

Urban Agriculture: The New Frontier

Ian Knowd, David Mason and Andrew Docking

Paper presented to Planning for Food Seminar: Vancouver 21 June 2006

Author Note

Mr Andrew Docking
Agricultural Environmental Officer
NSW Department of Primary Industry
andrew.docking@dpi.nsw.gov.au

Postal Address:

Locked Bag 4
Richmond, NSW, 2753

Mr David Mason
Development Officer – Urban Agriculture
NSW Department of Primary Industry
david.mason@dpi.nsw.gov.au

Mr Ian Knowd
Lecturer, Tourism Studies
School of Environment and Agriculture
College of Science
University of Western Sydney

Building K8, Hawkesbury Campus
University of Western Sydney Locked
Bag 1797
Penrith South D.C.
Penrith, 1797
AUSTRALIA

Email: i.knowd@uws.edu.au

Phone: =61 2 4570 1250

ABSTRACT

The drive to integrate agriculture into urban landscapes has a long history and this drive has intensified since the industrial revolution. Garden cities and the benefits that early visionaries perceived were possible through them remain utopian ideals. In the contemporary context of urban development, the possibilities of looking anew at agriculture relates more to implementing sustainability and addressing the structural changes brought about by globalization to communities, their food systems and quality of life for urbanites. Urban agriculture is a strategic resource and deserves a strategic approach in planning, one that recognizes the values of agriculture in economic, social and environmental terms. Decision-making processes that fail to do so risk denying current and future generations a range of choices in the way the economy, society and the environment are managed. These failures breach principles of sustainability and risk the loss of productive land, social capital and natural assets.

Keywords: Urban agriculture, sustainability, strategic resource, planning.

David Mason, NSW Department of Primary Industries – is the Development Officer, Urban Agriculture Sydney Region. He is Foundation Chair and Board Member of Hawkesbury Harvest Inc.

Ian Knowd, University of Western Sydney – Hawkesbury Campus – Ian lectures in tourism studies in the School of Environment and Agriculture. His research interests are in rural communities and tourism.

Andrew Docking, NSW Department of Primary Industries – is an Agricultural Environment Officer, Sydney Region.

INTRODUCTION

This paper seeks to question the apparent lack of debate about a sustainable and integrated role for agriculture in urban landscapes. Its specific reference will be to the agriculture occurring in the Sydney Statistical Division (Sydney Region) as defined by the Australian Bureau of Statistics (ABS). The Sydney Region extends to and includes the Wollondilly Shire in the south, Wyong Shire in the north, the Tasman Sea in the east, and the Blue Mountains City Council in the west. The population in the Region is expected to grow from 4.1 million in 2004 to 5 million by 2022 – a net increase of 40,500 per year. (NSW Department of Infrastructure Planning and Natural Resources (DIPNR) 2005). The agriculture within the Region is therefore associated with urban and urbanising landscapes and is referred to as urban agriculture and as such can occur anywhere from the Sydney City Centre to the Region's boundaries.

The paper explores the ways that agriculture and urbanisation have been and are being defined. This includes a brief history of the garden cities idea, the forces that inspired that and the human values that these ideas sought to satisfy. A conceptualisation of current views of the forms and values of agriculture is proposed that seeks to encapsulate a wider range of values than simple economic use.

The paper then explores why urban agriculture represents a frontier in terms of the geo-physical, economic, social and environmental situation in the Sydney basin, particularly in relation to the farming lands in Sydney's peri-urban west, the traditional 'food bowl' of the city.

The frontier character of the debates and land use trends in the Region are then argued to represent new opportunities and new ways of seeing the role of agriculture in this urbanised landscape. It is suggested that these opportunities are unique responses to the changing city structure, in using new technologies and emergent industries as partners, in ways that are innovative. These opportunities offer new choices where choices about a future for agriculture in the Region have been considered limited or absent. A call is made for a rethinking of the dominant planning orthodoxies that have created the urban sprawl which threatens to wipe out agriculture in the Sydney Region.

Finally, the paper articulates an argument for planning that integrates agriculture into the urban fabric of the city and that this makes good economic, social and environmental sense. The paper attempts to make the case that opportunities for economic resilience, branding, increased choice, maintenance of strategic resources, and the research and innovation opportunities that flow from preservation of productive agriculture in urban environments are important elements of a sustainable city.

DEFINING URBAN AGRICULTURE

At face value the following definition would appear to best describe the authors' current understanding of urban agriculture: "A complex system encompassing a spectrum of interests, from a traditional core of activities associated with the production, processing, marketing, distribution, and consumption, to a multiplicity of other benefits and services that are less widely acknowledged and documented. These include recreation and leisure; economic vitality and business entrepreneurship, individual health and well-being; community health and well-being; landscape beautification; and environmental restoration and remediation". (Butler and Maronek 2002). This paper also contends that definitions of urban agriculture should include reference to it as a response to modernisation that has cultural and philosophical dimensions. We will review the above definition in light of the outcomes of analysis and discussion resulting from the systemic approach in the development of this paper.

Garden Cities

An understanding of the genesis of ideas about garden cities is useful in order to adequately explore the significance of agriculture in urban contexts. Industrialisation and urbanisation are defining modern phenomena out of which emerged the reactionary ideas about garden cities and the utopian ideal. While the social factors behind these reactionary feelings remain, the motivation for revisiting the ideas about garden cities has moved on, focussing more on the enriching capacities of agriculture in urban contexts than the desire to protect agriculture from the ravages of urbanisation and industrialisation, and protect society from its own greed and avarice. It is however, necessary to see that the later still occupies the hearts and minds of many people today, and this remains an aspect of the debate around agriculture and human development in urbanised societies.

The social fallout of modernism is articulated by some writers who are questioning the usefulness of modern manifestations of utopias of abundance, as exemplified by Western materialism, and particularly the United States, and they are describing their dystopic effects. ‘American-style radical consumerism has succeeded to the point that social analysts now speak of things like “consumer trance” and “ecological dissociation”’. The hyper-commercialised American Dream has toxic effects on the psychological and social well-being of Americans leading to what some psychologists are naming a Dead Zone. (Schumaker, 2001:35). The thesis extends to any Westernized economy, of which Australia is one. The same sentiment was expressed as long ago as 1516 by Thomas More who first coined the word utopia in his book with the same title. More argued that pursuit of more than sufficiency in basic needs leads to a relentless seeking that enslaves and prevents people from having the time to “cultivate” the mind, the thing which More’s Utopians saw as the secret to happiness. One hundred and ten years ago William Morris responded to the ugliness of the industrial revolution in *News from Nowhere* (1891) where he foreshadowed what we now describe as Globalisation.

‘It is clear that in the last age of civilization men reached a wonderful facility of production, and created (or allowed to grow rather) a most elaborate system of buying and selling, which has been called the World-Market; and that forced them to go on making more and more of these wares, whether they needed them or not. By all this they burdened themselves with a prodigious mass of work merely for the sake of keeping their wretched system going.’ (Morris, cited in de Geus, 1999:108-109)

Morris argued that the transformative influence of the rural was the only relief that society had available to them, although mass tourism was soon to become an alternative. This idea of enslavement to affluence is repeated in the justification for the agrarian utopia of Henry Thoreau (1854) at Walden. In many ways Thoreau’s utopia is a response to the damage to nature, the pollution, the spiritual poverty, and the anxiety of modern living that he foresaw as a bleak future.

In 1898 Ebenezer Howard sought to design this need to reunite the city with country into his plans for *Garden Cities*. He recognized the town-country polarity as requiring a planning solution that would be more attractive than either the city or the country, and he made blueprints for several Garden Cities. He identified urbanisation as a blight on the landscape and its spread as a malignant growth, that sapped the beauty and vigour of the countryside, and alienated city dwellers from nature. Peter Kropotkin (1904) develops this idea of the bleakness of large-scale industrialized economies and proposed garden cities for retaining the essential linkage with the earth and agricultural production.

