimated to double by 2050 from 2001 levels (FAO 2011).

Accordingly, food security is now increasingly on the agenda of government agencies and agricultural industries in much of the world, and is no longer considered only an issue for developing countries. Issues threatening future food security have been highlighted by the food price crisis of 2007-08, the global financial crisis, increasing energy costs and climate change awareness.

While Australia has enjoyed a reliable supply of high quality, safe and affordable food for many decades, it is timely to consider the shifts that are occurring globally and the pressures that are emerging domestically.

To explore these issues, this scoping study has:

- Reviewed data regarding food production, supply, sources and demand in Australia.
- Reviewed domestic and international policies and programs addressing food security.
- Gathered perspectives on food security issues from a range of stakeholders in the Australian food industry.
- Assessed the strengths, weaknesses, opportunities and threats arising from current trends and possible future scenarios in food security.
- Considered possible responses that may be required from governments and industry.

3 Method

3.1.1 Scope

While the scope of the study has incorporated a general review of national and international trends and policy settings, the assessment of food security issues, scenarios and response strategies has been limited to the security of Australian domestic production and supply of fruit and vegetables.

3.1.2 Approach

The scoping study has involved a literature review to identify relevant statistics and data and to assess policy and program responses to food security issues. The information gathered through the literature review process was extended through a survey of Australian horticulture and food industry stakeholders. To capture the current thinking amongst key sectors within the horticultural industry and to identify any emerging issues that may only be apparent to particular sectors or industries, major participants have been surveyed.

A questionnaire was prepared to draw out relevant and informed responses through direct questions as well as an opportunity for general comments. The questionnaire was distributed via mail or email to forty representatives of organisations from different sectors directly involved in the horticulture supply chain and supporting industries, including growers, research & development, retail, processing, policy, planning, inputs, industry bodies and distribution. Some respondents provided additional information through a follow up phone call. The full questionnaire can be found in Appendix i.

4 What is food security?

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. It includes

- *Adequacy of food supply and availability*
- *Stability of supply, without fluctuations or shortages from season to season or year to year*
- *Accessibility to/affordability of food*
- *Quality and safety of food*

(Food & Agriculture Organisation).

From this definition, it is clear that food security involves more than just the production of sufficient quantities of food. It also requires that food to be accessible, affordable and of sufficient variety and quality to enable a healthy life.

The concept of food security can be applied at multiple scales, from the perspective of individuals, households, communities, regions, nations or globally. Pinstrup-Andersen (2009) provides a summary of food security issues at these multiple scales, along with a discussion of definitions and measurement.

For this project, we take a deliberate focus on the security of Australian domestic production and supply of fruit and vegetables.

5 The global context and the case for concern about food security

The current diminishing level of food security in the world is being driven by a number of factors. These include a burgeoning world population heading for 9 billion by 2050, loss of land and water due to degradation and urbanisation, speculative trading in commodities, and the increasing appetite for meat, milk and other sources of protein in countries which have become more affluent in recent years.

In 2007, international food commodity prices went into a major upward surge that shows no sign of abating during 2011.

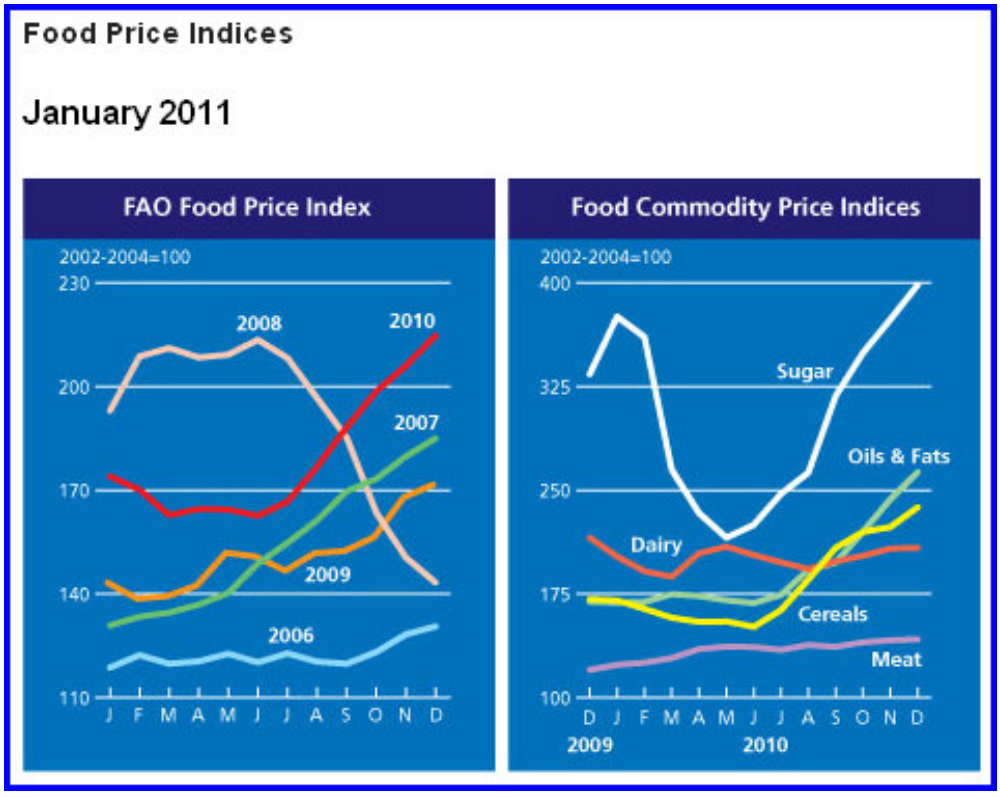

Figure 2: Variation in the FAO Food and Commodity Price Indices from 2006 to 2010 (Source: Food and Agriculture Organization 2011).

FAO food price index

		Food Price Index [1]	Meat [2]	Dairy [3]	Cereals [4]	Oils and Fats [5]	Sugar [6]
2000		**90**	94	95	85	68	116
2001		**92**	94	107	86	68	123
2002		**90**	90	82	95	87	98
2003		**98**	99	95	98	101	101
2004		**111**	111	123	107	112	102
2005		**115**	113	135	103	104	140
2006		**122**	107	128	121	112	210
2007		**154**	112	212	167	169	143
2008		**191**	128	220	238	225	182
2009		**152**	118	142	174	150	257
2009	December	**172**	120	216	171	169	334
2010	January	**174**	124	202	170	169	376
	February	**170**	125	191	164	169	361
	March	**163**	129	187	158	175	265
	April	**165**	135	204	155	174	233
	May	**164**	137	209	155	170	216
	June	**163**	137	203	151	168	225
	July	**167**	134	198	163	174	247
	August	**177**	138	193	185	192	263
	September	**188**	137	198	208	198	318
	October	**199**	140	203	220	220	349
	November	**206**	141	208	223	243	373
	December	**215**	142	208	238	263	398

1 **Food Price Index**: Consists of the average of 6 commodity group price indices mentioned above weighted with the average export shares of each of the groups for 2002-2004: in total 55 commodity quotations considered by FAO commodity specialists as representing the international prices of the food commodities noted are included in the overall index.

2 **Meat Price Index**: Consists of 3 poultry meat product quotations (the average weighted by assumed fixed trade weights), 4 bovine meat product quotations (average weighted by assumed fixed trade weights), 2 pig meat product quotations (average weighted by assumed fixed trade weights), 1 ovine meat product quotation (average weighted by assumed fixed trade weights): the 4 meat group average prices are weighted by world average export trade shares for 2002-2004.

3 **Dairy Price Index**: Consists of butter, SMP, WMP, cheese, casein price quotations; the average is weighted by world average export trade shares for 2002-2004.

4 **Cereals Price Index**: This index is compiled using the grains and rice price indices weighted by their average trade share for 2002-2004. The Grains Price Index consists of International Grains Council (IGC) wheat price index, itself average of 9 different wheat price quotations, and 1 maize export quotation; after expressing the maize price into its index form and converting the base of the IGC index to 2002-2004. The Rice Price Index consists of 3 components containing average prices of 16 rice quotations: the components are Indica, Japonica and Aromatic rice varieties and the weights for combining the three components are assumed (fixed) trade shares of the three varieties.

5 **Oil and Fat Price Index**: Consists of an average of 11 different oils (including animal and fish oils) weighted with average export trade shares of each oil product for 2002-2004.

6 **Sugar Price Index**: Index form of the International Sugar Agreement prices with 2002-2004 as base.

Figure 3: FAO Food Price Index (Source: Food and Agriculture Organization 2011).

A comprehensive study of the international food commodity price surge by the Australian Department of Foreign Affairs and Trade (DFAT) concluded that the price rises have been driven by a combination of both short and long term factors.

Longer term factors include:

- Continued population growth in developing countries (with world population projected to reach 9.2 billion by 2050), driving up demand for basic staples.
- Changing consumer tastes and preferences. Strong economic and per capita income growth in emerging economies will lead to higher per capita food consumption and changing diets, including increases in demand for grain-intensive foods like meat and dairy products.
- The increasing demand for crops to use in biofuel production, which has been driven by concerns about energy security and climate change.
- The lack of investment in developing country agriculture in recent decades, both by developing countries themselves and by international donors who have reduced the amounts of development assistance provided for agriculture and rural development.
- Subsidies in developed countries have distorted prices on world and local markets, reducing the ability of farmers in non-subsidising countries to earn a sustainable income and generate the capital required to invest in increasing production and improving productivity. At the same time, import barriers in major markets have denied export opportunities to efficient farmers in both developing and developed countries.
- Rising energy and associated fertiliser prices, which have significantly increased the cost of agricultural production, food processing and food distribution.

Short-term factors include:

- Poor weather conditions and harvests in the past couple of years in several major surplus producers, including Australia.
- A run-down in global stocks to record low levels due to the production shortfalls.
- Introduction of 'temporary' export restrictions to ensure domestic supply and rein in domestic food prices.
- The substantial depreciation of the US dollar (the currency in which most agricultural and other commodities are traded and to which many food importing countries link their own currencies) against the Euro and other major currencies since 2002 (Brown 2008).

Significantly, DFAT refers specifically to research and development (R&D):

The report said that there also needs to be a step up in investment in agricultural R&D globally, including in developed countries. As part of their recommendations to prevent future price surges, DFAT claims that "agricultural production needs to rise by 1.6 per cent a year on average for the next forty years…," but that "water shortages, land degradation, desertification and climate variability as a result of climate change will make this an increasing challenge. …." (Brown 2008).

