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Integrating agriculture and food policy to achieve sustainable peri-urban fruit and vegetable production in Victoria, Australia

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Abstract

Efforts to increase fruit and vegetable consumption are a significant aspect of national approaches to preventive health. However, policy frameworks for increasing fruit and vegetable consumption rarely take an integrated food-systems approach that includes a focus on production. In this policy analysis and commentary we examine fruit and vegetable production in peri-urban areas of Melbourne in Victoria, Australia, and highlight the significance of emerging environmental and economic pressures on fruit and vegetable production. This examination will be of interest to other locations around the world also experiencing pressure on their peri-urban agriculture. These pressures suggest that the availability and affordability of fruit and vegetable supplies cannot be taken for granted, and that future initiatives to increase fruit and vegetable consumption should include a focus on sustainable production. Threats to production that include environmental pressures, together with the loss and cost of peri-urban agricultural land and a cost-price squeeze due to rising input costs and low farm-gate prices, act in combination to threaten the viability of the Victorian fruit and vegetable industries. We propose that policy initiatives to increase fruit and vegetable consumption should include measures to address the pressures facing production, and that the most effective policy responses are likely to be integrated approaches that aim to increase fruit and vegetable availability and affordability through innovative solutions to problems of production and distribution. Some brief examples of potential integrated policy solutions are identified to illustrate the possibilities and stimulate discussion.

Keywords

Peri-urban agriculture, food policy, land use, zoning, Victoria, Australia

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Introduction

Victoria is Australia's most significant agricultural state (Victorian Government, 2009) and one of Australia's two main horticultural crop-growing states. Fruit and vegetables grown in Victoria are sold mainly in Victoria and other states of Australia (Crooks, 2009). The peri-urban areas, defined as the rural land on the fringes of urban areas (Larsen, Ryan, & Abraham, 2008) of the state's capital city Melbourne are primary production districts due to good quality soil and proximity to water infrastructure. The Melbourne region accounts for large proportions of Victoria's horticultural produce, including 72% of the state's vegetable production (VGA, 2008) and at least 10% of the state's fruit production (ABS, 2009a). However, the population of Victoria, and in particular peri-urban Melbourne, is growing rapidly (Parbery, Wilkinson, & Karunaratne, 2008). This population growth has lead to strong competition between land used for housing and land used to grow food, while simultaneously increasing the need for an adequate supply of nutritious food such as fruit and vegetables. Thus, efforts to plan for and accommodate the growth of the urban fringe of Melbourne have the potential to contradict efforts to support the horticultural industry and efforts to provide fresh, local and environmentally friendly produce to consumers. Land speculation in the peri-urban areas puts pressure on policy-makers to stop protecting land from development (Parbery, Wilkinson, & Karunaratne, 2008). Further, there is a lack of integration between policies and initiatives to increase fruit and vegetable consumption in Victoria, and the fruit and vegetable production industry.

These threats to peri-urban agriculture are not exclusive to Victoria. There are a number of cities in Australia and around the world that are experiencing similar pressure for land-use change that may affect the availability of fruit and vegetables (Nasr et al., 2010; OSISDC, 2010) This paper provides a case study examining the benefits of, and threats to, local fruit and vegetable production in Victoria, with a particular focus on peri-urban Melbourne. We outline the importance of maintaining local food production and of linking food security to land-use planning in order to build a sustainable, equitable, and healthy food system. We argue for the need to integrate policy on sustainably produced fruit and vegetables with policy for consumption for the health of Victorians.

The authors have specifically limited the focus of this paper to peri-urban Melbourne in order to provide a case study of one of the most important agricultural production areas in Australia. As noted above, Victoria is one of Australia's two most productive agricultural states, and the majority of its vegetable production comes from peri-urban Melbourne. Melbourne is also a rapidly growing city, and the combination of these two characteristics necessitates an analysis to inform current government policy-making for solutions to protecting fruit and vegetable production for this region.

These recommendations may not always transfer directly to other places, but both popular and academic literature suggest that many urbanizing regions throughout the world are experiencing similar tensions over land use and therefore the study is relevant to informing the debate about land-use planning for food production nationally and internationally.

Benefits of Local Fruit and Vegetable Production

A community benefits in multiple ways from having a strong fruit and vegetable sector (Gorsuch, 2009). The most commonly recognized benefits are the economic benefits of creating and maintaining both employment and export earnings. Indeed, the contribution of fruit and vegetable production to Victoria's economy is substantial, with a gross value of fresh fruit and vegetable sales of over $AUS1.4 billion (ABS, 2009b). In addition to the direct contribution that Victoria's fruit and vegetable farming industry makes to the state's economy, it also supports the local fruit and vegetable processing industry as well as providing produce to the state's retail sector.