In 1945 Bernard Skinner wrote *Walden Two*, a romanticizing novel about a utopian community similar to Thoreau’s Walden. In *Island* (1962) Aldous Huxley romanticizes a place where people live in harmony with their environment. In Skinner’s and Huxley’s rural utopias it is the resolve and values of the inhabitants that prevents the abuse of land and exploitation of nature so that a ‘balance’ between human need and human greed is created. More recently Ernest Callenbach proposed a rural utopia in the US he called *Ecotopia* (1975). Like his predecessors, Callenbach speaks in terms of a harmonious and balanced relationship with nature. And finally, Murray Bookchin through much of his writings has described a rural utopia based on his ideas of ‘social ecology’. A foundation premise for his vision is that basic needs are satisfied by organic farming and

horticulture on a human scale that is decentralized in ways that reflect the land's capacity to support human activities. (de Geus, 1999)

These utopian visionaries are merely the enunciators of a deeper longing created out of the angst of modern societies and the emergence of city living. This angst gains a recognizable expression in the Romantic Age when artists and writers begin to express the sense of protest and revolt against the establishment of the modern industrial state. At the same time, political writers like William Cobbett chronicled the situation for farming communities of England in the most aggressive and defiant terms. In *Rural Rides* (1830) Cobbett bemoans the impact on rural living of the industrialization of agriculture and the complicity of governments that diverted taxes and tithes to supporting “military academies, dead-weight standing army, military asylums, pensions and sinecures” (Cobbett's *Political Register*, 27 November, 1830) along with the industrial complex needed to support it. Things have not changed much since then except that the ‘financial arch-modernisers’ of Cobbett's day are the globalisers of today and this ‘new industrial and political class’ is again ‘fattening itself on the demoralized rural poor’ of countries all over the world. (Morpurgo, 2001:35)

Putting the political arguments about globalisation aside, the motivation today in seeking a renewed vision of the role of agriculture in urban contexts is about enhancing the lives of urbanites and retaining the capacity of agricultural land to contribute to sustainable cities. To continue to rail against the so-called “arch-modernisers” misses the point that Western economies have progressed well beyond the point at which halting such development might be an option, and the need is now to concentrate on making our current development models sustainable. Indeed, the argument about agriculture in this context is a defining one in terms of what is revealed about world views and commitment to sustainability. There is a dominant hegemony in the food system and trying to change this is probably a fruitless exercise and an alternative approach that sees multiple options is one that holds the greatest potential for a rich and sustainable relationship between agriculture, landscape and society.

Table1. The continuum of Urban Agriculture in the Sydney Region and associated values / benefits.

	Forms of Urban Agriculture	Values/Benefits
SOCIAL	Backyard	Recreation, human health on all dimensions, seed banks, supplementary food supply
	Community and Communal Gardens	Social cohesion through cooperative endeavour, education, food access, food equity, productive use of communal land
	Rooftop	Corporate involvement, worker wellbeing, efficient use of space
	School/Agriculture Plots	Education, connection with farming practices and culture,
ENTERPRISING	Historical	Heritage, conservation and collection of artefacts, repository, education, research
	Lifestyle/Hobby	Environmental management, recreation, diversity of lifestyle, supplemental incomes, niche production, small scale production
	Boutique/Cottage/Niche	Diversity, rural open space, small business, specialty production
	Farm Gate	\$\$ remain locally; 80% profit from 20% of farm sales, re-connecting with community, visitor experiences, education, alternative distribution channel, new markets.
	Agritourism	Income diversification; inter-industry leverage – hospitality, tourism, agriculture; home/farm based value added agribusiness; producer/consumer relationship benefits.
	Equine - Recreation - Studs/Training	Recreation; landscape visual aesthetics; bloodstock industry; horse culture and history \$ multiplier for support industries.
PRODUCTION	Flood Plain - Market Gardens - Dairy - Turf - Orchards - Fodder Crops	Intergeneration equity; food security; greatest inherent sustainability – soils and soil cycles, water access, landform, biodiversity (riparian, wetlands); water effluent and green recyclables. Hydrological system, micro and macro climate effects, sequestration of urban wastes, green belts, aesthetic contribution to rural commons
	Flood Free - Market Gardens - Dairy - Orchards - Fodder Crops/Agro-Forestry	Retention of a natural resource to meet future and perhaps yet unknown needs and considerations (eg. as a result of global warming) and technologies such as nanotechnology; sustainable urban agriculture as a NRM instrument particularly when land use is matched to agricultural suitability; community cultural diversity – people of culturally and linguistically diverse backgrounds (CLDB); carbon credits.
	Controlled Environment/High-Tech - Greenhouse Horticulture - Nurseries - Poultry - Fixed Pad Dairies - Mushrooms - Protected Cropping	\$ Multiplier for support industries, eg mushrooms >5; fresh perishable foods grown close to market; reduced emissions due to less transport distances, high productivity and efficiency, controlled waste, pesticide, water and energy systems, .

Forms of Urban Agriculture

Urban agriculture has many forms and this may be why there is a lack of understanding of the phenomenon at all levels of the community, particularly decision makers. Table 1 is an elaborated version of earlier work and demonstrates the continuum of forms and the dominant values and benefits of each form. In most instances the values/benefits identified for one form of urban agriculture also apply to other forms (Mason and Docking 2005). One of the values that all forms of urban agriculture has, is the research opportunity it represents to the nation. Australia has had a strong research-based agricultural sector and the emerging area of urban agriculture again represents an opportunity to develop world-class practices and policies, and to reinforce Australia’s position in the global agricultural knowledge economy.

Values of Urban Agriculture

This paper takes the position that urban agriculture has intrinsic economic, environmental and social values. These values are all indicators of the relevance of agriculture to contemporary urban environments and form the basis of an argument to retain and/or enhance its contribution to the quality of life in urban environments.

Economic values extend beyond the simple money value of production to consideration of the importance of diversity and capacity of production in close proximity to population centres, to recognition as strategic production resources, as resources that should be retained in productive forms in order to secure food and other primary products. There are also the values of urban agriculture in enhancing the urban environment, in simply having it, and in having it as an option for future productive use. These potentials are eliminated if the land is transferred to housing or mining uses. There are also economic values in retaining its current forms (existence) and in being able to hand it on to future generations in order that they may make decisions about sustainable use (bequest).

In the United States it is estimated that between 35 and 40 % of its agricultural products, in money value of marketed crops, are grown in its statistical metropolitan areas (Smit 1996). In Australia research is suggesting that agriculture occurring in peri-urban regions constitutes as much as 25 % of the total agricultural production in \$ terms in Australia's five mainland states and that this production occurs on less than 3 % of land used for agriculture in those states (Houston 2005).

The Sydney Region's agriculture represents up to 12% of NSW's total agricultural production that is grown on no more than 1% of the State's land (not including other forms of land use in the Region). The agriculture in the Sydney Region is therefore very intensive (\$5,433 per hectare compared to the State's average of \$136 per hectare – ABS). The figures have been compiled on an individual industry basis (\$1,023,422,912) and a local government area basis (\$970,998,754). Both figures are greater than the ABS figures by as much as 50%, (see Table 3). (Gillespie and Mason 2003).

Australian Bureau of Statistics figures show that the Sydney region accounts for 20% of the total vegetable production of New South Wales, but between 80-100% of all perishable vegetables (Sinclair, Bunker and Holloway, 2003). The production base is very diverse with examples including nursery plants, poultry, cattle, horse, alpaca, honey, deer, duck, goat, fish, nuts, oysters, mushrooms and wine (Knowd, 2003). However, others estimate that the Sydney region dominates production for certain produce (Table 2).

Table 2. Major Sydney Region Produce versus NSW State Production

Produce	% of NSW Production	Growers	Farm Gate Value \$M
Mushrooms	80	26	71
Poultry Meat	48	360	185
Poultry Eggs	45	74	55
Vegetables*	45	2015	215
Totals		2475	526

* For some bunching lines, Asian vegetables, cherry tomatoes, bean sprouts, silver beet, fresh market corn and spring onions the % of NSW production is closer to 90-95% (James pers. comm. 27 July 2005).