Other observers have looked at different factors as contributing to the food price spike. A recent study of commodity prices for example, has come to the conclusion that speculation in the wheat market may have caused a “food bubble” – artificially inflating the price of wheat, which was one of the main contributors to the 2007/08 Food Crisis (Kaufman 2010).

Without action, during this century the world may face a global food security crisis that pushes many more people into poverty and reverses development gains of the early 21st century. According to the United Nations, the number of people in developing countries without adequate food increased by 75 million during 2008 alone, and currently stands at almost 1 billion (United Nations 2010).

6 Food production, supply and demand in Australia – a snapshot of status and trends

6.1 Horticultural production in Australia

Horticulture is one of the largest and fastest growing industries within the Australian agricultural sector. It is characterised by high diversity in commodities and production systems, producing a range of fruits, vegetables, nuts and nursery products.

In 2008-09, the Australian horticulture industry produced over 6.8 million tonnes of fruit, nuts and vegetables worth in excess of $7.3 billion. The industry is composed of over 15,000 enterprises and employs over 60,000 people on farm (DAFF 2010).

6.2 Supply, demand and trade of fruit and vegetables

Australia's agricultural sector produces a healthy surplus of food. For example, Australia exported about 60 per cent of food production in 2009-10 for an export surplus of $14.2 billion (Foster et al. 2010) and 98 per cent of fresh produce consumed in Australia is grown locally (Ludwig 2010). These figures are often used to support arguments that there are no threats to Australian food security.

However, the figures used to support these arguments are biased by a small number of heavily export-focussed industries (e.g. meat and grains). If the goal is to maintain a balanced and healthy diet which is nutritionally adequate and sufficiently diverse to support dietary preferences, it is necessary to consider food supply across all major commodity groups. From a perspective of securing food supply, it is also inappropriate to focus solely on the economic value of traded commodities rather than on the quantity and nutritional value.

The data presented in *Australian Food Statistics 2009-10* (DAFF 2010) reveals that Australia is currently a net importer of horticultural products and that claims of a secure food supply for this sector are probably misplaced. Food security is a real concern for Australian agriculture, particularly the horticulture industry.

Supply, consumption and trade data relevant to horticulture is divided among three commodity classes – starchy roots (potatoes, yams, cassava etc.), vegetables (other vegetables excluding starchy roots) and fruit (citrus, bananas, apples, pineapples, dates, grapes and other fruit). This data is summarised in Table 1.

Starchy roots (potatoes): While Australia exports about 5 per cent of our production, we import about 17 per cent of what we consume. We import about 3.5 times the quantity that we export.

Vegetables: We export about 9 per cent of what we produce, but import about 19 per cent of what we actually consume. We import just over twice as much as we export.

Fruit: We export about 13 per cent of production, but import about 34 per cent of what we consume. We import about 1.6 times as much as we export.

Table 1: Supply and consumption of fruit, starchy root and other vegetables in Australia (Kilotonnes). Source: Australian Food Statistics 2009-10* (DAFF 2010).

	Fruit	Starchy roots	Vegetables
Imports	748	197	380
Consumption	2179	1141	2028
Exports	459	57	169
Production	3594	1255	1870

** Based on data from the Food and Agriculture Organisation using annual averages (2005-2007) and taking account of stock changes.*

In dollar terms, Australia exports more fresh or chilled vegetables, fruit and nuts than we import, but the gap has been narrowing over the last decade (figure 2). In contrast, we import a greater value of processed fruit and vegetables than we export, and the gap has been steadily widening over the last decade.

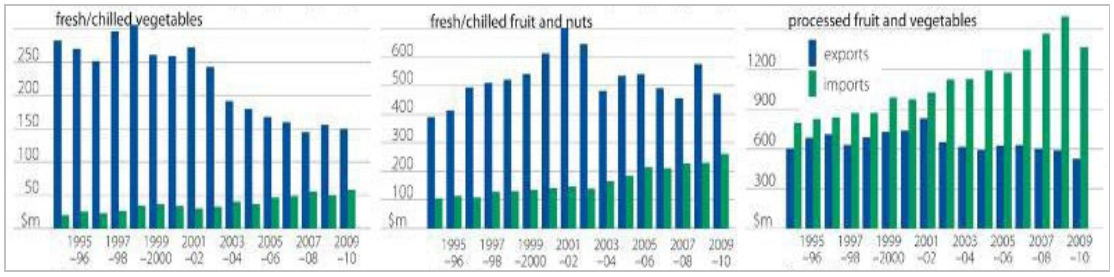

Figure 2. The value of Australian horticultural imports and exports (in 2009-10 Australian dollars). Blue bars represent exports while green bars represent imports. Source: Foster et al. 2010.

This information on supply, demand and trade of horticultural products raises some important issues that will be addressed in later sections of this report.

- In the context of food security data on quantities should be used rather than dollar values.

- Food security cannot be measured based solely on how much of our production is exported. There is also a need to look at the other side of the equation - how much of the food we eat is imported.
- There is no guarantee that imported products will continue to be cheap (or even available at all).
- The bottom line numbers, for example that 60 per cent or $14 billion worth of domestic food production is exported, that are often reported are biased by a small number of heavily export focused industries. To maintain a balanced and healthy diet, food supply across all major commodity groups must be considered.

7 Australian and international policy responses

Individual countries have responded to concerns about food security in a variety of ways. The responses have varied according to countries' levels of development, the impact on their populations, their ability to supply their own needs and their financial and administrative resources.

Governments have typically included a combination of one or more of the following policy responses:

- Direct controls on food prices.
- Consumer subsidies.
- Reducing tariffs on imported food.
- Imposing new restrictions on food exports.
- Increasing support for local farmers.

While all of the policy responses have sought to either lower prices within countries or mitigate the impact of higher prices on their populations, some measures – such as the imposition of export restrictions – are not well targeted and can have negative effects on long-term, global food security.

Many food-importing developing countries have moved, albeit on a temporary basis, to reduce import tariffs or increase import quotas to facilitate increased imports and exert some downward pressure on prices. For example:

- India is currently proposing a Food Security Act that could nearly double the level of subsidies to Indian farmers.
- From August 2007, Vietnam cut its tariffs on a range of food products, such as milk powder, wheat, soybeans and edible oils.
- From early 2008, Indonesia temporarily removed tariffs on soybeans and wheat flour.
- Since 2006, India has reduced various import tariffs, including for two of its biggest food import categories: pulses and edible oils.

Removal or reduction of import tariffs can involve a significant loss of revenue for governments, particularly in developing countries that have narrow tax bases and do not have sophisticated tax collection systems.

Even China became concerned about the potential for shortages and the impact of further price rises in its domestic markets, and responded by restricting exports in order to ensure sufficient supplies for their citizens and exert downward pressure on domestic prices.

7.1.1 Australia

Policy development around the issue of food security in Australia has traditionally followed the neo-classical economic model that relies on the operation of liberal international markets to deliver food security over time.

The consistent message from successive ministers and agencies has therefore been that Australia produces more food than we can consume, and that in fact we export about 60 per cent of our produce. The message has been that any specific commodity shortfalls are easily accommodated by imports, and that the only real threat to food security comes from trade barriers and other protectionist policies.

In this way, proposals that advocated a fresh look at the issue of food security were conflated with outdated protectionist structures, and those advocates struggled to find a voice at the policy-making table. The Ministers and agencies have also relied on assumptions that imports will always be available.

However, since the price spikes experienced during 2007/08, this neo-classical stance is seen by many to be deficient, and some industry observers began calling for a broader view of food security policy in Australia.

This period coincided with the early days of the Rudd Labor Government, and the issue was raised at the *Australia* 2020 ideas summit of 2008.

Under *Future Directions for Rural Industries and Communities* at the Australia 2020 Summit (Australian Government 2008), food security was one of the issues raised by the agriculture sub-group. The outcome sought was 'development of a national food security plan for Australia', and the main ideas for achieving this outcome were:

- Establishment of a government unit to consider national and global food security matters and develop and implement new policies.
- Examination of projected national food demands and the production systems required to enable sufficient food production to continue within Australia's environmental and resource constraints.
- Promotion of healthy food to tackle societal problems such as obesity and measures that ensure human capital is retained in remote, rural and regional Australia.
- Future policy being careful not to create food shortages by providing more favourable incentives for agriculture to participate in carbon markets.
- Assessment of the crucial role of honey bee pollination in food production and adequate support for the honey bee industry.
- Implementation of safeguards and building of industry capacity to preserve the genetic diversity of our plants and animals, including protection from exotic disease incursions.

On 1 December 2010, a National Food Policy Working Group was formed with representatives from various sectors (Ludwig 2010). The Minister for Agriculture, Fisheries and Forestry, Senator Joe Ludwig, said that the working group will provide strategic advice to government on the development of a National Food Plan.

The plan is designed “to ensure that our food industry adapts to the economic, environmental and consumer driven pressures across the food sector, from the paddock to the plate” (Ibid.).

Two days after the working group met for the first time, a new report from the *Prime Minister's Science, Engineering and Innovation Council* warned that while Australia may presently have an abundance of food, the future supply is far too vulnerable (PMSEIC 2010).

The council has recommended setting up a single national food security agency which would be responsible for regulation and research, rather than the current mix of organisations with little coordination.

The report stated that, if Australia's population continues to grow to 35 to 40 million and climate change continues unabated, food imports could soon outgrow exports. It continued on to state that productivity in the sector has plateaued over the past decade, while risk of diseases, food transport and storage concerns are also weighing down the industry (PMSEIC 2010).

7.1.2 State government initiatives

Most but not all states of Australia have gone some way to tackling food security, but these have not been co-ordinated either with one another or the national approach.

The New South Wales government organised a *Productivity and Food Security Symposium* in Sydney during 2009, highlighting the need to address global food security now for future generations.

The symposium recognised two key facts that are crucial to this debate:

- Global food output must increase by 75 per cent by the year 2025, and it must have doubled by 2050 to meet expected demand.
- Put another way, we must produce as much food in the next 50 years as we have produced in all of human history.

The symposium concluded that research is a key way of addressing these issues. Food Security author, Professor Julian Cribb, suggested that it needs to increase by 400 per cent if world hunger was not to increase (NSW DPI 2009).