Other benefits of a strong fruit and vegetable industry are often overlooked. The health benefits are of particular importance, and the health implications of production, land use, and trade policies

are often not recognized (Gorsuch, 2009). There is a broad consensus that fruit and vegetables are essential components of a healthy diet. Internationally, leading public health organizations including the World Health Organization (WHO, 2003), the World Cancer Research Fund, and the American Institute for Cancer Research (World Cancer Research Fund/American Institute for Cancer Research, 2007) recommend that fruit and vegetables be the foundation of a diet to help promote health and protect against diet-related diseases. Fruit and vegetables are classified as "protective" foods, meaning they have been shown to protect human health (Riboli & Norat, 2003). Epidemiological evidence consistently indicates that people who consume diets that contain plenty of fruits and vegetables have a lower risk of cardiovascular disease (Bazzano et al., 2002; Joshipura et al., 2001; Liu et al., 2000; Ness & Powles, 1997; see also Dauchet, Amouyel, Hercberg, & Dallongeville, 2006; He, Nowson, Lucas, & MacGregor, 2007 for meta-analytic reviews), several major cancers (Block, Patterson, & Subar, 1992; Riboli & Norat, 2003), and possibly hypertension (Moore et al., 1999) and Type 2 diabetes (Williams, Wareham, Cox, Byrne, Hale, & Day, 1999). Almost all national dietary guidelines include a recommendation to increase fruit and vegetable consumption as a foundation for healthy eating. For example, the current Australian dietary guidelines recommend "eat plenty of vegetables, legumes and fruits" and specifically suggest that adults consume two servings of fruit and five servings of vegetables per day (National Health and Medical Research Council, 2003). However, fewer than 10% of Victorian adults consume this recommended daily intake of fruit and vegetables (DHS, 2008). An additional consideration is that highly perishable products like fruit and vegetables are subject to loss of food nutrient value with extensive transportation and storage (Stringer, 2010), and thus maintaining a strong local production capacity can contribute to the health of the population. Reducing the need for fruit and vegetable imports also reduces the health and biosecurity risks due to quarantine breaches (DPI, 2010). Budge and Slade (2009) argue that productive peri-urban land should be recognized in terms of its health value as such land is a potential source of a secure supply of fruit and vegetables for the population.

The contribution of a local fruit and vegetable industry to environmental sustainability should also be considered as a significant benefit. The use of peri-urban land for the production of fruit and vegetables rather than housing reflects many of the key principles of an environmentally sustainable food system, including opportunities for carbon storage in soil and vegetation (Campbell, 2008), reduced carbon emissions through shortened distribution chains, increased biodiversity, and protection of water catchment. Although there is a lack of data on the benefits of supporting regional food systems in the context of Victoria, regional supply chains are likely to have significant environmental benefits and reinforce food security. Resource constraints are likely to make it increasingly difficult and expensive to transport and store fresh food in the future (Larsen, Ryan, & Abraham, 2008), with continuing demand for fossil fuels increasing food prices (Woodcock, Banister, Edwards, Prentice, & Roberts, 2007).

In addition, horticulture production is reported to be responsible for only a small proportion of total agricultural greenhouse gas emissions, and thus promoting fruit and vegetable production in this manner also is benefiting the environment (DPI, 2010).

Further, a strong fruit and vegetable industry is an essential component of a robust and resilient food system. A resilient food system is able to withstand the impact of global and local supply interruptions due to climate or other extreme events, such as breakdowns in transportation systems or fuel shortages. The need to improve the resilience of the Victorian food system has been the focus of recent attention (Larsen et al., 2008). Victoria is in the enviable position of having significant local production capacity; however, this production capacity is currently under threat due to multiple economic and environmental pressures, which are outlined in the next section.

Finally, there is strong consumer interest today in local and regional food products. Consumers increasingly want to know where their food comes from and how it was produced, and are becoming more interested in purchasing regional food products (Victorian Government, 2010). Farmers also value knowing where their products are sold and getting feedback from consumers. There are several methods available for farmers to sell their produce direct to the public in Melbourne's peri-urban areas, including roadside stalls, farmers' markets, community supported agriculture (CSA), and farm shops. By offering the promise of high-quality food experiences, the local food industry also plays an important role in attracting tourists to Victoria (and Melbourne specifically), and thereby generates increased visitation and total tourism receipts (VLGA, 2009).