Table 3. Comparative Estimates of the Value of Agriculture in the Sydney Region

Source	Intensive Horticulture	Extensive Horticulture	Intensive Animals	Extensive Animals	Extensive Cropping	Total Gross Annual Production
ABS 1997 Census	100,165,010 21.5%	42,230,330 9.0%	315,935,100 67.7%	7,747,200 1.7%	812,590 0.2%	466,890,230
Rural Land Studies	391,744,611 40.3%	155,768,549 16.0%	399,017,532 41.1%	23,021,812 2.4%	1,446,250 0.1%	970,998,754
NSW Agriculture	536,690,000 52.4%	117,162,902 11.4%	324,617,870 31.7%	43,498,240 4.3%	1,453,900 0.14%	1,023,422,912

The discrepancies in estimates of economic value of agriculture stem from the cultural issues, the statistical methods used to collect the data and gaps in data collection series. (Wollondilly Shire Council, 1993; Hassell and Assoc., 1997; Kelleher et al, 1998; Penrith City Council, 2001; ABS, 2002)

Other economic benefits that the Region’s agriculture provides include:

- There are somewhere between 8,000 (ABS) and 11,775 (NSW Agriculture) full time on-farm jobs which represents at least 11% of the State’s agricultural workforce.
- The intensive nature of Sydney’s agriculture enables the multiplier effect of agricultural production to be “estimated ... in the order of between two and three (EconSearch Pty Ltd, 1995 as cited in Young, 1997). These figures do not include the manufacturing of agricultural products. This is attributed to the manufacturing sector in the calculation of both multipliers and GDP (ABARE, 1996, 267). If all these impacts are summed, the total multiplier for agriculture can be of the order of 5 to 6 (Powell, Jensen and Gibson, 1985 as cited by Young 1997).
- The proximity to the market place can make a significant contribution to satisfying the consumer demand for freshness and the proximity to Australia’s largest international airport provides the opportunity for the region’s agriculture to meet both domestic and international demands.

The Sydney Region's agriculture contributes to Sydney's social capital including:

- It has provided people from many parts of the world, particularly since the end of the Second World War, with the opportunity to establish a new life in Australia. Between 80-90% of market gardeners in the Region are from Culturally and Linguistically Diverse Backgrounds (CALDB) with the across all industries figure estimated at 30%. (Parker and Jarecki 2003). These people have contributed significantly to the dynamic and evolving food and wine cultural of Sydney and have introduced technological innovation such as that associated with growing Lebanese cucumbers.
- Bolles, in a feature article in *the (Sydney) magazine* (October 2005) describes the significant events that have created what is now described as the "Sydney food scene". With the arrival of organic production in 1965, the emergence of modern Asian cuisine in 1976, the local cheese revolution of the '80s, fresh produce providers like Barry McDonald servicing Sydney's top restaurants in 1986, and Sydney's first food festival in 1998, the role of Sydney's 'food bowl' has been elevated beyond a mere supplier to be a significant contributor to the cultural life of the city.
- In an article in the *Hawkesbury Gazette* (1st October 2003) Rod Sherriff, President of the Free Growers Horticulture Council which represents the more than 2000 market gardeners in the Sydney region said "If it were not for the Hawkesbury there would be very little in the way of leafy vegetables on the Sydney market". This was due to the drought west of the Divide and the unseasonably hot weather in Queensland that was "stewing" the crops up there. The yet unknown affects of global warming may well increase the importance of the issue of food security.
- Recreation and rural amenity benefits from landscapes that provide opens space and the opportunity for people to connect or reconnect with themselves, others, the land and associated vegetation whether it is natural or cultivated.
- Agriculture's potential contribution to the health of local communities. Local agriculture is an important component of health based organisations such as the Hawkesbury Community Health Service's Hawkesbury Food Program. The Program works with the local community and organisations to improve nutrition, food safety and food security and promote sustainable agriculture. One of the cornerstones of the Program relates to increasing the consumption of local fresh fruit and vegetables. Emerging intensive production technology such as that being developed and trialled at NSW Department of Primary Industries Horticultural Institute at Gosford provide the option to produce foods that meet the needs of the Sydney community as well as meet production and environmental standards.
- In order to know who we are individually and as a community we need to have some knowledge of where we have come from. Very soon after first settlement Governor Macquarie established the towns of Windsor, Richmond, Ebenezer, Pitt Town and Castlereagh on the Hawkesbury River, later to be known as the 'Macquarie Towns' to provide fresh food for the Sydney population. The agricultural lands associated with these towns still produce in the order of 33% of the Sydney Region's total agricultural production (Gillespie and Mason, 2003).
- The agriculture of the Sydney Region is the focus of current research and education through the University of Western Sydney with research activity in irrigation, micro-climate, agriculture and rural reconstruction, agriculture and tourism, sociology of farming and technologies such as integrated pest management, intensive and controlled environment agriculture.

Other environmental benefits include:

- The consumption of locally produced food reduces the cost of transport of that food from paddock to plate and in so doing reduces the amount of green house gas emissions. There appears to be no comparable studies in Australia to one undertaken in the United Kingdom where it is established that agricultural and food produce accounts for 28% of all goods transported on UK roads and adds 11.8% to the cost of the per capital food basket. One outcome of the study was that if all foods were sourced within 20 kms of homes or other places of consumption the avoided environmental costs would amount to £2119 M (Pretty et al 2005). Rising fuel costs are a contentious issue in the Sydney market. The concern about these issues has materialised through activism such as the “locavore” movement in California (Green Party NZ, 2005) and in studies assessing values attached to the food system and agriculture (Pelletier et al, 2000)
- Water reuse in agriculture in the Sydney Region is thought to have the potential to save up to 32 billion litres of river water per year (DIPNR, 2004). This coupled with use of bio-solids from Sydney’s sewage treatment plants has the potential to fulfil what Smit says is the “essence of community ecological management (which) is the principle of closed nutrition links” (Smit 2000) The saved water can be used for environmental flow purposes in the Hawkesbury Nepean River system.
- Agriculture plays a role in the hydrological cycle of the Sydney basin, and in its climate and ecology. It is an important buffer zone and repository of remnant pre-European habitats.

WHY A FRONTIER?

Geophysical Reasons

First and foremost urban agriculture is a geo-physical frontier, the place where the rural and urban interface. Different and often conflicting land uses characterise this interface. The plight of agriculture in the Region is a classic case of the impact of globalisation and urbanisation, and one that exemplifies the tensions of this frontier.

The area is defined by the catchment five river systems which includes the Hawkesbury, Nepean, Grose, Colo and McDonald River valleys and the approximate 5800 square kilometres of that make up Greater Western Sydney. (LGMA, 2004) It is comprised of rural residential land use (78%), 80% of which is exclusively dwelling only and some suburban development interspersed with agriculture in rural villages with small lot sizes predominantly (74%) of less than 3ha (EDGE Planning, 2003). It is home to approximately 16.8% of the total population of Western Sydney and is colloquially referred to as the ‘food bowl’ of Sydney. (WSROC, 2000) Of those local government areas within 100 kms of the Sydney Central Business District, Baulkham Hills and Hornsby have been categorized as part of Sydney’s “Inner Exurban zone” (rural-urban fringe with < 50% metropolitan development) with Blue Mountains and the Hawkesbury Hills as “Outer Exurban Zone” (McKenzie, 1996: 72). Bunker and Holloway (2001:7) later described similar geographical zones as “Fringe Edge” and “Fringe Periphery” based on journey-to-work data.

Farming in this region is under threat from urbanisation with, at 18%, nearly double the average Sydney population growth rate from 1991 to 1999 (Hawkesbury City Council, 2000). It is at the forefront of residential development for the North West region and the character of this suburbanization has been described as “promiscuous urbanization” (County of Cumberland, 1948: 129) and a ‘rolling wave’ (Kelleher, 1998 & 2001) as distinct from the “rippling out” (Moseley, 1984: 447) and decentralization of city populations observed by some researchers. Little has been changed in the post-war period to restrain this urban sprawl. The forecast demand for new residential development to support Sydney’s current population growth is 25,500 dwellings (on average) per year over the next ten years, with 25% of that growth being located in greenfield sites on the urban periphery and Greater Metropolitan Region corridors (DIPNR, 2004).

In addition to the basic population forces there are the demand effects of a knowledge and service economy where quality of life means living in a quality environment, and quality environments are seen as rural. This phenomenon creates the same paradoxical problem for rural zones that successful tourism destinations suffer from; they are at risk of being loved to death by “lifestyle living” exurbanites relocating to the rural hinterlands of Sydney (Daniels, 1999; Sinclair 2001). The same pressures create both threat and opportunity for rural zones (Knowd, 2001). Conversion of prime farming land in the Sydney region into rural residential lots is at the forefront of political and development conflict and debate about appropriate planning policy (Sinclair, 2004).