The Victorian Department of Primary Industries has a program on food security aimed at enabling a productive, competitive and sustainable farming

sector, called *Future Farming Strategy* (Victorian DPI 2008). The DPI also co-ordinate the *Victorian Food Supply Security and Continuity Network* to help plan for emergencies that may disrupt the food supply, and their Department of Health works in collaboration with Local Government Authorities to reduce local barriers to access to food (Victorian Local Governance Association).

The food security debate in Queensland has revolved around issues of land use allocation and natural resource management policies. The State government has developed a new policy framework that is designed to provide some balance between the needs of urban expansion in a growth state, mining (especially coal-seam gas) and agricultural land (Qld Department of Infrastructure and Planning 2010). This policy aims to identify Queensland's best cropping land and exclude development that may impact upon that land's production capability.

"Developments such as coal seam gas, underground coal gasification, mining, urbanisation and permanent forest plantations will be assessed" (Qld Department of Infrastructure and Planning 2010). This is intended to provide farmers with secure access to the best food-producing land in the state. The Queensland Alliance for Agriculture and Food Innovation (QAAFI) has recently been set up to undertake research and be "a major driver of innovation, productivity growth, improved sustainability and international competitiveness in the food and agribusiness industries" (University of Queensland). It will also concentrate on tropical and subtropical research.

Tasmania has incorporated food security into their "social inclusion" suite of policies, guided by the Tasmanian Food Security Council (Department of Premier & Cabinet, Tasmania 2010).

The Council has the following responsibilities:

- Overseeing the development of a Food Security Strategy for Tasmania that is consistent with the objectives of A Social Inclusion Strategy for Tasmania.
- Identifying and making recommendations to the Premier about projects that can be funded from the Tasmanian Food Security Fund.
- Overseeing the development of a framework to measure food security at the local level in Tasmania.
- Developing a responsive and democratic approach to food distribution in Tasmania.
- Identifying the causes of food insecurity and advocating preventative measures.

7.1.3 International

Developing country governments have usually responded with lower import tariffs and targeted subsidies for the poor, but also with more short-sighted policies such as trade restrictions and other forms of protection.

Among developed countries, the United Kingdom has taken a leadership role in the analysis of food security issues. *Food Matters: Towards a Strategy for the 21st Century* was released in July 2008 (Cabinet Office 2008). The report combined the various elements of food policy and considered the challenges and opportunities for the food system as a whole for the first time.

The challenge set by *Food Matters* was for Government to aggregate its efforts on food policy looking at health, food safety, the economy and the environment.

The policy document noted that many of the elements required for a comprehensive food policy already existed, but that central Government needed to integrate them, and work with the public, food supply-chain businesses and other stakeholders to put a new policy framework in place.

In early 2010, the British Government released another blueprint policy document with a focus on domestic food security, *Food 2030* (DEFRA 2010). This is one of the few domestic food security policies written for a developed nation.

Unfortunately, since the change of government in May 2010 and large spending cuts introduced in response to the Global Financial Crisis, it appears to have been shelved. In January 2011, the new Cameron Government released a new report on how to feed the planet until 2050.

With this report, *Foresight. The Future of Food and Farming* (Government Office for Science 2011), the UK Government appears, unfortunately, to have fallen into line with the general belief of First World nations that food security is only a problem for the developing world. Launching the report, Britain's Environment Secretary Caroline Spelman said the report showed ways to unlock an “agricultural revolution in the developing world” (Spelman 2011).

However, there are many lessons from the report that are applicable to Australia. The report found that governments must take action to change dietary habits, cut waste, reduce subsidies and embrace genetically modified food (Government Office for Science 2011).

The report identified five key challenges for the future of food security:

- Balancing future demand and supply sustainably – to ensure that food supplies are affordable.
- Ensuring that there is adequate stability in food prices – and protecting the most vulnerable from the volatility that does occur.
- Achieving global access to food and ending hunger - this recognises that producing enough food in the world so that everyone can. potentially be fed is not the same thing as ensuring food security for all.
- Managing the contribution of the food system to the mitigation of climate change.
- Maintaining biodiversity and ecosystem services while feeding the world.

The study stated that with the global population forecast to reach nine billion in 40 years time, radical changes were needed to a system already struggling to feed the existing population. The report also found that food prices could rise substantially over the next 40 years. As hunger spread, the threat of migration and conflict would increase, while wider economic growth would also be affected.

The study claimed that the global food system was already living beyond its means, consuming resources faster than they can be replenished (Government Office for Science 2011).

Many expert commentators have stated that the only way to provide for the world's burgeoning population is to have a modern, science-led 'Green Revolution.' The phrase 'Green Revolution' refers to scientific breakthroughs achieved mostly with rice varieties in Asia from the 1960s onwards to avoid predicted mass famines. In the last fifty years, yields in rice have been increased from 1.5 tonne per ha (t/ha) to over 4 t/ha (Ziegler 2010). There is general agreement that the way to feed the world is through greater yields rather than bringing more land under cultivation, and that science will be crucial to this (Economist 2008).

8 Key threats to food security in Australia

Clearly, there is more to food security than simply the production or importation of adequate food supplies; political, economic and social issues are also critical (Funk & Brown 2009). While there may be no immediate threat to the Australian domestic food supply, Australia does face a number of key food security challenges over the longer term (Sheales and Gunning-Trant 2009).

The following discussion provides an overview of the many factors that may influence food security:

8.1.1 Resources

- **Land availability:** One of the major challenges of ensuring food security is the management of competing land uses, and the permanent alienation of good quality cropping land that other uses can cause.

  While more than half of Australia's land surface is used for agricultural purposes, the area of productive land is decreasing as a result of increasing urbanisation, land use competition and degradation (e.g. salinity, nutrient depletion, erosion, weeds etc., ABARE-BRS 2010). Cities can affect agricultural production by expanding across productive land, by drawing labour from surrounding farming areas, and by encouraging shifts to non-productive activities because of rising land prices. The results of land use competition and incompatible adjacent land uses can be more subtle than the displacement of agricultural activities.

  Based on current levels of immigration of above 260,000 per year, research undertaken for the Department of Immigration and Citizenship found that by 2050, 430,000 hectares of agricultural land surrounding Melbourne and Sydney will be taken up by housing (National Institute of Labour Studies 2010; Peckham 2011). The best soils for horticulture occur predominantly in the peri-urban areas of Sydney, Melbourne, South-East Queensland, and a number of regional cities in Queensland (CDI Pinnacle, Street Ryan and Associates, and Growcom 2004; Buxton and Low Choy 2007). Horticulture cannot simply just move further west, as is sometimes suggested. Soils suitable for growing pasture or broad-acre crops more often than not are unsuitable for horticulture (Weston et al. 1981).

  At the global level, rapid population growth in developing countries is threatening arable land. For example, while an average of about 0.5 ha of arable land was available per person in 1961, it is predicted to drop to about 0.1 ha per person by 2050 (Martine and Marshall 2007). There

is also a direct relationship between population density and land degradation in the developing world (Bot, Nachtergaele, and Young 2000). These land use conflicts are likely to worsen over time.

Permanent removal from production of land through urbanisation can be added to neighbourhood conflict in areas zoned as Rural Residential or similar as a threat to horticulture production. Local governments and the varying types of residents in Rural Residential type areas often do not agree on the definition of such zoning (Ranke 2010). Many neighbours believe that such areas should not be commercially farmed at all, and raise sometimes legitimate, sometimes vexatious complaints regarding the use of chemicals and machinery, erection of greenhouses, noise, and against other normal farming practices, despite the farm having existed there long before closer settlement occurred. This has been particularly pronounced within the Logan City Council area, south of Brisbane (Ranke 2009).

Permanent alienation of quality agricultural land by mining has become an increasing problem in recent years. Coal has been discovered in many horticultural districts. While land that has been open-cut mined has been successfully restored to grazing quality, cropping land has never been successfully rehabilitated to previous standard, given the delicate soil balance and contouring required (Growcom 2009).

Coal Seam Gas (CSG) mining is a newer method of extraction that has been introduced for use under cropping land recently. Growers' fears that miners were rushing into this method before any proper assessments of potential impacts on land and water had been conducted, appear to have been realised in the case of at least one mine, which the Queensland Government has now closed, citing an 'unacceptable risk to the environment' (Hatzakis 2011).

Sovereign Wealth Funds are investment funds owned by governments. Countries such as China, Qatar and the United Arab Emirates have acted to protect their own food security through the purchase of agricultural properties in Australia, which will produce food for direct export back to home countries (ABC News 2010). Although there has always been large international investment in Australian agriculture, the prospect of produce being grown in Australia solely for remittance back to home countries, with no opportunity for Australians to purchase this product, is quite distinct from a foreign company or individual selling its produce on the open market. This phenomenon, if not managed carefully, could have potential consequences for Australian food security should there be a global food crisis.

- **Water:** Australian food production is often limited by water availability, and water is probably the most critical factor affecting future food production (PMSEIC 2010). The agriculture industry is the largest consumer of water in Australia, consuming 6,996 GL or 50 per cent of national water consumption in 2008–09 (ABS 2010). Droughts,

competing water uses and water reform processes (e.g. the Murray-Darling Basin reforms) are likely to require agricultural producers to reduce water consumption and increase water use efficiency (MDBA 2010).

Water availability is also a major constraint on food production in other regions. Excessive groundwater extraction has raised concerns for continued access to irrigation water across major regions of North Africa, the Middle East, India and China (reviewed in Konikow and Kendy 2005). There are fears that aquifer depletion and degradation will threaten food security and socio-economic development in these regions, and major investments in groundwater management are urgently required (Foster and Chilton 2003). The aquifers which irrigate much of India's horticulture production are thought to have less than fifteen years before they are depleted (Athrady 2010), and there are similar predictions for China (Postel 2010).

- **Chemicals:** Access to chemicals has been identified as a major concern. One retailer surveyed mentioned the fear and ignorance often spread by the media on issues such as chemicals that are banned overseas but permitted for use in Australia due to our unique climate. A consumer boycott based on this misinformation could force retailers to stop accepting fruit and vegetables treated with such chemicals.

  The current situation with Dimethoate and Fenthion is also illustrative of this risk. The Australian Pesticides & Veterinary Medicines Authority is due to rule this year on whether these important chemicals for treating pests can continue to be used, yet there is still no alternative that has been found (Summerfruit Australia 2010).