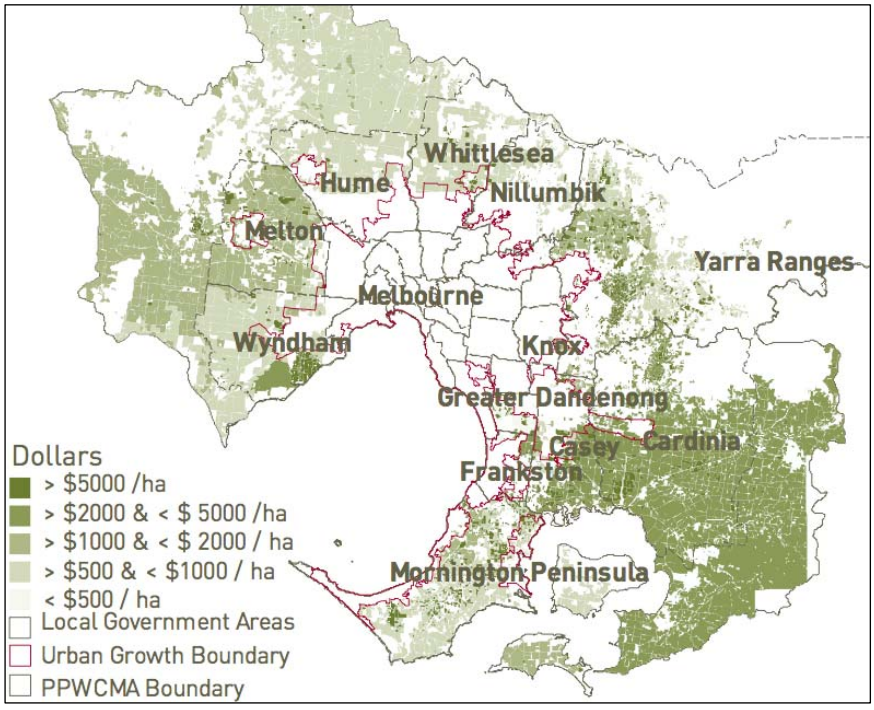
The benefits of a strong, local, sustainable horticulture industry are clear, and thus it is apparent that a continuation and strengthening of production in peri-urban Melbourne would be advantageous on a number of accounts. Yet it is the health benefits that are most frequently emphasized in health-promotion initiatives in an attempt to increase fruit and vegetable consumption among Victorians. That these efforts are not integrated with policies related to production is limiting and problematic. Peri-urban fruit and vegetable production in Melbourne is under threat, meaning that gains made through promotion could be counteracted by access and cost-related pressures.

Threats to Fruit and Vegetable Production in Peri-urban Melbourne

The fruit and vegetable industries in Victoria, and peri-urban Melbourne specifically (see figure 1), are currently facing multiple pressures that threaten the viability of production and the security of the supply of these nutritious foods that are essential to a healthy diet. These pressures include competition for productive agricultural land, a reduction in the quality of soils due to intensive agricultural practices, climate and water pressures, natural disasters such as flooding and bushfires, and economic pressures, each of which is discussed here in turn.

Melbourne's population is growing rapidly, with the city's population likely to reach 5 million before 2030 (Victorian Government, 2008c). This rapid population growth trend is generating competition for land for housing and agriculture (Victorian Government, 2010). Agricultural lands in Victoria, especially in the peri-urban area of Melbourne, are threatened by urban sprawl. For every person moving to the inner suburbs, five are moving to the city's fringe (OSISDC, 2009). Melbourne's peri-urban areas are of high agricultural value due to the