Prime farming land is being sacrificed to the demands for housing as Sydney expands, and also to the demands of the construction industry that supports that housing development. Mining activity associated with the Penrith Lakes Development supplies 75% of the sand and aggregates needed for the construction industry in the Sydney basin. The cropping areas of this Class A agricultural land on the floodplain will be replaced by 2010 with 700 hectares of lakes, 400 hectares of residential/commercial development, and 900 hectares of open space. (PLDC, 2000)



Figure 2: Mining of sand and gravel along the Hawkesbury/Nepean Valley (Photo courtesy of Leigh James, NSW Agriculture, 2002)

Market Reasons

Market structures have put many farmers in a non-viable bargaining position when selling their produce, with some in the Hawkesbury area finding it a cost imperative to allow their produce to rot on the ground rather than transport it to market (Glover, 2002; Verity, 2003c). Farmers are price-takers, have increased conditions placed on them by retailers, have decreased incentives to diversify production because of the limited range of varieties that retailers demand, and have seen a decrease over time in the number of independent local retail outlets that might stock their produce. This loss of power in the food distribution system is compounded by pressures brought about by globalised produce markets, with increased non-local competition and cost disadvantages brought about through large scale agribusiness which use economies of scale and efficiency.

These market forces compromise local sustainability and exacerbate the economic pressures farmers face due to current agricultural practices and the attendant risks of small-scale, low return agriculture (Kelleher et al, 1997: 6) and this is reflected in the value of production per hectare. Hawkesbury ranks seventh and Baulkham Hills fifth out of the eight LGAs in Western Sydney. Both LGAs yield less than 5% of the \$/Hectare that agricultural land in Parramatta generates, Sydney’s “second” Central Business District, where productive land holdings are much smaller (WSROC, 2000). The situation is so serious that many older farmers see that agriculture is not a viable option for future generations of their families but are committed to keeping their

properties under family ownership and in farm-based businesses (Getz et al 2004: 164). Combined with an “impermanence syndrome” (Berry 1978 as cited in Lockeretz, 1989) that is characterized by farmers expecting land conversion and the typical increase in land values that accompanies urbanisation, many farmers are succumbing to a liquidation mentality whereby their farms have value only as future residential home-sites and the capital nest-egg they need for their retirement off the land. (Kelleher et al, 1997: 4). The policy responses of successive state and local governments for planning in the wider Sydney region have encouraged this syndrome through a focus on the “needs for suburban expansion” that have created “suburbs-in-waiting”. (Bunker & Holloway, 2001: 13).

Social Reasons

The significance of agriculture in social terms stems largely from the community’s desire to retain agriculture’s aesthetic and heritage values and their contribution to sense of place and ‘charm’ (WSROC, 2000: 32). Consistent with the findings from US studies (Nelson & Dueker as cited in McKenzie, 1996: 19) that indicate resident attitudes being influenced by “amenity value” rather than production value, a study investigating Hawkesbury resident perceptions about agriculture found that 64% of respondents considered agriculture very important or of higher importance but had very little understanding about the actual situation with agriculture in terms of economic contribution, benefits to the region, land uses and the implications of changes in agricultural production in the future. (Kelleher et al, 1998; Sinclair et al, 2003) The Hawkesbury Community Survey of 2000 showed that 65% of all households nominated ‘rural atmosphere’ as the most valued thing about living in the Hawkesbury region, confirming earlier studies of 1993 and 1997 where ‘maintaining the rural character’ and the ‘rural-country atmosphere’ were nominated as the most important issue of primary concern and the most nominated reason for choosing to live in the Hawkesbury (HCC, 1993; HCC, 1997). This is significant because 61% of the population reside in the urban areas of the City (HCC, 2000a/b). Kelleher et al (1997:2) reached the conclusion that the future trajectory of agriculture in the Hawkesbury was in intensification and production largely independent of the Class of land. They concluded that any case for protection of the land would be more convincing if it were made on the grounds of “community amenity and open space”. The problem with this approach is that while the land remains, it does so only as an artefact of its previously productive form, it is sterilized and quarantined from all productive uses.

There is an increasing recognition of agriculture as a worthwhile, desirable and legitimate form of long term land use and human activity in the Sydney Region. Testament to this is demonstrated by:

- The launch of the Strategic Plan for Sustainable Agriculture – Sydney Region in 1998 by the then NSW Minister for Agriculture. This strategy was the result of a comprehensive five year government, industry and community consultation process facilitated by NSW Agriculture. One significant outcome of this process was that agriculture was articulated in the final document as a “legitimate constraint to urban development”.
- The recent formation of the Sydney Farming Network with support from political, media, academic and farmer directions.
- Details and advice on the role of agriculture as a component of sustainable cities are increasingly being sought at political levels; eg. Hansard: Commonwealth of Australia, House of Representatives Environment and Heritage Steering Committee, Sustainable Cities, 6 April 2004
- The social, economic and environmental benefits of sustainable agriculture were provided significant recognition at a meeting held early in 2005 between members of NSW Department of Primary Industries, NSW Department of Infrastructure, Planning, and Natural Resources, and strategic planners from a number of local councils in Sydney that have a substantial agricultural land use. The purpose of this meeting was to consider the issue of agriculture in regard to Sydney’s Metropolitan Strategy. It was apparent that those who were aged up to 40 years had a greater appreciation of the triple bottom line values of urban agriculture coupled with a desire to retain the agriculture than those above that age. In the main (with exceptions) the older participants thinking was affixed almost solely on the traditional bureaucratic view of agriculture and associated lands as a transitional activity as determined by the politics of the day and/or the highest bidder in \$ terms.

- Direction 3 of the Sydney Metropolitan Strategy ‘Greater recognition will be given to non-urban land so that it is not treated as land 'in waiting' for urban development.’ (DIPNR 2005)
- The increasing success of the Hawkesbury Harvest Farm Gate Trail and the following it has developed as a regular part of ABC Radio 702 each Saturday morning. This segment has done a great deal to inform and educate the Sydney community of some of the values and benefits of its local agriculture.
- The Sydney Food Fairness Alliance was formed at a meeting of 30 health workers, nutritionists, community garden advocates and permaculturists in Granville, in the city's western suburbs, on 22 September 2005. Potential roles for the Alliance were discussed including advocacy, education and lobbying for affordable food and to influence the Metropolitan Strategy. Making a submission on the strategy was chosen as a first initiative because it was the most effective action that could be taken at the present time. Teams have been formed around education, advocacy and other areas.

Farmers within the Sydney and Perth region note the importance to them of maintaining existing connections with support communities (employees, markets, processes) and institutions – from NSW Department of Primary Industries experience this is particularly true for the CALDB growers. The city farmer also enjoys the quality of life benefits associated with being near a well serviced metropolitan area with opportunities for cultural and recreational activities (Henderson 2005).

Environmental Reasons

The increasing population of the world focuses humanity to think about the management of food production and the natural resources that agriculture relies upon. The production of food relies upon biological systems and agents outside the realms of human capability. Therefore maintaining diversity of plants and animals and associated biological systems and agents to supply human populations is important and on average greater diversity provides greater productivity (Council for Agricultural Science and Technology 1999).

Agriculture has an important role in providing for biodiversity at a landscape scale. Agricultural landscapes are where soils are produced, nutrients recycled, water infiltrates through crops / grasslands (Alteri 1999, Commonwealth of Australia 1998). These landscapes are also useful for maintaining remnant vegetation that can act as fauna links through vegetative corridors and buffer the edge of urban development from natural areas.

In the Hawkesbury, agriculture plays an important role in environmental and conservation terms (Bunker & Holloway, 2001). With large tracts of the region's land being National Park, agricultural land acts as an important buffer between park areas and residential development. Agricultural holdings have stands of endangered remnant vegetation and habitat (Cumberland Plain and Western Sydney Dry Rainforest) (Shams et al, 2004), with the lowlands along the river system being an important green belt and part of the catchment's hydrological and flood mitigation system. An example of this within the Sydney region is found at the NSW Department of Primary Industries Elizabeth Macarthur Agricultural Institute (EMAI) near Camden. The EMAI farm operates cropping and a commercial dairy and its lands adjoins the Camden urban area. Existing farm vegetation has been augmented to complete a vegetated corridor linking EMAI to the natural areas of the Razorback Range (Burton 2005).