- **Peak fertiliser:** Australian food production relies heavily on fertiliser applications because of the poor quality of soils across much of the country. Increased fertiliser use (primarily nitrogen and phosphorus) has been directly responsible for increases in agricultural yields. Fertiliser use has increased by about 700 per cent over the last four decades (Foley et al. 2005).

  Global supplies of rock phosphate (from which phosphorus fertilisers are produced) are controlled by a small number of countries and production has been predicted to 'peak' in about 2030 (Cordell, et al 2009) after which supplies will fall and prices will rise. Although other reports contain more optimistic estimates of remaining resources (International Fertilizer Development Centre 2010), it remains that those resources are largely controlled by four or five countries. Australia has small deposits of rock phosphate.

  Natural gas and energy are required to produce nitrogenous fertilisers, and rising costs of these inputs will increase the costs of these fertilisers. Regulatory restrictions on fertiliser use to address pollution issues may also have an impact.

- **Peak oil/fuel:** Peak oil refers to the situation where oil production will no longer be able to increase in response to rising demand. It is anticipated that, at some point in time, the supply of oil will plateau and begin to fall. The basic idea that oil production must necessarily peak at some point is generally accepted, but estimations of the timing of this peak vary widely. Ingles and Denniss (2010) suggest that the peak will be "sooner than most people expect and definitely sooner than many would prefer."

  Regardless of when the peak occurs, it will have far-reaching effects on the economy via impacts on energy availability and cost. Oil and gas are important inputs to modern agricultural practices, contributing to energy consumption, transport, and chemical manufacture. A fall in oil supplies leading to price increases in oil and oil-based products could cause a spike in food prices. Peak oil is likely to encourage switching to other forms of energy and may result in larger areas of agricultural land being used in the production of biofuels rather than food.

  The looming oil shortage and energy price increases have encouraged many governments to provide incentives for biofuel production (such as subsidies, tax exemptions etc.). On a global scale, there are concerns that these measures may displace food production and lead to a major increase in food prices. For example, it has been estimated that 30 per cent of the increase in cereal prices between 2000 and 2007 can be attributed to biofuel production (IFPRI 2008, cited in Sheales & Gunning Trant 2009). Within Australia, only a relatively small amount of grains are currently diverted to biofuel production, but this may easily change as energy availability and prices vary.

- **Erosion of agricultural biodiversity:** Agriculture is based on highly diverse resources and comprises a number of managed agro-ecosystems that benefit from natural resources (Thrupp 2000). Agricultural biodiversity includes a number of biological resources, including genetic resources, plants and crops, insects, and microorganisms. However, agricultural developments over the last few decades have resulted in degradation of many of these biological resources, potentially undermining productivity and food security (reviewed in Thrupp 2000). Some examples include:

  The reliance on monocultures of high-yield varieties and modern breeding methods can lead to the erosion of genetic resources, increasing biosecurity risks and restricting future developments. The heavy use of pesticides and other agrochemicals may reduce insect and soil diversity, leading to a loss of soil fertility, reduced pollination and reduced productivity. Ineffective conservation efforts and the degradation of surrounding habitats can reduce the diversity of insect predators and pollinators. The geographic expansion of agriculture can lead to the loss of habitat diversity and wild crop relatives.

Any discussions around the initiation of a new “green revolution” as a mechanism for increasing food production will need to consider these issues.

8.1.2 Climate change and variability

Current climate variability and extreme events (e.g. droughts, floods and cyclones) lead to fluctuations in production, supply and cost of fresh food products. Although these fluctuations are often more extreme in developing countries, Australian producers and consumers are also affected on a regular basis.

Longer-term climate change is expected to have negative impacts on food availability and access, leading to increased risks of hunger and under-nutrition across the developing World (UNSCN 2010).

Australia is projected to be among the most adversely affected regions and climate change is expected to impact on food security in several ways. Increased temperatures, altered rainfall patterns and more frequent intense weather events are likely to present additional challenges for food producers (Stokes & Howden 2010). Producers will be required to respond with new varieties, new farming systems and practices, and possibly by shifting production regions. The potential impacts and response strategies relevant to the horticulture industry are reviewed in Webb & Whetton (2010). The horticulture industry has recently reviewed the RD&E activities and future requirements to address these climate-related challenges (Turnbull 2009; Putland 2010).

In addition to the direct effects on production, intense weather events like cyclones and floods lead to the disruption of food distribution channels. In more extreme scenarios, climate change and elevated sea levels may lead to large changes in the distribution of human populations (e.g. through high levels of migration) to which food production and distribution will need to adapt.

The horticulture industry produces negligible greenhouse gas emissions. However, it is likely to be caught in any policy framework designed to reduce emissions from the broader agriculture sector. If not carefully designed, there is the potential for these policy measures to impact on farm productivity and profitability. In many cases, it is expected that farmers will experience the negative affects of climate policies, such as increased input prices, before the physical effects of climate change itself. There is also a risk that these climate policies may divert agricultural lands away from food production to the generation of offsets.

8.1.3 Population growth and demographic changes

The World population is projected to exceed 9 billion by 2050. The Australian population is expected to increase to between about 30 million and 42 million by 2056 (ABS 2008). In addition, the growing middle class in developing countries, particularly throughout Asia, is expected to increase demand for higher quality and higher protein food sources.

It appears that significant reductions in food availability will follow the increases in demand driven by growing populations and rising living standards (Funk & Brown 2009). Providing adequate nutrition to this growing population through a balanced diet of quality food products is likely to be challenging.

Consumer demands have always been a driver of the food value chain. It is expected that a number of consumer trends will have a significant influence in the near future (Jacobs et al. 2007). They include:

- Rapid growth in online shopping.
- Increasing focus on sustainability and environmental issues (such as energy efficiency, water use and waste).
- Personalised food products and offerings.
- A growing focus on health and wellbeing (such as diet and obesity care).

8.1.4 Economic Issues

- **Food prices:** Although fresh food prices remain low in Australia, the 2007-08 food price crisis illustrated the effects a spike in food prices can cause around the globe. The food price crisis was characterised by massive price increases in staple food products and was caused by a combination of some poor harvests, lower food reserves, greater demand, rising oil and energy prices, price speculation and protectionist trade policies (Ejeta 2009; Sheales & Gunning-Trant 2009; Kaufman 2010). Many of these conditions persist and/or are likely to worsen over time, and the resulting price volatility is likely to be a critical risk to food security, particularly for developing nations. Importantly, the FAO Food Price Index recently surpassed the previous high levels set during the 2007-08 crisis (FAO 2011).

  Horticultural products are particularly cheap in Australia, where average weekly household expenditure on fresh fruit and vegetables has fallen over the last few decades. For example, in 1975-6, 1.83 per cent of total household expenditure was spent on fresh fruit and vegetables (2.58 per cent on fresh, frozen or processed). By 2003-4, this had fallen to 1.79 per cent (2.31 per cent on fresh, frozen or processed). Less than 10 per cent of total expenditure on food and beverage products is directed to fresh fruit and vegetables (DAFF 2010).

- **Farm profitability:** Farmers will only continue to produce food while it is profitable to do so. With the concentration of market power in two major retail chains, Australian growers are “price takers” with little influence over the prices they receive for their products. The weakening of cultural links between urban consumers and rural producers contributes to the current situation where consumers do not recognise the true value and worth of food. These factors combine to place financial pressures on food producers, reducing the appeal of farming as a business, and threatening reliable food production. There is anecdotal evidence that for many horticultural product lines, returns to growers have decreased significantly in real terms over the last two decades.

- **Insecurity of imports:** Imports are often considered to be a true alternative to domestic production and as a “safety net” in the case of production failures. Australia is a net importer of processed fruit and vegetable products and imports of fresh produce are growing (Foster et al. 2010). However, imports are not a secure source of food. In the event of a widely distributed food crisis, food imports will cease to be available (or increase in cost) as nations secure their own production for domestic requirements. This risk of reduced import availability and/or increased costs needs to be assessed.

- **Lack of infrastructure:** Efficient and reliable transport infrastructure is critical to ensure access to affordable food and to maintain the international competitiveness of Australian horticulture. Capacity constraints, often exacerbated by natural disasters such as floods and cyclones, can severely limit the effectiveness and efficiency of food distribution and transport services.

- **International trade:** Protectionist trade policies and agricultural subsidies in developed nations erode the food security of developing nations. As discussed above in the section on *Australian and international policy responses*, developing nations sometimes implement short-sighted protectionist policies as a reaction to an immediate threat, but these are not always well targeted and may cause negative effects on long-term, global food security.

- **Intellectual property rights:** Biotechnology companies and developed countries have lobbied for strong intellectual property (IP) rights in international negotiations. These organisations have argued that IP rights are required to protect their investments in research and development. In a global context, IP rights are managed under World Trade Organization’s agreement on the Trade Related Aspects of Intellectual Property Rights (World Trade Organization 2010). In the agricultural sector, IP rights allow biotechnology companies to control the use and distribution of seeds and plants using a system of restrictions and royalties. For agricultural in developing countries, recent analyses have suggested that the costs of developing and

maintaining IP rights may outweigh the gains (reviewed in Yamin 2003).

- **Waste**: Post-purchase wastage of food in Australia amounts to over $5 billion annually, and uneaten fruit and vegetables are the major contributor (Baker et al. 2009). Around 35 per cent of municipal waste and 21 per cent of commercial/industrial waste is food waste (Environment Protection and Heritage Council 2010). It is estimated that the average Australian generates about 360kg of food waste per year. The level of food waste may increase given expected increases in incomes and reductions in household size (Baker et al 2009). A large amount of food is also wasted pre-purchase, via losses in processing, the supply chain and through minimum quality requirements. Clearly, waste minimisation could provide an important contribution to achieving food security.

- **Speculative trading:** Many food products are treated like just another commodity to be traded on the global market for profit, leading to price volatility through speculation and manipulation. However, food is not just another commodity, but has intrinsic fundamental value to people and society which much be recognised to achieve true food security (Fullbrook 2010). It has been suggested that a reserve and intervention mechanism should be established to calm markets under speculative situations (von Braun and Torero 2008).