Figure 1. Agricultural Production in Victoria in 1999-2000

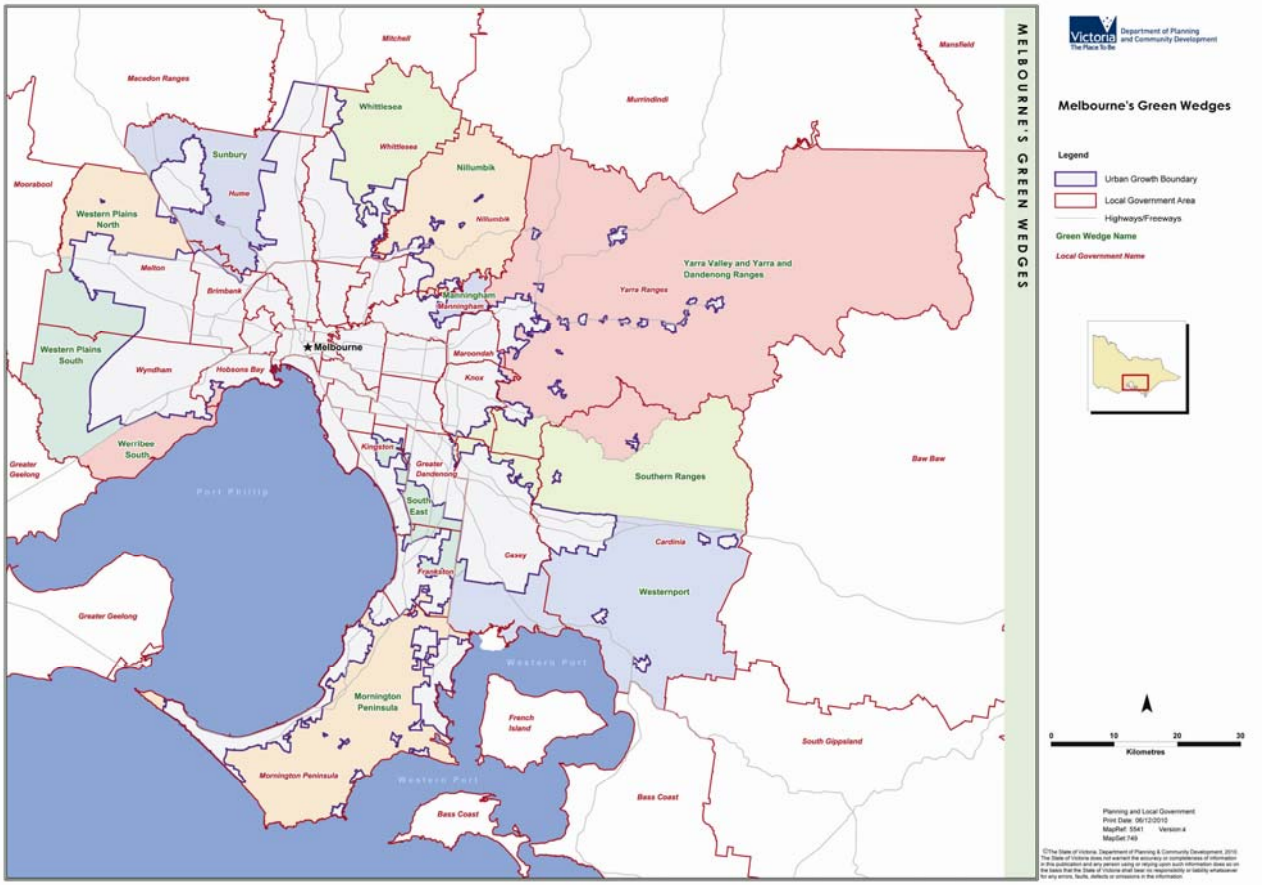


Source: Melbourne Atlas, retrieved from http://www.dpcd.vic.gov.au/__data/assets/pdf_file/0003/31179/Agriculture.pdf

quality of the soil, their proximity to water infrastructure, and their access to a large customer base. As such, this land is highly productive, producing 16% of Victoria's total agricultural value on just 5.3% of its total land (Houston, 2005). These areas are likely to be increasingly important to the state's future food security in the context of reduced availability of water and petroleum-based inputs.

The city's "green wedges" are part of the peri-urban agricultural areas of Melbourne. Green wedges are productive rural areas that have been designated as nonurban areas outside the Urban Growth Boundary (UGB) of Melbourne (see figure 2). Farmers located within the green-wedge areas of Melbourne need to rely on the UGB being fixed for a period of at least 10 to 15 years in order to provide certainty for their decisions in making long-term investments in their land. The green-wedge zoning offers some protection to this agricultural land. However, on 29 July 2010 the Victorian Parliament approved planning changes to redevelop the green wedges by expanding the urban boundary around Melbourne by 43,600 hectares (107,738 acres) in order to accommodate an additional 134,000 homes for the city and provide 20 years of land supply for new housing (Dowling, 2010). This is the third time the UGB has been moved since its introduction in 2002. This rezoning will significantly diminish the amount of prime food-growing land on the city's fringe. The lack of certainty and stability around green-wedge zoning presents a threat to the continuation of farming in these fertile areas, as the value of the

Figure 2. Melbourne's Green Wedges. In mid-2010, Melbourne's Urban Growth Boundary was expanded, adding another 43,600 hectares. This expansion overlaps with some green wedge land.



Source: The Melbourne Atlas, State of Victoria, Department of Planning & Community Development, copyright © 2010; available at http://www.dpcd.vic.gov.au/__data/assets/pdf_file/0017/56123/Melbournes_Green_Wedges.pdf

land increases speculatively along with the taxes (Victorian Government, 2010). Soaring land values in these peri-urban areas limit farm expansion (Commissioner for Environmental Sustainability, 2008), and farmers then often sell their land to buy cheaper land further from the city fringe.

Other land-related threats exist in the form of land degradation as a result of unsustainable agricultural practices (Larsen et al., 2008). Soil quality is decreasing dramatically due to erosion, salinity, sodicity, acidification, loss of biodiversity, and loss of organic matter, and thereby also suffering nutrient exhaustion, compaction, and contamination. All of these issues reduce the productive capacities of the land (Larsen et al., 2008; Wood, Lenzen, Dey, & Lundie, 2006).

Climate and water pressures also threaten the production of fruit and vegetables in Victoria. Victoria has experienced significant climate variations over the last decade. The average annual temperature in Victoria has increased since 1950, while the total annual rainfall for the state has decreased by 13% over the past decade compared with the previous 30 years. Commonwealth Scientific and Industrial Research Organisation's s climate change projections for Victoria suggest that annual temperatures will rise by between 0.6°C and 1.2°C by 2030, and the annual average rainfall is expected to decrease by around 4% by 2030. Both parameters are likely to increase the frequency of drought by between 10% and 80% (Victorian Government, 2008a).