Ecological Footprint and Sequestration Reasons

Agricultural land plays an important role in sequestration and recycling of wastes, particularly where agricultural practices make use of waste water and nutrient recycling of organic wastes. An assessment of the need for rural land in terms of long-term sustainability using the concept of the ecological footprint estimated that the Western Sydney region needed eight times the bushland it currently has, but twenty seven and a half times the rural land. Overall, the region had a conservative (not including land required for water supply) footprint twelve times the area it actually covers. (WSROC, 2000:61) Thus the continued liquidation of productive land to urban development in the Sydney basin does not address the fundamentals of sustainability.

Land Economy Reasons

Agriculture is one of several options available within a land economy. When it is replaced by other uses, such as for housing or green space, its potential to contribute to a diverse local economic base is eliminated. 'Economies', like any eco-system, are stronger when there is a diverse range of economic relationships. Diversity provides a wide range of economic options to a community in the face of changing trends and discontinuities. Having agriculture in the mix increases economic resilience.

The same principles apply in terms of practices too. Diverse agricultural production systems that incorporate a mix of crop types or rotation of crops in association with integrated pest management, that is, using the natural predators to control crop pests can provide near self functioning ecosystems (Altieri 1999). The experience of permaculture and organic farming demonstrates these self functioning ecosystems '...which have the diversity, stability, and resilience of natural ecosystems' (Permaculture Research Institute of Australia 2005).

Within a city, urban agriculture has elements of diversity in production locations, type and scale which not only, with good design, supports ecosystem services, but also provides food for the city dwellers and local employment. The resilience of these production systems based on diversity provides urban farmers '...improved economic and ecological sustainability' (Altieri, p.31 1999). Micro-climate agriculture enhances the effectiveness of production in these diverse contexts.

Planning orthodoxies reasons

The response to support urban agriculture by planning authorities has been slow with agriculture given minimal consideration in urban planning policy (Deelstra and Girarde 2005) – a recent report by the Australian Government on Sustainable Cities fails to mention food production in the recommendations (Australian Government 2005). For sustainability, the social forms of urban agriculture will need to be included in planning mechanisms through participatory processes with local communities (Mougeot 2005). The oversight represents a missed opportunity in building a strong land economy that includes agriculture.

A NEW FRONTIER

Ways of seeing urban agriculture

This paper has attempted to make a case that society is faced with a choice to see agriculture as an integral part of urban landscapes or lose the contribution that it can make forever. This requires a shift in the way agriculture is viewed. Planners have suggested that control instruments need to redefine farming in exurban zones to include production, landscape and recreation and to shift the existing approach of land value determination from private-use to include public-use values (De Fano & Grittani, 1997; Mansvelt, 1997; Beismann, 1997). McKenzie (1997) observed, however, that it will be difficult for regulatory regimes to exhibit a flexibility that meets the dynamic and heterogeneous conditions created in exurban zones with the combination of economic, social and political forces at play in this case. In the Sydney region local sentiment reflects support for a more integrated view about agriculture in the Sydney basin, one that includes the cultural heritage, environmental and social values of farming (Arblaster, 2004; Hart, 2004; HSC, 2004; Jamal, 2001; Jordan, 2004; McIntosh, 2001; Stevens, 2001; The Land, 2002; Verity, 2003a/b/c). McKenzie (1997) notes that it is local government authorities who have to deal with these sentiments on a day-to-day basis and who are forced to accommodate local agendas. In doing this they are largely unsupported by regional extra urban or metropolitan planning bodies, resulting in ad hoc and uncoordinated policy implementation across and between local government areas. Some policies have both internally conflicting aims as well as conflict with the aims of other policies that undermine the potential for authorities to retain agriculture and rural amenity (McKenzie, 1997: 92). The most recent study in the Hawkesbury Local Government Area identified all of these issues as matters for strategic action in order to retain agriculture. (HARtDaC, 2005)

Finding ways of maintaining the economic contribution of agriculture to the locality in sustainable forms is vital if the area is to avoid the unsustainable scenario of being transformed into one more of Sydney's dormitory suburbs, albeit with high aesthetic values in rural amenity. Studies have suggested that the criteria

for assessing viability need to be changed to reflect the shift to smaller-scale or ‘hobby’ style farming that is occurring in the exurban zones (Bowie, 1993 as cited in Kelleher et al, 1997: 7). The strategic implications of this are fully understood by many in the community. David Mason, Officer in Charge, Windsor Region for NSW Agriculture says:

“The agriculture that exists in Western Sydney at this point in time is substantial. It is worth in the order of \$700m to \$800m farm gate value per annum and would have a multiplier factor of at least three. It is, however, limited in its capacity to provide the full benefits of long-term sustainability because there is little or no incentive for it to become sustainable apart from threat of prosecution (in terms of environmental responsibility).” (Mason, 2001)

The pressures on agriculture may be alleviated if it can be seen as a strategic resource. The impacts of global shock events such as bird flu and September 11 accentuate the importance of self-sufficiency, especially in the fresh food supply. Access to markets can be shut down at short notice in these circumstances with no recourse to alternative supplies.

As the impacts of global warming begin to take effect, the existence of farming in the coastal zone, and particularly in proximity to major cities, takes on a greater significance as a strategic resource. The predicted aridification of the productive lands west of the Great Dividing Range will compromise the Nation’s capacity to feed its citizens. There are many other factors influencing the economic viability of agriculture in Australia, these include the globalisation of the Australian market to allow more open competition from overseas food suppliers, the small domestic consumer base (compared to other domestic markets), only two main buyers of produce (Woolworths and Coles), and climatic variability.

Urban agriculture is a key research opportunity in Australia: The strategic knowledge development, and its contribution to future economic flows should be part of the planning decision-making about a role for agriculture in urban environments.

Urban agriculture has the potential to address the issues that proponents of garden cities first identified more than five centuries ago – the important relationship between humans and the land, particularly the earth and its productive role. When partnered with tourism and hospitality as industries for facilitating visitation to farms and use of farm produce, a new set of relationships between consumers and producers becomes possible. These relationships help preserve and conserve the social values that a connection with our food sources brings.

These social values include the education and training asset that viable and sustainable agriculture provides for our communities. It also addresses the disconnect that many of our urbanised younger generations have experienced with their food sources, a disconnect that is graphically, and to older generations, shockingly displayed through the ignorance shown about food. Having farming areas integrated into urban developments allows current and future generations a chance to connect with food production in its fundamental forms. Failure to provide such an opportunity must be seen as a failure of present generations in ensuring that this physical, cultural and epistemological asset base is passed on for the benefit of future generations – it’s fundamentally an intergenerational and intragenerational equity issue. These issues were identified as important elements in planning for agriculture in the Sydney Region as far back as the mid 1990s in the Strategic Plan for Sustainable Agriculture (NSW Agriculture, 1998).