8.1.5 Research, development & extension

In Australia, public funding of agricultural R&D has been in decline for several decades. Several studies have highlighted a link between the drop in R&D funding and declining growth in agricultural productivity (Sheng et al 2010; Nossal and Gooday 2009). Increased funding and support for agricultural R&D will be vital to maintaining food security in the face of these multiple challenges (PMSEIC 2010; Ejeta 2009; Von Braun 2009). Areas requiring particular attention include:

- Productivity/yield/efficiency increases
- Sustainable agricultural practices
- New varieties
- Genetically modified crops
- Biosecurity
- Climate change impacts and adaptation
- Economic impacts of rising input costs

The adoption of agricultural innovations requires a combination of economic/political stability, R&D investment, and extension that must be maintained over relatively long periods (Funk & Brown 2009). The demonstration of relative benefit of innovations is particularly important to drive adoption (Marsh 2010).

The need for more rural research and development (R&D) was one of the main themes of the recent report, *Australia and Food Security in a Changing World* (PMSEIC 2010). It noted:

i) While the role of scientific advances in dealing with problems of food supply are well recognised, global investment in agricultural R&D has decreased over the past 20 years (PMSEIC 2010).

ii) The drop in investment has been linked to a decline in agricultural productivity (Alston et al, 2009). In Australia R&D investment has progressively fallen from a peak of five per cent of gross value of agricultural production in the 1970s to just above three per cent in 2007 (PMSEIC 2010).

iii) Consequently, international debate on the global approach to food security has focused on global underinvestment in food production research (PMSEIC 2010). However, the Productivity Commission's recently recommended to the Australian Government that public funds for rural R&D should be cut by half over the next ten years (Productivity Commission 2010).

iv) The decrease in real investment in R&D has led to the substantive decline in underlying productivity growth in the Australian agricultural sector. Increased investment will boost agricultural productivity and provide a key strategy to reduce the impacts of climate change, as well as reduce the greenhouse gas emissions footprint of the agricultural sector (PMSEIC 2010).

The report made some strong recommendations, citing a direct and quantifiable link between the decline in agricultural productivity growth and the decline in R&D investment. Urgent investment is required to rebuild R&D capability and regain momentum in productivity growth (PMSEIC 2010).

The Expert Working Group of the PMSEIC recommends that Australia increases investment in agricultural R&D to harness national expertise and take a leading role in national and international programs targeted to improving low input farming systems.

The aim of this recommendation is to enable sustainable levels of food production in low input environments nationally and internationally by leveraging the world-leading R&D capabilities in Australia (PMSEIC 2010).

8.1.6 Biosecurity

Outbreaks of pests and diseases can have serious consequences for the supply and distribution of horticultural products. Quarantine, pest monitoring and other biosecurity controls are a vital component for maintaining food security.

8.1.7 Industry policy and planning

Formal training in agriculture and food production appears to be in decline (Pratley and Hay 2010), with falling enrolments in agriculture and related general sciences. This observed decline raises concerns about the future availability of qualified agricultural scientists and skilled farm labour. A number of factors have combined to make it difficult for agricultural businesses to find and retain skilled labour; these include strong economic growth, the boom in well-paid jobs in the resources sector, and an ageing population (Sheales & Gunning-Trant 2009).

There is more to a successful farming business than simply growing quality produce. Successful farmers require a suite of skills to maximise profit, including management, marketing and negotiation among other things. Farm management practices are dynamic and require frequent updating to maximise yields, productivity and sustainability.

Consumer education is also important to reverse the weakening in cultural links between rural and urban Australia (PMSEIC 2010). There is a growing need for consumers to recognise the true value of food, accept lower quality (appearance) products, eat more sustainably, waste less and purchase products from more sustainable producers (Cribb 2010).

Due to Australia's domestic and international reputation as a large agricultural producer and exporter, the general public is largely unaware of the figures mentioned above, that up to 34 per cent of fruit is imported and 19 per cent of vegetables. Those who are aware that Australia's horticultural output is shrinking while our population is growing believe that it will always be possible to import what we do not produce, and often mistake food security with protectionism.

During the Doha Round of trade negotiations monitored by the World Trade Organisation (WTO), official responses during this time were especially scathing of any suggestion that equated "food security" with protectionist policies, or tendencies towards "self-sufficiency".

> "The idea that 'food security' can best be achieved through 'food self-sufficiency' is misguided; strong, efficient and dependable international markets are a vital source of food security for countries around the world. For most countries, domestic agricultural production will form a significant part of their food supplies. But few countries can realistically be entirely self-sufficient, because it is neither practical nor economically advantageous. Even efficient agricultural producers, such as Australia, suffer from droughts, disease and crop failures. Broad and deep international agricultural and food markets are therefore vital to spread these risks and mitigate the effects of potential future crises.

These issues must be addressed by explaining and vigorously advocating the benefits of freeing up global food markets. Liberalising world food markets will expedite rational supply responses and the allocation of resources towards more efficient producers, including those in developing countries, thus lifting productivity and global output. This will stimulate growth in developing countries' agricultural sectors, increase their share of world food output, boost their economic growth and contribute to poverty alleviation" (Brown 2008).

Australia has the developed world's second lowest level of agricultural subsidies, estimated at 6 per cent by the OECD in 2007, and low barriers to agricultural and food trade. Australia also imports a wide range of food and beverage products, averaging A$7.5 billion per annum over the past five years.

8.1.8 Interruption to supply

- **Food safety:** Australian food safety standards are particularly high, resulting in a very low incident of biological, chemical or physical hazards in food. Despite this, there is always a risk that biological hazards (such as bacteria) or contamination by chemicals or objects may lead to disruptions in supply because of public health concerns.

- **Natural disasters:** Natural disasters pose a threat in a number of ways, often concurrently. The cutting of transport routes can make it impossible to either get produce out of the growing districts, or into the market areas. The cutting of electricity and telecommunications for a period can also provide hardship. The loss of a portion or all of a crop is also a threat. With some commodities such as pineapples or citrus taking years from planting to maturity, a natural disaster can cause long-term supply deficits.

- **Politics and conflict:** Dictatorship, kleptocracy, war, sabotage and bioterrorism can have negative impacts on food security. Conflicts can lead to major disruptions of food supplies (Cribb 2010). It has been estimated that countries undergoing or recovering from conflict may have 20 per cent of the population affected by food insecurity (Nellemann et al. 2009).

  Even local domestic issues, such as land-use conflicts or unrelated social grudges, may lead to sabotage events that disrupt production and/or distribution (as demonstrated by recent events in Bowen, north Queensland) (Tin 2010).

9 Australian food industry perspectives

We constructed a detailed questionnaire featuring a number of direct questions designed to draw out relevant and informed responses. Respondents were also invited to provide any additional information that they felt might be relevant to the topic. The full questionnaire can be found in Appendix i.

The questionnaire was sent via mail or email to forty people from different sectors directly involved in the horticulture supply chain and supporting industries, including growers, research & development, retail, processing, policy, planning, inputs, industry bodies and distribution.

9.1 Survey results

In total, eight survey responses were received, with one also backed up by a teleconference that went into further details. The respondents covered the spectrum of sectors that were the focus of the survey with the detail from the retail sector being the standout result, clearly showing their interest in this subject.

Responses were received from the growing sector, one state government representative, academics, processing and the three major retail groups Coles, Woolworths and Metcash. No detailed responses were received from any politicians although some acknowledged our request.

The responses below are given for the sectors so that all respondents remain anonymous.

9.1.1 Question 1: How do current government policy settings and industry structure affect future food security?

The responses to this first question focused mainly on the current government policy settings that most affect food security. Comments received clearly showed that most groups believed that current government policy settings were inadequate. Comments ranged from government policies being ones that "sometimes affect clarity", "fragmented and driven by different interests", "often very disjointed and unclear, "have far too many overlaps", "no real direction" and in one respondents' eyes believed "that when it came to food security most Australian governments are asleep at the wheel".

There was support for current government policies from the government representative in the area of Research and Development (R & D) which was seen as a positive influence.

In the main all the respondents were calling for a much more integrated approach to food security at a government policy level with one respondent advocating a dedicated Minister and Department. Many talked about the need for “greater competitiveness” and called for reduced regulatory costs and a more conducive economic environment that promoted R & D and innovation.

One retailer noted that the total food sector should be included in government policy making. They linked the inputs sector and the post-farm-gate components of the economy with the agriculture sector to come up with a quoted estimate that the total sector contributed 12per cent to national GDP making it the largest sector of the economy.

In this way, there was support for a nationally coordinated food industry strategy composed of a number of suggested elements. These included sustainability in regards to water, waste, energy and carbon; a focus on the protection of prime horticultural lands – particularly good lands close to urban centres of population; key investment in R & D, innovation and labour force development and training; and on the supply chain side a need for investigations into retailer domination, predatory behaviour and cost competitiveness.

Nutrition was also brought out by some respondents as a major component of food security and that a major strategy should also include the strong links between healthy citizens and the consumption of fruits and vegetables.

On the question of industry structure, one respondent noted that the industry was highly fragmented, with grower capabilities and competitiveness varying widely. They saw that there were significant opportunities for the Australian produce industry to acquire scale and efficiencies and to provide nutritional food at great value to Australian consumers.

It was also noted by some respondents that the overall security of Australia would benefit from a politically stable region where food was in plentiful supply.

9.1.2 Question 2: What do you or your organisation believe are the major challenges or threats to Australia’s future food security?

This question asked respondents to look at the major potential challenges and threats to Australia’s food security and give some thought to a ranking these threats in order of priority. This question suggested 11 challenges or threats with a further section for additional elements. Seventy five percent of the respondents chose to rank the key challenges and threats presented.

The results showed a very mixed response to many of the issues listed. Of the 11 suggested issues, only four were ranked as the highest priority by at least one of the respondents. They were:

- Population growth and demographic changes.
- Climate change and variability.
- Inadequate productivity growth.
- Economic issues.

We also calculated a composite rank for each issue by combining the ranks provided by all respondents. This method produced a list of the main issues identified by our survey, in order of priority:

1. Climate change and variability.
2. Resource limitation.
3. Population growth and demographic changes.
4. Inadequate productivity growth.
5. Economic issues (farm profitability and prices).
6. Government policy and planning.

Government policy and planning was rated more highly than industry policy and planning, reflecting the view among our respondents that government policy and planning has a greater influence over food security in comparison to industry planning.

Although biosecurity was ranked as high as fourth by some respondents, other comments suggested that they believed this issue was at present quite well handled by industry and government under the mechanisms that now exist for Biosecurity Australia and their related state counterparts.