Fruit and vegetable production is sensitive to environmental extremes. Temperature increases affect the quality, yield, and production windows for fruit and vegetable crops (Deuter, 2008). Since 2000–2001, the main constraints on the fruit and vegetable industry's production capacity have been climate variability and water availability (National Land and Water Resources Audit, 2008). More than half (58%) of Victorian agricultural businesses have reported that they have needed to modify the management practices on their farms in response to perceived changes in climate (ABS, 2009b). Further, the impact of two severe droughts in quick succession has had a significant effect on production and farm profitability. Drought reduced the gross value of Australian fruit and vegetable production by about 9% between 2002 and 2003 (Apted, Berry, Short, Topp, Mazur, & Van Mellor, 2006) and led to an increase in prices (Quiggin, 2007). Climate modeling suggests that Australia could experience fruit and vegetable supply interruptions and price spikes once every two to four years in a warming climate, rather than the current average of about once every 10 years. An increase in the frequency of heat waves and drought could make it difficult for the fruit and vegetable industries to recover in the more temperate years, leading to permanently higher prices (Quiggin, 2007).

This "big dry" in the state of Victoria has now been replaced by a fresh round of heavy rain and flash floods brought on by some of the heaviest and most sustained rainfall on record in January 2011. The implication for food producers of this major flooding across much of the eastern and southern parts of Australia is yet to be determined.

Related to these climate pressures are the threats presented by water scarcity. Land use in Australia is strongly related to water supply. The agriculture sector is responsible for more than 65% of Victoria's water use (Victorian Government, 2008b), and access to water is seen as a major constraint to the sustainable development of agribusiness (Victorian Government, 2010). Horticulture in particular is highly dependent on water availability for irrigation. In recent years, drought has reduced the amount of available water and thereby led to financial stress for some producers (Crooks, 2009). Climate modeling suggests that Victoria can expect further reductions in the amount of water available for irrigation over the coming decades (Victorian Government, 2008a), which is likely to result in more frequent interruptions to fruit and vegetable supplies and price spikes. Recent floods, however, have complicated and added further complexity and impact that was unforeseen. Further, the huge volumes of water extracted to support food grown for export have left major river systems over-allocated (Commissioner for Environmental Sustainability, 2008), while fruit and vegetable growers

struggle during drought to access sufficient water to maintain production. In a recent survey, over 75% of Victorian farmers said that the availability of irrigation water presents a barrier to the future viability of vegetable production (Crooks, 2009).

Economic pressures also threaten the local production of fruit and vegetables in peri-urban Melbourne. While food production is a significant component of the Victorian economy, the vulnerability of the current food system could undermine its future economic contribution to the state. The profitability of Victoria's horticulture industry is affected by a complex range of factors that include a cost-price squeeze due to the rising cost of inputs such as fertilizers and pesticides, and low farm-gate prices (Crooks, 2009). This cost-price squeeze is intensified by price pressure from the major supermarkets (Apted et al., 2006) and by competition from the Asia-Pacific region, which can produce fruit and vegetables more cheaply due to lower labor costs (James, 2006).

The multiple pressures currently facing the fruit and vegetable industry in peri-urban Melbourne threaten the viability of production and the security of the supply of these nutritious foods that are essential to a healthy diet. Given the necessity of a sustainable, local supply of fruit and vegetables for health, environmental and economic benefits, policies and systems that address and manage these threats are essential.

Policy Challenges and Opportunities

Past policy responses have attempted to address the unprecedented changes in Victoria's food system as it relates to health, environment, and productivity in isolation. The discussion above has shown that it is clear these have not worked, and an integrated policy response is required. As previously mentioned, policy approaches to increasing fruit and vegetable consumption in Victoria have often focused on social marketing strategies, such as increasing the availability of fruit and vegetables to low-income groups.

Unfortunately, there are few examples of policy approaches that link fruit and vegetable consumption to production, either in Victoria or internationally. The Victorian government has invested resources to help reduce diet-related illness. It has also undertaken considerable policy work to support regional economies and grow the agricultural sector. Food-production issues in the context of population growth, climate change, drought, and environmental degradation are also being addressed by the Victorian government. However, these activities are disconnected from one other. Government funds used to increase fruit and vegetable consumption should also contribute to the incomes of Victorian fruit and vegetable growers. Efforts to plan for the growth of Victorian towns and cities should not contradict the simultaneous efforts to support economic growth of the horticultural industry. The issue of food security should not be addressed in isolation, but instead with consideration to land-use planning. Policy development should aim to reap the multiple benefits of a healthy population and environment, along with the vibrant growth of cities and rural economies. Rather than being seen as competing interests, these areas should be addressed in an integrated policy environment. Possible opportunities for integration of policy to this end are introduced below as an initial response to some of the threats that face fruit and vegetable production in Victoria, particularly production in peri-urban areas. The policy options presented below are not intended to be a comprehensive suite of policies, but instead to stimulate thinking about integrated policy-making by illustrating potential points of integration. These suggestions may prove relevant not only to Melbourne, but also to other cities experiencing similar pressures on agriculture in the city fringe areas, such as Sydney, Australia (see Armstrong & Allison, 2003), and cities in England (Whitehand & Morton, 2006) and Canada (Bourne, Bunce, Taylor, & Luka, 2003), among others.