Current generations having access to food sources and to the cultural asset is an intra-generational equity issue. One of the driving forces behind the emergence of Hawkesbury Harvest was food safety, access, quality and equity in the supply system. Evidence existed to indicate that the incidence of diet related diseases is increasing in the Hawkesbury LGA and as part of Local Agenda 21 and the Healthy Cities Program, the Hawkesbury Food Program, a World Health Organization inspired activity related to the Ottawa Charter for Health Promotions, was sponsored by Hawkesbury City Council. It involved a ‘re-orientation of food supply systems’ (Saville, 2002:1) and it sought to improve food security, access and safety in the region for local inhabitants. The Program was designed to intervene in the existing food supply system in order to improve access to locally produced fresh food, to re-build and strengthen the links between producers and consumers, to

create food security for low income families, and to use a ‘settings approach’ for developing policy and programs whereby any initiatives target specific settings, such as schools, fast food outlets, and Health Service providers. (Saville, 2002:2)

These issues about the future of food are at the forefront of the debate about the role of agriculture in our food system. Concerns about the transformation of the food system in the post-war era are gathering on a global scale. A reaction to the current direction of industrial food production into smart foods and convenience foods, coupled with the structural changes in food sourcing, is driving a “counter-trend” in consumption behaviour. Tasting Australia, a major international food festival, was host to a recent public forum on the future of food where these issues were high on the agenda. (O’Neill, 2005)

If the values that urban agriculture represent in economic, social and environmental terms are so important to current and future generations, then a failure to investigate an integrated role in urban planning will constitute a breach of the precautionary principle. Perhaps this may not be a serious problem, as the idea that agriculture be integrated with urban development is one that is being taken up by the development industry. Lend Lease and General Property Trust along with the Department of Infrastructure, Planning, and Natural Resources (DIPNR) and Landcom, have created a master plan for a parcel of agricultural land in the Rouse Hill area in the west of Sydney. The joint venturers have, as part of their planning for the site, seen fit to seek to integrate aspects of production into the site plans and partner with various community organisations in order to connect the new township with the surrounding region. An important element in this is seeing how the garden cities idea can be implemented in this contemporary context. The project is an ambitious attempt to break new ground in urban planning with the proponents aiming to set a new benchmark “as a new model for sustainable urban communities within Australia.” (Lend Lease Corporation, 2003) However, as an isolated instance, the question still remains as to whether the development industry will fully embrace the integration of agriculture with urban development.

Adaptive Responses to Agriculture in the Urban Context

The situation with agriculture in the Sydney Region has been an effective incubator for alternative solutions in retaining viable agriculture. In March 2000 a public meeting was held and Hawkesbury Harvest Inc. was formed and a Farm Gate Trail (FGT) and Growers Directory initiative implemented with \$20,000 support from Hawkesbury City Council. The Farm Gate Trail has become an iconic tourism product extending across the North West sector of Sydney and the Growers Directory facilitates direct access to farms for locals and visitors who can visit the farm gate. A fundamental connection and interdependency was activated along with the role both industries play in development of the region through use of the natural and agri-cultural asset base, the Hawkesbury landscape. The Harvest model assumes a nested view of sustainability, with ecology as the foundation, society as the human system within which economy is a sub-system. A land economy based on agriculture and tourism supports the regional society by conserving and enhancing regional amenity and health assets, and encouraging better stewardship of the natural and agriculture ecosystem of the Hawkesbury River catchment. The model is a practical means of addressing “how the actual deterioration of the landscape can be seen as expressing the limited consciousness of most consumers” (Beismann, 1997: 173) through making the nexus between consumer and the landscape explicit in a relationship with farmers.

The Trail and Growers Directory is resurrecting local economic relationships between farmers and their host community but the cultural/attitudinal, planning, development and political barriers represent significant challenges for Harvest. The community’s relationship with its agricultural heritage is being revitalized and tourism as the mechanism for this has created new opportunities for packaging and interpretation of that heritage. There are visitor-driven incentives for farmers, as custodians and stewards of the land, to employ better practices and management of the environmental assets they use.

Interconnectedness is what this agriculture/tourism nexus is about. Tourism and direct visitor access to farms is an integrating force because it sets the scene for new relationships between agriculture and other industries, between farmers and other farmers and businesses in the tourism, hospitality and retail sectors, and with consumers. Interdependence builds through these relationships and raises awareness about food and other

primary production, farming culture and practices, regional quality and the role that individual farms play in the visitor experience. As a living experiment in sustainable tourism and sustainable agriculture the Harvest model holds great promise in re-connecting with communities through learning experiences that emphasize the unique qualities of regions in the face of global forces.

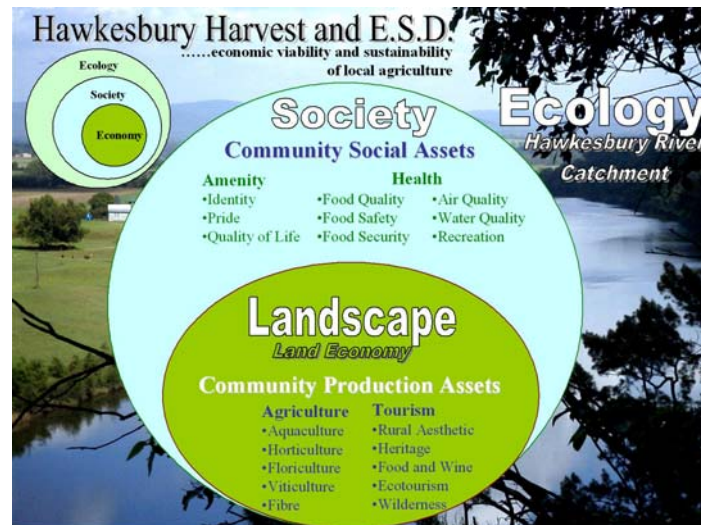


Figure 3: Tourism and Agriculture’s Common Interest in Landscape, Source: Knowld, 2005

When this kind of socio-economic action is harnessed with emergent agricultural technologies such as Effective Microorganisms, the prospect of a viable urban agriculture is conceivable. The use of EM to unlock bound up nutrients and increase productivity in soils that have a long history of the application of in-organic fertilisers is gaining momentum. Professor Higa from the Ryukyu University in Okinawa/Japan has found many applications for mixes of microorganisms that include lactic acid, yeast and photosynthesis bacteria (Multikraft 2005). Studies have shown that EM inoculants applied to high nutrient environments that exist in some sugar cane, banana and grain belt farms can release nutrients for crops thereby reducing risk of pollution and increasing production (Piyadasa *et. al* 2005). EM reduces fertiliser costs and can also be affective in reducing odours in agricultural industries from dairy and piggery effluent ponds and from poultry farms (Amon *et. al* 2004; Multikraft 2005). Biotechnology such as EM is a powerful tool, which may assist in limiting land use conflicts from agricultural operations that remain close to settled areas.

Conclusion

Urban agriculture presents our society with a range of opportunities. These have been detailed above and include health, the conservation and building of regional identity based on production, the subsequent potential for geographic indicator status and the branding asset this represents, the contribution to landscape virtues of agriculture including clean production, and the future for agriculture that these opportunities might deliver for current and future generations. These opportunities present us with choices about how we are to manage the eco-logy of agriculture in urban contexts.

Our communities in the urban and peri-urban zones of cities do have the choice to include agriculture as part of their living landscape. Choices that integrate urban agriculture into the fabric of urban landscapes have the potential to deliver resilience in economic, social and environmental terms, to reinforce the local character of place in a global context, to build sense of place and hence community pride in place, to secure choices about agriculture for future generations and increase choices for current generations, to extend these choices through research and contribution to a knowledge economy. This then defines urban agriculture as a strategic resource, one that deserves a planning approach that includes a triple bottom line accounting of the values of agriculture in urban environments.

ACKNOWLEDGEMENTS

The authors acknowledge the assistance of Andrew Kennedy, Technical Specialist Natural Resources, NSW Department of Primary Industries, Orange in developing the continuum of agriculture tables.