One respondent brought up the issue of the threat to Australia of a major collapse in the food supply in our region. Noted in particular were the plains areas of India and China which could release several hundred million refugees – many of which could land in Australia.

Another threat identified was a rapid increase in the price of oil. Prices at or above $300 a barrel have been predicted by some US experts within this decade which would make the farming sector unprofitable, unless alternative sources of energy can be found.

Another factor identified was declining skills and capacity in the sector noting the aging of the farming population.

9.1.3 Question 3: What do you or your organisation believe are the primary actions required to secure the food supply?

The primary actions identified by the respondents covered a number of areas. One suggestion was the need for the creation of conditions for business success including economic reform, development of infrastructure and resource security.

Reliable water supplies were noted by a number of respondents as of paramount importance. Actions here included the need to balance production

needs, keeping sufficient environmental flows, maintaining healthy aquifers and securing new sources of water. Water use efficiency in tandem with significant infrastructure development was considered necessary.

Healthy soils were noted as being important for production and to reduce environmental degradation. Technical advances such as precision cropping and minimum tillage were needed to be adopted more widely.

Government engagement and support for R & D was also noted to be a key action. Australian researchers were regarded as a "rapidly ageing resource, with much knowledge being lost to industry with retirements". Actions about recruitment of new researchers need to be considered along with the establishment of good career paths within the industry.

More emphasis on mechanisation within industry was another suggested action. This needed to be coupled with suitable trial and demonstration programs that are meeting world standards of uptake within industry. Protective cropping techniques for industries such as cherries, berries and tomatoes were also considered relevant actions.

One retailer placed emphasis on actions to develop a national food strategy and to create a national food department that oversees nationally consistent legislation, regulations and standards. They also wanted action on better resilience planning and resources devoted to hazard planning for significant events such as earthquakes, tsunamis, bushfires and pandemics. As this was written before the recent events particularly in the eastern states of Australia, another area to be considered for such planning would be flooding.

Another retailer noted that sustainability and food security are interlinked. They rely on social capital, natural resources and regularity structures and market dynamics to function and supply good quality food at affordable prices. So they suggest that any actions to address food security also need to incorporate sustainability of our food production and supply.

9.1.4 Question 4: What is your organisation's role in securing the food supply?

The answers given to this question reflected the respondents' various positions in the sector.

Growers believed their role was to keep looking for more efficient ways of growing product. Academics saw their role as leading discussions, floating ideas and policies, and to continue raising awareness. The state government representative noted their role as being a facilitator.

Retailers were much more creative in their responses. They saw their roles as working with growers to be more sustainable and environmentally aware. They listed programs and examples they were already engaged in to assist growers all over Australia in this endeavour. One noted that they need to take

into account a risk management approach and stated how they helped the industry comply “to over 130,000 laws across Australia that impact on our industry”. They saw themselves as setting the standards for food quality and safety, and that they were very engaged in the procurement of products for their customers. One noted that government needed to take a more proactive role in assisting the more vulnerable in the community.

The processing industry were lobbying for a more comprehensive and coordinated government approach to food overall and were assisting food and grocery companies to become more competitive through a range of industry policies and programs.

9.1.5 Question 5: What do you see is the industry’s role in securing the food supply?

Responses to this question about the role of industry in securing the food supply again reflected their various positions.

Growers wanted to see industry influence government to “stop adding to production costs”. The state government representative believed the industry was a “key player”. The processors saw the industry role as working cooperatively across the supply chain, working with government and in becoming more efficient.

Researchers saw the industry role as similar to their own in the need to generate discussion, float ideas and policies and to be involved in awareness raising activities. One suggestion regarding public awareness was the need to focus on eating a lighter more sustainable diet, especially one that contained about 50 per cent more fruit and vegetables.

Retailers again were more proactive in their responses. One retailer saw the industry role as being involved in the coordination of industry information, industry development and training. A concern expressed here was the lack of graduates with agronomic/horticultural skills and the low numbers of enrolments at universities and other training facilities. These numbers will need to grow to support the industry sector and the skills are needed in future in production, environmental and supply chain positions. A suggestion is to set up sponsored study places at Universities.

Another role is in breaking down the barriers of trade across state boundaries and to positively engage with government on structural reform and infrastructure development.

Another retailer wanted to see industry bodies to show vision and to lead their members in addressing these difficult issues. Their prioritised list included:

- The slowing rate of productivity growth and potentially declining productivity.
- The sustainability of supply.

- Water scarcity and impacts of climate change as related matters.
- Resource limitation – phosphorus/soil nutrients, agricultural land, oil.
- Declining skills and capacity in the sector – ageing farming population.

9.1.6 Question 6: What do you believe should be the priority actions taken by industry bodies?

One respondent to the question regarding the priority actions that industry needed to undertake was quite blunt and to the point – "stop talking and start acting". Other responses saw industry actions as informing the debate; leading the debate and enabling members through education, leadership and advocacy.

Growers saw industry as creating constructive public awareness of the real issues involved in food security and to educate the government about the risks of not being self sufficient in food as a country.

A major theme from some respondents was in taking a more collaborative and cooperative approach in getting industry to act as one. One retailer wanted to see industry work cohesively across the nation rather than driving state based agendas. Retailers and export markets look at national supply chains and recognise Australian product rather than state based product.

Another suggested priority action is working with the community to explain sustainability and environmental credibility and to attract more students into the industry.

Other priority actions included:

- Lobby for infrastructure improvement with government.
- Ensure the continuous development of growers.

Another retailer saw the design of a more food industry friendly Government interface as a good way forward. They also saw the need for a lot more research into sustainability and climate change adaptation planning that could save lots of waste and effort by many hundreds of companies. There was also a need for more support and research into better organising the growing community to achieve higher global standards and not leave it to the small grower to inefficiently learn and adopt such standards.

In addition, this retailer wanted to see a lot more research into community resilience planning to ensure ongoing food security to the whole 100 per cent of the population. Of mention was research funding and stockpile support for Foodbank which was described as "an industry sponsored supplier of food to the vulnerable". The research would focus on how to improve the efficient distribution of suitable food to this vulnerable population group.

9.1.7 Question 7: What do you think are the primary policy changes required (for both government and industry)?

Respondents saw that the primary policy changes required covered a wide field.

Growers wanted to see greater government incentives for people to work in horticulture. They see that current compliance regulations are crippling family farms as they do not have the resources to comply. There was also a need to make policy changes to curtail the domination of the major supermarket chains. Their actions are said to be "driving growers broke due to their predatory pricing activities."

The state government representative saw the resolution of the Murray-Darling Basin water issues as important policy changes as well as the finalising of policies regarding strategic cropping land. Market access and the future of R & D funding were also seen as of primary importance for policy change.

The processors want to see government reduce and streamline regulations that impact on the industry. They see the need to establish a higher profile within government for the food industry so that the "right environment" is established to promote a strong and vibrant industry. There also see the need to research and support innovation and investment in new technologies that are globally competitive.

Academics wanted to see a greater increase in R & D for agriculture with one stating this investment should be doubled. There was also a need for policies that protect agricultural land and water assets, an investment in new energy policies and the recycling of urban nutrients into horticulture/agriculture.

The retailers had a good list. They included:

- Less red tape and harmonisation of regulation across state boundaries (e.g. pesticide use, quarantine barriers).
- Support of education of graduates, research and development including mechanisation and protective cropping.
- Infrastructure development for secure water and distribution.
- Support of consistent environmental standards and their implementation.
- Secure labour supply for horticulture at times of high employment.
- A need for "a lot more" research into sustainability and climate change adaptation planning across the horticulture supply chain - mention of CSIRO and leading industry players as needing to be involved.
- Support and research for the growing industry to adopt new technologies and standards.
- Far better import and export planning around dock management of fresh foods and critical packaged goods.
- Planning of better distribution of food to the vulnerable 10 per cent of the population.

- Better hazard crisis planning for natural disasters that ensures ongoing food security for the whole Australian population.
- A joint industry/government/community consortium to help consumers understand and agree to the plethora of new claims and greening initiatives in a calm and effective way that reduces the extremist view from dominating the way forward.

9.2 Priority challenges and threats

The survey has turned out to be a rich source of information for this project. There are clear themes that have come through from all the respondents.

Firstly, a greater focus and priority on R&D is required. However, an R&D program must be much more proactive in recruiting and skilling the industry and also one that is more integrated across issues, e.g. linking productivity gains with sustainability and environmental issues. The new R&D program needs to be also more active in "speeding up" the delivery of new technologies and practices to farmers and the supply chain so that they can adapt much more quickly to changing climates and consumer requirements in the future. A much more "sustainability" and "supply chain" focus. The strong calls for R&D to be either maintained or increased are in stark contrast to the recent recommendations of the Productivity Commission's Review into Rural Research and Development Corporations, which has recommending a halving of government funding for R&D over a ten-year-period (Productivity Commission 2010).

All respondents at some stage of the survey spoke about the need for a more integrated approach to the whole issue of food security and sustainability. The new approach needed to be more cooperative and cohesive, with many advocating a dedicated Minister and Department. The new food agency also had a clear role in reducing and streamlining the regularity burden on growers and others in the supply chain.

There were no "silver bullets" seen by any of the respondents to the issue of food security, however a range of actions that could build on what we have but coordinated and delivered in a much more effective approach. This approach needed to produce goals from a sustainable land and water perspective, from a farm and industry viability perspective; and from a health and wellbeing perspective. Combining these streams would also deliver for the nation and the region a more stable political future.

10 Future scenarios

To assist with industry decision making and prioritisation, two scenarios were developed for 2050 based on the current trends and threats to food security defined in the previous section. This scenario planning exercise also identifies possible opportunities for the horticulture industry.

Obviously there are several factors that can't be predicted, particularly on the global stage. Therefore, these scenarios contemplate food security in the Australian context and are predicated on the assumption that the best way to ensure food security for Australians is to ensure Australia is internally food secure.

These scenarios have been developed around alternative outcomes for the issues identified in the literature review, prioritised using the information gained from the industry survey. The scenarios focus on high likelihood factors rather than on high consequence but low likelihood outcomes such as nuclear winter or extreme bioterrorism. There is also a focus on factors that the horticulture industry can control or influence.

Both scenarios are based on the assumption that the Australian population will increase to the levels predicted by the Australian Bureau of Statistics of between 30 million and 42 million by 2056 (ABS 2008).