Land-Use Planning

Changes to the land-use planning system are required to protect Melbourne's highly productive peri-urban land, to stabilize Melbourne's UGB, and to provide certainty to agribusiness. Protecting land is also about protecting the quality and fertility of

its soil in order to keep it arable for future generations. Increasing the proportion of foods grown sustainably, which focus on building healthy soils and using natural methods of disease and weed control, can reduce greenhouse gas emissions, reduce air, water, and soil pollution, and ensure the durability of these vulnerable lands (Stringer, 2010). One potential mechanism for encouraging good environmental management is to internalize environmental costs in product prices (Pretty et al., 2000), such as levying an environmental tax on pesticides or fertilizers. However, input costs have already risen dramatically in recent years, and additional increases could affect vegetable prices and farm viability (Crooks, 2009). Another approach to supporting better environmental management (also posited by Pretty, et al.) is to direct public funds to support more sustainable production practices. While this is already happening to some degree, continuing or even increasing this investment would improve the economic viability of sustainable environmental farming practices. A transition to agro-ecological production has the potential to decrease use of inputs, reduce adverse environmental and public-health impacts, and increase the resilience of the sector to climate pressures. While the Victorian government has recently provided some support to the development of the Victorian organic industry (DPI, 2010), there is a need for farm-scale trials of agro-ecological production systems under Victorian climatic and soil conditions (Larsen, et al., 2008).

The Victorian Parliament recently commissioned an inquiry into sustainable development of agribusiness in outer suburban Melbourne (conducted by the Outer Suburban/Interface Services and Development Committee [OSISDC]), which concluded that "operating a farm in peri-urban Melbourne is more complex, more frustrating and in some ways more costly than elsewhere in the state…with agriculture being 'one of the best uses of green wedge land'" (OSISDC, 2009, p. ix). Serious consideration should be given to the committee's 84 recommendations for supporting peri-urban agriculture, but using an integrated approach.

To protect arable land, it first must be identified. The Department of Primary Industries has developed the Victorian Resources Online database describing characteristics of Victoria's Catchment Management regions, including climate, soil type and degradation, water availability, landform, and more. These data could be analyzed and interpreted in order to identify areas with fertile land and potential for secure water sources that are suited to grow fruit and vegetables for current and future use. The government in the Australian state of Queensland has developed planning guidelines for identifying good-quality agricultural land and a policy framework for protecting such land (Department of Environmental and Resource Management, 2010). These initiatives provide a strong example for other Australian cities such as Melbourne.

Finally, recognition of the health benefits related to peri-urban land should be enshrined in criteria when decision-makers are considering extension of the UGB and investment in water infrastructure. In addition, research about costs and benefits for urban versus peri-urban housing density is needed to inform decisions about UGB extensions, especially cost differences of infrastructure.

Climate and Water Policy

Victoria's fruit and vegetable production in the peri-urban regions of Melbourne presents an opportunity for use of recycled water to support production due to its proximity to water infrastructure, which may offer some protection against threats of climate change and water scarcity. Melbourne has two large water-treatment plants. A trial of recycled water for vegetable production from one of these plants allowed farmers in one peri-urban area of Melbourne to continue production during the recent drought (DPI, 2010). However, as yet, only a small number of Victorian horticulture farms use recycled water (Crooks, 2009). There is a need for government funding to extend the infrastructure for use of recycled water from these plants to secure production. Investment in water infrastructure to support peri-urban production is particularly important because farmers in these areas have less access to extra water via trad-

ing on the water markets than farmers in Victoria's rural food-producing regions (OSISDC, 2009) and because of the higher cost of water in peri-urban areas (Top & Ashcroft, 2005). However, trials of recycled water for vegetable production in peri-urban Melbourne have also encountered problems with water quality due to high salinity levels (Ker, 2009) and measures to improve the quality of recycled water are needed to ensure a viable, long-term water source.

History shows Australia has floods dispersed with droughts, and it is necessary to plan for these occurrences. Early commentary has discussed the merits of additional dams, buying back flood-prone land, and limiting building on riverine areas.

Economics

A cost-price squeeze currently threatens the viability of the Victorian fruit and vegetable industry due to high input costs, low farm-gate prices, and competition from cheap imports from elsewhere in the Asia-Pacific region. Rising input costs and increasing environmental pressures suggest that the cost of fruit and vegetables may need to rise if horticulture in the region is to continue to be viable. Yet fruit and vegetable consumption is likely to be adversely affected by increasing prices, particularly among low-income consumers. This conflict between the needs of farmers for viable farm-gate prices and of consumers for affordable, nutritious food is currently resolved in favor of low prices for consumers, driven largely by the major supermarkets that compete on price. However, mounting environmental pressures suggest a need to find new ways to resolve this dilemma in the future. Reports from around the world suggest that taxes for unhealthy foods and subsidies for healthy foods could play a part in alleviating this dilemma. Fruit and vegetable prices are already being affected by environmental pressures, as seen in the price spikes during recent drought periods (Quiggin, 2007). The major supermarkets needed to adjust their practices in order to maintain supply during the droughts, altering product specifications to accept heat-affected produce and also encouraging consumers to adjust their expectations of product appearance (Palmer, 2009).