REFERENCES

- ABARE 1996, *Australian Commodity Statistics 1996*, Australian Bureau of Agricultural and Resource Economics, Canberra
- ABS, 2002, *Agricultural Census 2001*, Australian Bureau of Statistics, computer file, Canberra.
- Altieri M.A., 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems and Environment* 74:1999, 19-31.
- Amon, B., Kryvoruchko, V., Amon, T., Moitzi, G. 2004, Ammonia, Methane and Nitrous Oxide Emissions During Storage of Cattle and Pig Slurry and Influence of Slurry Additive, Effective Micro-Organisms (EM), University of Natural Resources and Applied Life Sciences, Vienna. (on-line) 6 October 2005, <http://www.emtech.org/data/pdf/0024.pdf>
- Arblaster, J. 2004 Find the best the land offers, *Hills News*, 24/3/04, Fairfax Newspapers.
- Australian Government., 2005. *Sustainable Cities*: House of Representatives Standing Committee on Environment and Heritage, Canberra.
- Beismann, M., 1997, Landscaping on a farm in Northern Germany, a case study of conceptual and social fundaments for the development of an ecologically sound agro-landscape, *Agriculture, Ecosystems and Environment*, 63, Elsevier Science, 173-184
- Berry, D. 1978 Effects of urbanization on agricultural activities, *Growth and Change*. Vol 9 Num 3, pp. 2-8
- Bolles, S., 2005, Moments to savour, *the (Sydney) magazine*, Issue #30, John Fairfax Publications, Sydney
- Bowie, I.J.S. 1993 Land Lost from Agriculture: a dubious base for rural policy, *Urban Policy and Research*, Vol 4 Num 2, pp. 217-229.
- Bunker, R. and Holloway, D. 2001 *Fringe City and Contested Countryside: Population Trends and Policy Developments Around Sydney*, Issue Paper 6, Urban Frontiers Program, University of Western Sydney.
- Burton, R., 2005. Recovering bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland. NSW Department of Environment and Conservation, Sydney, Australia.
- Butler L. and D.M. Maronek (eds.) 2002. *Urban and agricultural communities: Opportunities for common ground*. Council for Agricultural Science and Technology. Ames Iowa.
- Cobbett, William, 1958, *Rural Rides*, Macdonald and Co. Ltd., London
- Commonwealth of Australia., 1998. Biodiversity Nature's Variety Our Heritage, Our Future: A guide to using and protecting Australia's Biodiversity. Environment Australia.
- Council for Agricultural Science and Technology., 1999. *Benefits of Biodiversity*. (On Line 13 April 1999), http://www.cast-science.org/biod/biod_ch.htm
- County of Cumberland, 1948 *County of Cumberland Planning Scheme Report*, presented to the Hon. J.J. Cahill, M.L.A., Minister for Local Government, on 27 July.
- Daniels, T. 1999 *When City and Country Collide: Managing Growth in the Metropolitan Fringe*, Island Press Washington D.C.
- De Fano, G. and Grittani, G. 1997 Evaluating Functions in Urban-Rural Areas in Borri, D., Khakee, A. and Lacirignola, C. (Eds) *Evaluating Theory-Practice and Urban-Rural Interplay in Planning*, Kluwer Academic Publishers, Dordrecht.
- de Geus, M., 1999, *Ecological Utopias, Envisioning the Sustainable Society*, International Books, Utrecht.
- Deelstra T., Girarde H., 2005. *Urban Agriculture And Sustainable Cities*. (Cited on-line 21 September 2005. http://www.ruaf.org/reader/growing_cities/Theme2.PDF
- DIPNR, 2004 *Meeting the challenges – Securing Sydney's Water Future, Metropolitan Water Plan*, Department of Infrastructure, Planning and Natural Resources, NSW, Sydney.
- DIPNR, 2004 *Metropolitan Strategy: Ministerial Discussion Paper May 2004*, Department of Infrastructure, Planning and Natural Resources, NSW, Sydney.
- EDGE Land Planning, 2003 *Western Sydney Land Use Study*, Department of Infrastructure, Planning and Natural Resources, Sydney.
- Getz, D., Carlsen, J. and Morrison, A. 2004 *The Family Business in Tourism and Hospitality*, CABI Publishing, Oxfordshire

- Gillespie P.D. and Mason D., 2003: *The Value of Agriculture in the Sydney Region (Draft)*. New South Wales Agriculture
- Gillespie P.D., 2003: *Agricultural Trends in the Sydney Region 1996 – 2001 Census Comparisons (Draft)*. New South Wales Agriculture
- Green Party Aotearoa New Zealand, 2005, *The rise of the “locavore”*, accessed from <http://blog.greens.org.nz/index.php/2005/06/03/the-rise-of-the-locavore/>, 5th October.
- Hart, R. 2004 Farmers living on the edge: looking at Sydney’s rural future. *Hills News*, 22/6/04, Fairfax Newspapers.
- HARtDaC, 2005, *Growing Hawkesbury’s Future: Hawkesbury Agricultural Retention through Diversification and Clustering*, Agriculture Victoria and Hawkesbury City Council, Sydney.
- Hassell and Associates, 1997, *Hawkesbury Sustainable Agriculture Development Strategy*, Hawkesbury City Council, Windsor.
- Hawkesbury City Council 2000 Hawkesbury Social Plan 2000/2001: *Improving and Maintaining Community Well-being; Part 1 – Hawkesbury Social Atlas*, Hawkesbury City Council, Hawkesbury City, Australia.
- HCC 1993 *Our City, Our Future Strategy*, Hawkesbury City Council, Windsor
- HCC 1997 *Healthy Cities Survey*, Hawkesbury City Council, Windsor
- HCC 2000a Hawkesbury Social Plan 2000/2001: *Improving and Maintaining Community Well-being; Part 1 – Hawkesbury Social Atlas*, Hawkesbury City Council, Windsor.
- HCC 2000b Hawkesbury Social Plan: *Hawkesbury Community Survey*, Hawkesbury City Council, Windsor
- Henderson S.R., 2005. Managing land-use conflict around urban centres: Australian poultry farmer attitudes towards relocation. *Applied Geography*, 25 (2005) 97-119.
- Houston P., 2005: Re-valuing the Fringe: Some Findings on the Value of Agricultural Production in Australia’s Peri-Urban Regions. *Geographical Research* 43(2):209-223
- Howard, E., 1985, *Garden Cities of Tomorrow*, Attic Books, Eastbourne.
- HSC 2004 Hornsby on the way to sustainable tourism. *Local Government FOCUS – Council Supplement*, Hornsby Shire Council, Sydney.
- Jamal, N. 2001 Houses or food: suburbs split over city’s blessed plots. *Sydney Morning Herald*, 11-12/8/01 p. 11, Fairfax Newspapers
- Jordan, B. 2004 Tourists blaze a trail to Farm gates. *Hills News*, 5/6/04, Fairfax Newspapers, Castle Hill.
- Kelleher, F. 1998 The Future of Agriculture in the Peri-urban Fringe of Sydney. *Proceedings of the 9th Australian Agronomy Conference*, Wagga wagga, Australia, accessed from The Regional Institute Ltd, <http://www.regional.org.au/au/asa/1998/7/069johnson.htm> 24/7/02.
- Kelleher, F. 2001 Urban Encroachment and the Loss of Prime Agricultural Land *Proceedings of the 10th Australian Agronomy Conference*, Hobart, Australia, accessed from The Regional Institute Ltd, <http://www.regional.org.au/au/asa/2001/3/a/kelleher2.htm> 24/7/02
- Kelleher, F., Chant, J.J., and Johnson, N. 1997 Rural Subdivision Impact on Agricultural Industries, The Natural Resource Base and Socio-Economic Development of Rural and Peri-Urban Environments, Report to the Rural Industries Research and Development Corporation, Farming Systems Centre, University of Western Sydney
- Kelleher, F., Chant, J.J., and Johnson, N.L. 1998 Community Expectations and Perceptions of Agriculture in Peri-urban regions. *Proceedings of the 9th Australian Agronomy Conference*, Wagga wagga, Australia, accessed from The Regional Institute Ltd, <http://www.regional.org.au/au/asa/1998/7/069johnson.htm> 24/7/02
- Knowd, I. 2001 Rural Tourism: Panacea and Paradox. *Tourism Geography CD*, July 2001, University of Western Sydney, Hawkesbury.
- Knowd, I. 2003 Grasping the Nettle: Farmers and Tourism in. Braithwaite, RW., and Braithwaite, RL., (eds), *Riding the Wave of Tourism and Hospitality Research* Proceedings of the Council of Australian University Tourism and Hospitality Education Conference, Coffs Harbour, 2003, Southern Cross University, Lismore
- Knowd, I., 2005, Tourism as a Mechanism for Farm Survival, *Journal of Sustainable Tourism*, Elsevier Science, Clevedon, (Forthcoming)
- Kropotkin, P., 1904, *Fields, Factories and Workshops*, Swan Sonnenschein and Co, London.