Other issues addressed in these scenarios are:

- Climate change and variability.
- Resource limitation.
- Productivity growth.
- Economic issues (farm profitability and prices).
- Government policy and planning.

It is important to recognise that these issues are not necessarily independent or mutually exclusive. For example, productivity growth and climate adaptation are both highly reliant on investment in research and development. Government policy and planning is an overarching issue that can (and does) influence all of the other factors.

10.1 Scenario 1 – status quo 2050

This scenario is predicated on the assumption that from a policy and industry perspective little has changed from the 2011 situation.

10.1.1 Context:

- The Australian population reaches 42 million and is still growing.
- No cohesive national food policy has been implemented.
- Australian agricultural productivity plateaus or declines, because:
    - Public investment in research and development has stagnated or declined in real terms from 2011 levels.
    - Planning regimes have not considered food production and fail to protect agricultural resources such as land and water.
    - No effective greenhouse mitigation strategies have been implemented at a global level.
    - There has been little development or application of effective adaptation strategies for climate change impacts.
    - Poor farm profitability leads skilled growers to leave the industry.

10.1.2 What does this mean?

In 2050, Australian horticultural production remains at 2010 levels. This is a consequence of a number of factors including:

- *Lack of suitable land available for horticulture*. Population pressures have meant that areas once utilized for horticulture are now residential areas or neighbour issues in rural residential areas have forced growers out.
- *Climate pressures*: Some regions are no longer suitable for certain commodities as a consequence of higher minimum temperatures, decreased rainfall and more frequent catastrophic weather events. Many former horticulture regions are constrained by water limitations.
- *Pest and disease pressure:* A number of chemicals have been taken off the market as a result of consumer health concerns. A lack of R&D funding has meant that suitable replacements have not been found leaving many commodities vulnerable. In addition, reduced funding to State agricultural departments has severely reduced extension services.

In combination with the population increase from 22 million to 42 million, this will reduce the per capita availability of domestically produced food by approximately 48%. Unless there are other mitigating factors, this scenario will result in significantly reduced food security. Given the commodity profile of food production in Australia, with a surplus of meat and grains but tight supply

of fruit and vegetables, it is likely that this will have impacts on balanced nutrition and health.

While this scenario appears pessimistic, it could be significantly worse if international factors are considered. For example, a significant deterioration in global food security resulting from projected massive population growth, increasing demand, falling productivity, resource depletion and increased prices could see many nations resorting to protectionist or isolationist trade policies with a goal to protect food production for domestic consumption and reduce domestic food prices. These conditions were met in the food crisis of 2007-8. Under these conditions, it could be expected that the availability of food for import into Australia may be constrained, exacerbating the food security status. This would be particularly important for the horticulture industry given that we are already net importers of fruit and vegetable products, with imports representing almost one quarter of fruit and vegetables consumed in Australia (Table 1; DAFF 2010).

Some opportunities and consequences that may arise from this scenario could include:

- An increased emphasis on home gardening to supplement the limited availability or cost of fresh fruit and vegetables. It could also support a shift back towards market garden style production, particularly to supply local markets.
- On the remaining viable horticultural lands, there would be a strong driver to maximize productivity through intensification, greenhouse production systems or other means such as hydroponics.
- The paucity of public funds may drive an increased emphasis on corporate research and development investment and investment partnerships, including enhanced supply chain collaboration. This would also drive increasingly privatized research outcomes.
- A need to implement marketing strategies that encourage and support consumers to revise their expectations of year round access to fresh produce and instead adapt their eating habits back towards embracing seasonal produce.
- A need to maximize the marketability of as much produce as possible, driving a renewed effort to find markets, processing, or value adding options for poorer quality product.
- An increased need to promote and market Australian grown produce.

10.2 Scenario 2 – effective action

This scenario is based on the premise that all of the priority issues have been met with effective action.

10.2.1 Context:

- The Australian population reaches 30 million (and stabilises at that level, after an initial growth rate of about 1.5% per year).
- A coordinated food policy and planning framework across all levels of government protects key resources such as agricultural land and water.
- Productivity growth returns to previous high levels (at approximately 1.8% per year), because:
    - RD&E investment quickly returns to the levels of the 1970s.
    - Climate change is minimised and tackled with effective adaptation measures.
    - The increase in farm profitability through productivity enhancements, improved efficiency, increased farm-gate prices etc. encouraged more experienced and skilled growers to remain in the industry.

What does this mean?

Under this scenario, growth in agricultural productivity exceeds population growth, resulting in improved domestic food security. This scenario would also place Australia in a good position to capitalise on new opportunities. For example, our surplus production can be exported to meet increased international demand for quality produce and deliver on our international obligations to improve security in neighbouring developing nations.

10.3 Conclusions

Inertia favours Scenario 1. Failure to adequately address the multiple issues identified in this report through policy development, integrated planning and investment will result in a significant erosion of Australia's domestic food security. In comparison, Scenario 2 gives an insight into what might be possible if all of the appropriate actions are taken.

We have presented two scenarios towards opposite ends of the spectrum of possible outcomes; the actual outcome is likely to be somewhere in between. There are multiple possible scenarios that involve other combinations of these priority issues. For example, perhaps increased investment in research and development produces highly effective climate adaptation strategies, but we fail to adequately protect agricultural land and water resources. What would be the consequences of that scenario? In addition, how is the balance of imports and exports likely to change of the coming decades (Figure 2). The

analyses required to address these more complex scenarios are beyond the scope of this report.

11 Recommendations

11.1 Industry Action

11.1.1 Educate governments, policy makers and the general public on the issue of food security and the potential consequences of inaction.

Due to Australia's domestic and international reputation as a large agricultural producer and exporter, the general public is largely unaware that up to 34 per cent of fruit is imported, and 19 per cent of vegetables. Many policy makers who are aware that Australia's horticultural output is shrinking while our population is growing, operate under the premise that it will always be possible to import what we do not produce. There is also a common misunderstanding that equates food security with protectionism, therefore stifling debate.

Industry organisations need to work collectively to raise awareness that imports may become less available in the future, the implications of import dependence on Australian production and ultimately domestic food security.

A key facet of any awareness program is to change the way import levels are reported. Quantities rather than dollar values should be used to demonstrate the level of imports, as levels of imports from lower priced input countries can appear to be quite small when measured in Australian dollars.

Industry needs to promote domestic food security to policy makers as an important policy objective. We need to be able to feed ourselves and this should not be compromised by our participation in the global marketplace.

11.1.2 Establish a higher profile for horticulture with Government at all levels

Survey respondents called for the horticulture industry to work for a higher profile of government at all levels, so that the industry's needs are taken into account when policy is being made in the same way that broadacre crops and grazing is. Industry needs to work together at raising this profile by speaking to key policy makers and politicians.

Horticulture needs to be seen as an entity in the same way that the livestock industry is. This requires working together to promote policy objectives relating to food security. A collective voice will enable greater bargaining power at a national level.

11.1.3 Increase research into sustainability and climate change adaptation across the horticulture supply chain.

Research on climate change and sustainability must be directed towards issues that are directly relevant to the primary stakeholders in the industry. Priorities for RD&E should be clarified, and there should be better coordination of research effort among multiple research organisations. Research results also need to be communicated effectively to growers and industry extension officers. Information on climate change and sustainability must be accessible, relevant and easy for growers to apply on-farm.

11.2 Government Action

11.2.1 Establish an Australian Food Security Agency.

The recommendation for an Australian Food Security Agency, contained in *Australia and Food Security in a Changing World* (PMSEIC 2010) is strongly supported.

This agency would co-ordinate the development and implementation of policies and programs targeted to improving Australia's food security. Liaison with the States and Territories through the Primary Industries Ministerial Council (PIMC) and the Council of Australian Governments (COAG) would also be a key part of such an agency. It would concentrate on a more integrated approach to food security and sustainability.

Key responsibilities of the Agency would include

(i) Developing and implementing a nationally co-ordinated food industry strategy, including sustainability with regards to water, waste, energy and carbon. This should include the co-ordination of state and federal government policy and programs across the food production, processing and supply sectors.

(ii) Data collection on the environment, food production, food processing and distribution, and food consumption patterns, to support policy development.

(iii) A National Land Use Planning Framework based developed in conjunction with state and territory governments and their own programs, such as Queensland's Strategic Cropping Land identification, to secure future food production.

(iv) Determining how many people Australia can environmentally sustainably support, and where to house them while minimising the alienation of good quality cropping land and urban encroachment.

(v) Ensuring appropriate inputs are available for farming, such as fertiliser, water, access to chemicals, right to farm in peri-urban areas.

(vi) Reducing and streamlining the regulatory burden on growers and the rest of the supply chain. This includes interstate barriers to trade within Australia.

(vii) Co-ordinating policy with the Department of Climate Change and Energy Efficiency to ensure food security is not compromised by poorly designed programs to participate in carbon markets or provide alternative fuels.

(viii) Examine and monitor whether the actions of Sovereign Wealth Funds undermine domestic food security.

11.2.2 Stronger resolve and action by regulatory authorities to investigate and act upon uncompetitive and unfair behaviour by retailers when dealing with producers, and consideration for allowing growers to collectively bargain in order to redress the large bargaining power imbalance betweens producers and large retailers.

The domestic supply chain cannot exist without profitable producers. They are the essential link in the supply chain. Governments need to acknowledge and act upon the reality that two dominant retailers continually cutting the real price paid to growers who are at a large bargaining imbalance as individuals is a large threat to domestic food security, with the ultimate result being a forced reliance on imports as land is degraded and/or farmers leave the industry and the land is used for non-agricultural purposes.

11.3 Action by both Government and Industry

11.3.1 Australia needs to dramatically increase its investment in and output from agricultural research and development from both government and non-government sources to at least 1970s levels.

This was the almost universal response from non-government sources interviewed, and the recommendation from all relevant literature reviewed. It was the message from growers, supermarkets, the Department of Foreign Affairs and Trade, scientists, processors, industry and distributors. This can be achieved not only through an increase of direct government investment, but by a more conducive economic environment that promotes research and development.

DFAT has found that agricultural production needs to rise by 1.6 per cent per year for the next forty years (Brown 2008). This cannot be done without increased levels of R&D. Australian agricultural research and development investment is currently at around three per cent of the gross value of agricultural production. In the 1970s it was five per cent, and will need at a

minimum to return to this level if we are to feed a growing population utilizing fewer resources, particularly land**.**

This increase in R&D could facilitate the modern science-led Green Revolution aimed at dramatically increasing yields is required which has been called for by many scientists in the food area.