Stakeholders within the policy environment have different views about the best way of addressing the economic pressures. While state and federal governments favor increasing exports, only a minority of Victorian farmers perceive the development of export markets as a satisfactory strategy, due to high freight costs (Crooks, 2009). Instead, the association representing Victorian vegetable growers (Vegetable Growers Association, or VGA) favors increasing domestic consumption (VGA, 2008). Government support to address economic pressures (many of which are consequences of other threats such as environmental pressures) is warranted, but there are limits to the types of support that would be acceptable within Australia's World Trade Organization obligations and its political orientation towards trade liberalization. Successive Australian governments have progressively dismantled financial support for agriculture, such that Australian agriculture now receives less support than most other farm sectors in the world (NFF, 2009). Consequently, measures such as minimum vegetable prices and subsidies for inputs are unlikely to be implemented in Australia. Recommendations for the future should take into consideration these barriers to maximize the potential for implementation by government.

There is a need to re-examine conventional supply chains and explore models for alternative supply chains to find new ways to deliver affordable fruit and vegetables to consumers while also paying a viable price to farmers in the face of mounting economic and environmental pressures. Proposed solutions need to move beyond the traditional dichotomies of supporting health or the environment, farmers or consumers. Current pressures demand that we explore the possibilities for achieving both. The Victorian government should fund a collaborative initiative that brings together stakeholders from across the supply chain to explore integrated solutions.

New distribution channels might aim to increase the accessibility of farm produce for low-income groups, enable consumers to purchase products during the week (rather than just at weekend farmers' markets), and facilitate the purchase of

fruit and vegetables for public-sector institutions and workplaces direct from Victorian farmers. Finally, encouraging cooperation between local producers and retail and hospitality industry outlets such as supermarkets and restaurants to increase the proportion of local products sold in these outlets would have a great impact. A government-supported feasibility study on new ways for consumers to purchase fruit and vegetables directly from Victorian farmers to complement existing farmers' markets may point to additional possibilities for shortening the supply chain.

Despite their success in the United States and Europe (Larsen, et al., 2008; Victorian Government, 2010), community supported agriculture (CSA) programs are rare in Australia, with only two existing in Victoria. CSA is a relatively new socio-economic model of food production, sales, and distribution. CSAs usually offer a weekly or monthly delivery or pick-up of fruit, vegetables, and other agricultural products. In this model, CSA members are actively involved in the production process, providing a form of direct financing through advance purchase of produce, and assisting with distribution by picking up their produce. It can also provide an opportunity to reintroduce old varieties of fruits and vegetables rejected by supermarkets, and thereby increase biodiversity. Increasing the number of CSAs in Victoria has the potential to both alleviate some of the economic pressures, and improve access to fresh, locally produced fruit and vegetables for consumers. Community supported agriculture models that are able to provide lower-cost shares are essential to address food security issues.

Other strategies to address the economic pressures may include differentiating Australian produce in markets by developing new varieties of fruit and vegetables (for example, the Pink Lady apple) and new technologies and shortening the supply chain between producers and consumers. A shorter supply chain allows for a higher price return for the producer and has the additional benefit of making fresh produce more easily available to Victorians. To this end, there has been a rapid proliferation of farmers' markets in Victoria in recent years, with an estimated 70 markets with approximately 2,000 participating farmers in 2009 (Victorian Government, 2010).

The Victorian Planning Provisions prohibit retail premises in the green wedges, except for markets, plant nurseries, fresh produce sales, and restaurants. Primary produce sales are restricted to unprocessed products sourced from the property on which they are sold, or adjacent land (with the exception of wineries, which are allowed to sell their own wines on their property). This legislation limits what can be sold from roadside stalls and farm gates within the green wedges, and thereby does not support on-farm diversification, which is preventing farmers from selling on-farm processed products. A relaxing of this legislation may offer direct relief from some of the economic pressures faced by Victorian farmers, strengthening the local economy and creating jobs. It also assists in ensuring a safer food supply, as food can be traced to its source more easily. Furthermore, direct sales of farm-processed products could offer tourism potential.

Other Government Policies

There is no specific government policy that focuses on issues within the peri-urban area. It is evident that farmers need support, especially those from the peri-urban areas. Most, if not all, of the recommendations from the Victorian Parliament's OSISDC hold merit, such as improved bicycle paths and walkways, and a sustainable fruit and vegetable production mark or logo to allow consumers to support sustainable production. Additionally, support could be offered to fruit and vegetable producers to hold farm visits and tours and to create an agritourism plan bringing urban Victorians, not just tourists, to peri-urban and rural Victoria. As governments plan for "sustainable population growth," aligning policy so that efforts to plan for the growth of regional Victoria do not contradict the simultaneous efforts to support economic growth of the horticultural industry makes sense from an integrated perspective.