- Lend Lease Corporation Limited, 2003, Media Release: Lend Lease/GPT Joint Venture Named Preferred Tenderer on Rouse Hill Regional Centre Project, 28 Feb., Sydney
- LGMA, 2004 Hawkesbury City Council: communities and councils working together, *Local Government Managers Australia*, January 2004, located at http://www.lgma.org.au/national/LGMDecJan2004/Council_Hawkesbury.htm, accessed 29/7/04
- Lockeretz, W. 1989 Secondary effects on Midwestern agriculture of metropolitan development and decreases in farmland. *Land Economics*, Vol 65 Num 3, pp. 346-358.
- Mason D. and Docking A., 2005: *Agriculture in Urbanising Landscapes – A Creative Planning Opportunity*. Planning Institute of Australia Congress, Melbourne Australia
- Mason, D. 2000 NSW Agriculture's Response to the Strategic Planning and Transport Vision and Directions Statement and the Draft Working paper for the Creation of Technology, Employment and Learning Corridor (TELC) in Greater Western Sydney, NSW Agriculture, Windsor, NSW, Australia.
- Mansvelt, J.D., 1997, An interdisciplinary to integrate a range of agro-landscape values as proposed by representatives of various disciplines, *Agriculture, Ecosystems and Environment*, 63, Elsevier Science, 233-250
- McIntosh, E. 2001 Sample the best from the country. *Penrith Press*, 23/3/01, p. 7, Cumberland Newspapers, News Limited, Penrith.
- McKenzie, F. 1996 *Beyond the Suburbs: Population change in the major exurban regions of Australia*, Department of Immigration and Multicultural Affairs, Canberra
- McKenzie, F. 1997 Growth management or encouragement? A critical review of land use policies affecting Australia's major exurban regions. *Urban Policy and Research*, Vol 15, Num 2. pp. 83-101.
- Morpurgo, Horatio, 2001, Feet and mouths, *New Internationalist Number 337*, August, p34-35.
- Morris, W., 1983, *News from Nowhere*, Routledge and Kegan Paul, London.
- Moseley, M.J. 1984 The revival or rural areas in advanced economies: a review of some causes and consequences. *Geoforum*, Vol 15 Num 3, pp. 447-456.
- Mougeot Luc J.A., 2005. Thematic Paper 1 Urban Agriculture: Definition, Presence and Potentials and Risks Urban Agriculture: Definition, Presence, Potentials And Risks. (On-line 21 Sept 2005) <http://www.trabajopopular.org.ar/material/Theme1.pdf>
- Multikraft 2005, *Effektive Mikroorganismen: In daily life and for our personal well-being*, (on-line) 6 October 2005, <http://www.multikraft.at/01051/em-index.html>
- Nelson, A.C. and Dueker, K.J. 1990 The exurbanization of America and its planning implications. *Journal of Planning Education and Research*, Vol 9 Num 2, pp. 91-100.
- NSW Agriculture, 1998: *Strategic Plan for Sustainable Agriculture – Sydney Region*. Department of Agriculture, Orange. New South Wales.
- NSW Department of Infrastructure, Planning and Natural Resources., 2005: *Planning for a Better Future. Sydney Greater Metropolitan Region Strategy Discussion Paper*. NSW Government, Sydney
- NSW Government 2001, Gosford/Wyong Local Environmental Plan 2001-Central Coast Plateau Areas in *NSW Government Gazette No. 87*, NSW Government, Sydney.
- NSW Government 2003, *Hawkesbury Local Environmental Plan*, (online), (cited 8 September 2003). Available from Internet: >URL:<http://www.legislation.nsw.gov.au/maintop/scanact/inforce/NONE/0>
- O'Neill, H., 2005, Future Fare, *The Weekend Australian Magazine*, September 3-4, 39-40, Fairfax Newspapers, Sydney.
- Parker F. and Jarecki S., 2003: Transitions at the Rural/Urban Interface: "Moving In", Moving Out" and "Staying Put". *State of Australian Cities Conference*, Parramatta, Sydney Australia.
- Pelletier, D., Kraak, V., McCullum, C., and Uusitalo, U., 2000, Values, public policy, and community food security, *Agriculture and Human Values*, 17: 75-93, Kluwer Academic Publishers, Netherlands.
- Penrith City Council, 2001, *Rural Lands Study*, Penrith City Council, Penrith.
- Permaculture Research Institute of Australia., 2005. *What is Permaculture?* (Online 27 Sept 2005), http://permaculture.org.au/?page_id=20

- Piyadasa, E.R., Attanayake, K.B., Ratnayake, A.D.A., Sangakkara, U.R. 2005, *The Role of Effective Microorganisms in Releasing Nutrients from Organic Matter*, Faculty of Agriculture, University of Peradeniya, Sri Lanka. (on-line) 6 October 2005, <http://www.emtech.org/data/pdf/0024.pdf>
- PLDC 2000 *The Penrith Lakes Scheme Fact Sheet*, Penrith Lakes Development Corporation, Penrith. Located at <http://www.penrithlakes.com.au/fact-general.htm>, accessed 10/8/04
- Powell, RA, Jensen, RC and Gibson, AL, 1985. *The Economic Impact of Irrigated Agriculture in NSW*. 163pp
- Pretty J., Ball A., Lang T., Morison J., 2005: Farm Costs and Food miles: An Assessment of the Full Cost of the UK Weekly Food Basket. *Food Policy*, Volume 30, Issue 1, February 2005, Pages 1-19
- Saville, L., 2002, 'Hawkesbury Food Program', *Sustaining Our Communities, International Local Agenda 21 Conference*, Adelaide from March 3-6, 2002, Environment Australia, located at <http://www.adelaide.sa.gov.au/soc/pdf/saville.pdf>, accessed 28/7/04
- Schumaker, J. F., 2001, Dead Zone, *New Internationalist Number 336*, July, 2001, New Internationalist Publications Ltd, Adelaide.
- Shams, R., Stephenson, P., Woods, R. and Matthews, I. 2004 *Mapping Western Sydney Dry Rainforest on Private Land in the Hawkesbury Region*, School of Environment and Agriculture, University of Western Sydney.
- Sherriff, R., 2003. Farmers walk tight-rope. *Hawkesbury Gazette* 1st October, Rural Press Pty Ltd, Sydney
- Sinclair, I 2001 'Lifestyle living' in A View From The Edge: Issues in Rural and Metropolitan Fringe Planning. *New Planner*, Planning Institute of Australia, NSW Division, Num 49
- Sinclair, I 2004 'The Rural Fringe' in A View From The Edge: Issues in Rural and Metropolitan Fringe Planning. *New Planner*, Planning Institute of Australia, NSW Division, Num 58
- Sinclair, I., Bunker, R. and Holloway, D. 2003 From the outside looking in – Planning and land management in Sydney's fringe. *State of Australian Cities National Conference 2003*, Urban Frontiers Program, University of Western Sydney.
- Smit J., 1996: Urban Agriculture, Progress and Prospect: 1975-2005. *Cities Feeding People, Report 18*
- Smit J., 2000: Urban Agriculture and Biodiversity. *Urban Agriculture Magazine*, Volume 1, Number 1.
- Stevens, R. 2001 Closing the gap on farmers. *Hawkesbury Independent*, September 2001, p. 18.
- The Land 2002 Hawkesbury's harvest. *The Land* 16/5/02, Rural Press, North Richmond.
- Thoreau, Henry D., 1854, *Walden; or, Life in the Woods*, Ticknor and Fields, Boston.
- Verity, W. 2003a Cry for help from Sydney's undervalued farms. *The Sydney Morning Herald*, 10/2/03 p. 9, Fairfax Newspapers.
- Verity, W. 2003b Up the garden path. *Sydney Morning Herald*, 10/2/03 p. 11, Fairfax Newspapers.
- Verity, W. 2003c Escaping from farmageddon. *Sydney Morning Herald*, 10/2/03 p. 11, Fairfax Newspapers.
- Wollondilly Shire Council, 1993; *Agricultural Lands Study*, Wollondilly Council, Picton.
- WSROC 2000 *Western Sydney Regional State of the Environment Report*, Western Sydney Regional Organisation of Councils, produced for WSROC by the Regional Integrated Monitoring Centre, University of Western Sydney, Hawkesbury, Australia
- Young, R., 1997: Agriculture and Land Use Planning: A submission to the Northern Rivers Regional Development Strategy. NSW Agriculture, Orange.
- Personal Communication
- Glover, I. 2002 *Personal Communication*, Penrith Valley Oranges, Castlereagh. Also documented in Verity, W., 2003c
- James, L. 2005, District Horticulturist (Vegetables), NSW Department of Primary Industries.