Research and Development needs to be aimed at asking what sort of food Australia can grow, where it can grow, and where productivity can be improved. This increased R&D program needs to be proactive in recruiting and skilling the industry. An integrated focus on issues such as linking productivity gains with sustainability and environmental issues is also called for. The new R&D program needs to focus on shortening the time taken for delivery of new technologies and practices to farmers and the supply chain.

11.3.2 A tropical research program for Australia

As the only developed nation with extensive tropical regions, a tropical research program would prove very beneficial to food security both in Australia and export markets. This would include investigations of new varieties and indigenous foods, in addition to research on traditional tropical foods such as mangoes, bananas, passionfruit, and papaya. This is a clear opportunity for horticulture to expand its market both domestically and internationally, and assist in the replacement of unreliable imports.

11.3.3 Incentives from government and the private sector to encourage uptake of formal qualifications in agriculture.

There is a low number of graduates in agronomy and other agriculture related fields, which will only worsen as existing personnel retire. A concerted effort is needed to attract the future scientists and other experts who will be required for the increased levels of research and development in the industry.

11.3.4 Improve the co-ordination of food regulation, including the national harmonisation of laws in quarantine and pesticide use and avoid increasing government imposts

Growers were keen to see government stop adding to production costs, in an industry where they have little to no ability to pass these costs on. A strong theme was also the need for a collaborative and cooperative approach in getting industry to act as one. The current compliance regulations are seen to be crippling farmers.

The estimate by one retailer that there was a total of 130,000 laws across the country affecting the horticultural industry highlights the difficulties and costs incurred by many sections of the production chain. A different quarantine regime in each of the states in particular costs national supermarkets

considerable time and money. There is a strong case for a national harmonisation of laws in quarantine, pesticide use and other state-based laws, along with a more comprehensive and co-ordinated approach by governments to food overall.

11.3.5 Assess Australia's projected demand for food and the production systems required to produce sufficient food within our environmental and resource constraints.

Environmental research suggests that the global food system is already operating beyond its means, consuming resources in an unsustainable manner. Soils are being degraded and underground water is being depleted at a much faster rate than it is replenished. The relatively cheap cost of food enjoyed by Australians and other first world nations is coming at the cost of running down our environmental capital.

Reports have found that new technologies such as genetic modification, cloning and nanotechnology should not be excluded on moral or ethical grounds, but may be part of the solution to feeding more people with less land and water. However, this would have to be done in such a way that the least well off could afford the produce grown in this way.

11.3.6 Identification and protection of strategic cropping land, and studies on potential damage undertaken before other uses such as mining are allowed to proceed on such land.

Identification of strategic cropping land should include land that has the potential to be cropped given the right inputs such as water. Studies to fully understand the effects of mining on good quality agricultural land and groundwater need to be undertaken before mining occurs, rather than waiting for an adverse event to occur and then investigating. Policy must also ensure that food shortages are not created through incentives to grow trees for carbon offset on prime agricultural land.

11.3.7 Continued support for the worldwide dismantling of tariffs, levies, limits, restrictions, long-term subsidies and other trade barrier.

Restricting the movement of food around the world contributes to food insecurity and hunger. While protectionist economic policies may assist with localised food security for a short period of time, they are not always well targeted, and in the long term they cause food insecurity on a much broader scale.

All players in the horticulture sector should continue to support Australia's long-term bipartisan policy of working for freer economic markets around the

world. This will assist not just with Australian food security, but provide opportunities for increased export markets and allow Australian farmers to play their role in helping achieve global food security.

11.3.8 Action needs to be taken to secure water supplies and ensure healthy soils

There is a need to balance production requirements, environmental flows, maintaining healthy aquifers. Securing new water sources and infrastructure development are also vital. The Queensland Government-Growcom Rural Water Use Efficiency program could be a model for this (Wallace 2007).

11.3.9 Secure labour supply

A secure labour supply for harvesting is vital to the success of the horticultural industry, and therefore food security. Industry and Government need to continue working together, as they have on the Pacific Labour guest worker scheme over the last few years, to ensure that unskilled labour is available when required, at all points in the economic cycle.

11.3.10 Enhancing resilience and recovery following natural disasters to ensure ongoing food security

Natural disasters can have serious impacts for the production and distribution of food. A high priority for RD&E should be to identify and develop aspects of farm design and systems that enhance the resilience of a farm business, i.e. the ability of the farm to withstand a natural disaster and maintain production. Similarly, it is important to identify systems and processes that facilitate rapid recovery and a return to production following major disasters.

11.3.11 To provide a clearer understanding of these issues, a detailed analysis of the horticulture trade balance is required.

This would include analyses of the seasonal variation in the supply of fresh, frozen and canned produce, as well as an investigation of price differentials and marketing strategies of the retail chains.

12 Conclusions

Australian horticulture has more to lose from food security challenges and more to gain from achieving food security than perhaps any other agricultural commodity.

Figures from the Department of Agriculture, Fisheries and Forestry, and comments from their Minister, Senator Joe Ludwig, demonstrate that the livestock and broadacre cropping sectors produce amounts far in excess of consumption in Australia and will continue to do so well into the future. However, comments by Senator Ludwig and his department suggest that they are distracted by Australia's overall agricultural export surplus of $14.2 billion. Unfortunately, this overall surplus masks the increasing deficit in fruit and vegetable production and distorts perceptions so that both policy makers and the general public believe that Australia does not, and will not in the future, face food security problems.

Government, particularly the Commonwealth, appears to be out of step with every other stakeholder in the area of food security. It appears to be complacent and unwilling, or unable, to acknowledge that food security is a serious concern.

The reality facing the Australian horticulture industry is that it is already a net importer of fruit and vegetable products. With much of the best soil for fruit and vegetable production located on the urban fringes of expanding cities, horticulture also faces a greater competition for land, resources and the 'right to farm' than most other agricultural commodities.

If horticulture production in Australia can be increased, then the industry stands to gain increased markets both domestically as a substitute for imports that cease to be available, and as exports to assist with world food security. There are a number of potential responses by industry to ensure food security for Australia. However, very few of these can be achieved without co-operation and action by governments. The frequent misrepresentation of industry trade data and incorrect linking of Food Security concerns with protectionism are stifling a debate on the actions Australia should be taking in this area. A particular topic of discussion should be the level of reliance on food imports that may not always be available in the future. On industry's behalf, this will require working towards a greater profile for horticulture with government, so that our industry is considered as a matter of course when the important decisions are being made, in the way that more prominent commodities already are.

The acknowledgement that food insecurity is a real problem that will affect Australia if not addressed, combined with a Food Security Agency to co-ordinate federal, state and local efforts to address the problem is essential. Without this central lead from the federal government, solutions will continue to be ad hoc and address symptoms rather than causes.

Governments and the private sector need to work together to ensure rural Research, Development and Extension (RD&E) funding is increased to at least 1970s levels and better targeted towards achieving food security. The evidence in this paper clearly demonstrates that without a modern science-based green revolution to increase current output, the numbers of under-fed people in the world will continue to increase, and will affect developed countries as well as developing countries. The resulting research needs to be communicated to growers in a practical manner by people with on the ground experience in the industry. Industry and government together must also work towards encouraging the study of agricultural science and related subject areas at a tertiary level to provide the qualified people to under take this RD&E.

Without profitable fruit and vegetable producers, the supply chain doesn't exist. Financial pressures caused by government regulation and sustained low prices paid to growers will see the domestic horticulture industry output continue to decline, increasing reliance on unreliable imports.

Security of all the inputs required to grow fruit and vegetables is important. This includes maintenance of access to good quality cropping land, water, and chemicals, and assistance with climate adaptation.

The evidence gathered and analysed in this discussion paper has found that food security will be of increasing importance to the horticulture industry going forward. Given the diversity of challenges facing the horticulture industry, a co-ordinated response involving Government, industry and Research and Development Corporations is essential if Australia is to achieve and maintain food security of horticultural produce.

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14 Appendix i – the questionnaire

Dear <xxxxx>

Growcom, Queensland's peak horticulture body, has been contracted by Horticulture Australia Ltd (HAL) to investigate the complex and varied issues surrounding national food security and the horticulture industry. HAL has identified food security as an emerging issue and is seeking expert input to help frame industry strategies.

We define food security as reliable access to sufficient, safe, nutritious and affordable food. While it is necessary to take a broad brush approach to food security in the first instance, our study will concentrate on the factors that achieve and support food security in domestic fresh fruit and vegetable production in the years ahead.

We are contacting individuals and organizations from a variety of fields and sectors to gain a broad range of perspectives about the issues and potential solutions. We believe that <you/your organization> may have a valuable contribution to make to the industry's understanding of the issues, and we would be most grateful if you are able to provide information for this project.

If you are interested in providing input to this project, could you please provide brief answers to the following general questions in a return email? Please feel free to elaborate on any topic for which you feel you have particular expertise.

1. How do current government policy settings and industry structure affect future food security?

2. What do you or your organization believe are the major challenges or threats to Australia's future food security? Please rank the following in order of priority (where 1 is the highest priority).

    - ☐ Population growth and demographic changes
    - ☐ Inadequate productivity growth
    - ☐ Climate change and variability
    - ☐ Resource limitation – land, water, oil, phosphorus, energy, labour etc.
    - ☐ Biosecurity
    - ☐ Government policy and planning
    - ☐ Industry policy and planning
    - ☐ International factors (competition and trade)

- ☐ Economic issues (farm profitability and prices; investment levels)
- ☐ Conflict or sabotage
- ☐ Lack of statistical information to define and measure the problem/opportunity, and to set benchmarks for improvement.
- ☐ Other _____

3. What do you or your organization believe are the primary actions required to secure the food supply?

4. What is your organization's role in securing the food supply?

5. What do you see is the industry's role in securing the food supply?

6. What do you believe should be the priority actions taken by industry bodies?

7. What do you think are the primary policy changes required (for both government and industry)?

If you would like further information on this project or to discuss any issues in more detail, please feel free to contact the project leader at the contact details below. Alternatively, please nominate a suitable time for us to contact you.

Many thanks for your time and information.

Yours sincerely,

The Growcom Food Security Team


growcom
together we grow