Viewing the food system with an integrated approach opens up possibilities across the food

supply for improvements that will result in health, economic, equity, and environmental benefits. It is necessary to re-examine the supply chain of both conventional and alternative operations to find innovative solutions with this approach in mind. Consultation needs to occur with multistakeholder groups to analyze the issues and propose improved systems for food. This consultation needs to address how needs of the disadvantaged are best met. Some of the integrated solutions could also include peri-urban Melbourne producers as stakeholders when developing health-promotion campaigns to ensure that consumers are aware of the need for sustainable production and the importance of purchasing in season and buying locally. Minimum, mandatory health and sustainability standards for public-sector food purchases would create significant demand, while role modeling good practice. Innovative and diverse stakeholder groups could be brought together to address the competition over land for housing and land for food, and to promote increased housing density as a possible solution. Organizational links between the many government departments that have a vested interest in food would benefit from formally recognized coordination. This could take the form of a department of food, a food commissioner, or a food policy council. Creating a structure is necessary to carry on the whole of government food-policy work that has recently begun in Victoria with the forming of an Inter-Departmental Committee for a Victorian Food Strategy. Lessons for integrating food policy can be learned from the recently passed Transport Integration Act 2010. This act sets out a vision, objectives, and principles for transport, making it clear that any decisions made by any government agencies about the transport system need to be integrated and sustainable — in economic, environmental, and social terms. It requires all Victorian transport agencies to work together toward the common goal of an integrated and sustainable transport system. Another example of government legislating for integration of policy is the state of Illinois (U.S.) Local Food, Farms, and Jobs Act 2009 (Illinois General Assembly, 2009), which establishes a policy council to ensure that government activity on food and farming is integrated with activity on increasing employment in Illinois.

Potential Areas for Policy Integration

This paper has identified a range of potential points of policy integration to support sustainable fruit and vegetable production and consumption in peri-urban Melbourne. We have argued that the most effective policy responses are likely to be integrated approaches that aim to increase fruit and vegetable availability and affordability through innovative solutions to problems of production and distribution. The top 10 examples of potential integrated policies that emerge from this paper are:

1. Integrate food policy and regional planning so that efforts to plan for the growth of Victorian towns and cities do not contradict efforts to support the economic growth of the horticultural industry. Also create organizational links between the state government departments of Health, Primary Industry, and Regional Development.

2. Fund research initiatives to investigate the health, economic, social, and environmental benefits of regional supply chains in the Victorian context, including the link between the loss and cost of peri-urban agricultural land to the cost of food in Victoria.

3. Ensure that future initiatives to increase fruit and vegetable consumption, such as public marketing campaigns and government provision of fruit and vegetables, include a focus on sustainable production and involve Victorian producers, either buying from them or promoting them in the campaigns.

4. Create minimum, mandatory health and sustainability standards for public-sector food purchasing. For example, hospitals, as tax-funded organizations, should have nutritional and sustainable criteria on which they base their food procurement.

5. Legislate for the recognition of rural land and green wedges in terms of health benefits, not

just economic benefits (that is, when making decisions about extending the UGB, these health benefits must be entered into the cost benefit analysis).

6. Carry out a feasibility study and implementation plan to provide support for food provision initiatives that link producers to consumers, focusing on consumers who do not already have good access to fruit and vegetables. These would include box schemes, CSAs, farmers' markets, coordinated, cooperative networks, mobile fruit and vegetable vans or markets, and farm open days.

7. Create an agritourism plan that appeals to both urban Victorians and tourists.

8. Determine the best use of peri-urban farmland by analyzing the soil and using land-mapping data to identify areas with fertile land and potential for a secure water source that are well suited to grow fruits and vegetables for current and future consumption.

9. Protect this rich agricultural land through exclusive, noncontestable zoning of land designated for agriculture, resulting in "exclusive farming zones" that support sustainable farming practices.

10. Investigate the development of a Victorian "sustainable fruit and vegetable production" mark or logo to allow consumers to support sustainable production.

Summary and Conclusions

Victoria's peri-urban agricultural land hosts productive horticulture farms that not only make significant contributions to Victoria's economy, but also offer health, environment, and food security benefits. With the understanding that regular consumption of fruit and vegetables offers a protective effect against lifestyle and diet-related illnesses, it is particularly important to consider the health benefits of having fresh, local, and sustainably grown produce available to consumers. However, the viability of the Victorian horticulture industry is under threat as land and environmental and economic pressures increase. A lack of integration between consumption policies and production policies has contributed to, or at least maintained, the vulnerability and reduced potential benefits of fruit and vegetable agribusinesses in Victoria. Policy initiatives to increase fruit and vegetable consumption should include measures to address the pressures facing their production.

The discussion in this article of the threats to peri-urban fruit and vegetable production in Victoria will have relevance for other locations around Australia and the world that are experiencing similar pressure. We have argued that the most effective policy responses are likely to be integrated approaches that aim to increase fruit and vegetable availability and affordability through innovative solutions to problems of production and distribution. This integrated approach is beginning in Victoria with the recent forming of an Inter-Departmental Committee for a Victorian Food Strategy. Advancements in this policy will be of interest to land-use planners and public-health professionals.

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