Submission to the Productivity Commission Issue Paper 'Inquiry into the Australian Government Research and Development Corporations Model'

A Submission by
Nursery & Garden Industry Australia (NGIA)

June 2010

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EXECUTIVE SUMMARY

Nursery & Garden Industry Australia (NGIA) welcomes the opportunity to make a submission as a response to the Productivity Commission Issue Paper 'Inquiry into the Australian Government Research and Development Corporations Model' and fully endorses the industry-wide submission to this inquiry by the Australian Farm Institute (AFI).

The nursery and garden industry (NGI) supports the research development corporation (RDC) model but recognises that while the current model allows for investment in extension, this appears to be an area where totally different skills are required. When assessments of the Research and Development (R&D) impacts are undertaken it is the shortfall in this important area that is identified. There is a need for increases in investment in extension activities and subsequent reporting over time to ensure business can apply the outcomes of research.

The NGI is relatively unique among the industries covered by the RDC arrangements, and the public good from investment in this sector far outweighs the private benefits. These benefits could be further increased by greater support from all sectors of Government.

Details are provided in this submission of the substantial public benefits arising from investment in the nursery and garden sector. These include benefits in areas such as:

1) People and Green space
2) Health Impacts
3) Improved Communities
4) Urban Planning and Heat Island Affects
5) Energy Savings and Climate Change
6) Childhood Education and Skills Development
7) Air Quality and Pollution Control
8) Biodiversity and Climate Variability
9) Increased Real Estate Values
10) Public education

If the current model is to be modified to apply greater controls on some sectors, Government needs to recognise that a 'single model' does not fit all industries and there

should be flexibility to ensure sectors which can demonstrate both private benefit and extensive public benefit are supported - otherwise market failure will result.

1.0 Industry Profile

NGIA is the national peak industry body representing producers, retailers and allied trades involved in the production of greenlife across Australia. NGIA works in very close association with the state and territory peak industry bodies providing a nationally united position on issues of commonality and importance.

2.0 Value of the Australian Nursery Industry

Australian nursery and garden businesses make up a multi-billion dollar industry that plays a vital part in the human (community and personal), environmental and economic well being of the wider Australia community. The combined 'supply chain' of the Australian nursery industry has an annual value exceeding $5.5 billion, includes more than 20 000 small to medium sized businesses and employs approximately 45 000 FTE. It is a truly Australian industry, transcending all state borders and spreading across urban, regional and rural environments, provided greenlife to a diverse customer range (Table 1).

Table 1: National value of horticultural sectors supplied by production nurseries

Production Nursery	Horticultural markets	Economic value
Container stock[1]	Ornamental/urban horticulture	$2 billion retail value
Foliage plants[1]	Interior-scapes	$87 million industry
Seedling stock[2]	Vegetable growers	$3.3 billion industry
Forestry stock[3]	Plantation timber	$1.7 billion industry
Fruit and nut tree stock [1]	Orchardists (citrus, mango, etc)	$5.2 billion industry
Landscape stock[1]	Domestic & commercial projects	$2 billion industry
Plug and tube stock[4]	Cut flower	$319 million industry
Revegetation stock[1]	Farmers, government, landcare	$109 million industry
Mine revegetation	Mine site rehabilitation	Value unknown
	Total horticultural market value	$14.5 billion

[1] Data sourced from Market Monitor 2010, [2] Data sourced from Horticultural Handbook 2004, [3] Data sourced from ABARE 2008
[4] Data sourced from industry

The production sector is broad based producing in excess of 10 000 plant species with many and varying target markets that have an estimated annual value to the Australian economy exceeding $14 billion. It is important to note that the industry is far broader than the perceived 'ornamental' market, with businesses involved in large scale forestry, nurseries, medicinal products, flowers, alcohol production, revegetation for mining,

landscaping and starter plants for fruit and vegetable production all engaged as levy payers.

The Nursery and Garden Industry (NGI) is a recipient of Government Funds to match a Research and Development (R&D) Levy as well as Voluntary Contributions, so makes this submission from the view point of a contributing industry. For several years, NGIA has undertaken R&D through the nursery industry pot levy collected by the Australian Government managed through Horticulture Australia Limited on. The R&D pot levy is currently set at 3 per cent of the container price and is matched $1:$1 by the Australian Government. The industry also has a Marketing Levy.

Levy collection administered by the Levy Revenue Services appears to reflect the costs incurred by the Department of Agriculture Fisheries and Forestry (DAFF). The collection charges incurred by industry have remained consistent for the past 5 years. In amending or proposing a new levy, the process appears fluid.

The NGI's response to the key Terms of Reference for the Productivity Commission's review follow:

I. Examine the economic and policy rationale for Commonwealth Government investment in rural R&D;

Just as most agricultural industries are made up of many individual farm operators, the NGI is made up of many small businesses that do not have the individual economic capability to invest in research for Industry collective benefit. They do however recognize that for efficient business and industry growth, new technologies need to be available. The overall economic benefit from the industry uptake of key outcomes in the areas of natural resource management, contribution to environment and business sustainability justify Government Investment as demonstrated by the following reviews of two key areas of investment.

A recent benefit-cost analyses of 14 environmental projects funded by the Nursery Industry Research and Development Program between 2004–2010 was undertaken to examine, amongst other things, the Net Present Value (NPV), Benefit-Cost Ratio (B/C

Ratio) and Internal Rate of Return (IRR) at a discount rate of 5 per cent[1]. The R&D projects included as part of this investigation related to research identifying environmental and health benefits of indoor plants, industry on-farm environmental (EcoHort) and biosecurity (BioSecure *HACCP*) programs as well as the industry Minor Use Program for access to agrochemicals. Other projects included in this study related to industry R&D into climate change, invasive plants, water, biosecurity and natural resource management. The report found that these projects yielded a NPV of $8.13 million, a B/C Ratio of 5.6 and an IRR of 26 per cent (all expressed in 2008/09 $ terms using a discount rate of 5 per cent). The report concluded that the potential benefits from the investments in the examined projects offered industry a significant return in investment.

A benefit-cost analysis of the Industry Development Officer (IDO) network project, the industry training program as well as other components of the overall industry development and extension program between 2004–2010 was also undertaken to examine, amongst other things, the NPV, B/C Ratio and IRR at a discount rate of 5 per cent[2]. The economic assessment found that the investment of $0.9 million (present value of costs) can be considered to have more than paid for itself with a NPV of $1.3 million, a B/C Ratio of 2.4 to 1, and an IRR of over 20 per cent (all expressed in 2008/09 $ terms using a discount rate of 5 per cent). The report concluded that the potential benefits from the investments in the examined projects offered industry a positive and modest return in investment.

These examples serve to show that the public investment in the sector represents good value.

II. Examine the appropriate level of, and balance between public and private investment in rural R&D and Extension

Details are provided in Section (VII) of the public benefit arising from having a 'greener environment'. This section argues that public benefit is far greater than the private benefits accrued to industry that provides the products. Private investment into areas such as plant breeding, development of fertilisers for Australian conditions, adoption of biodegradable containers to remove plastic from the supply chain and process improvement and adoption are not accurately measured when comparisons between Public and Private investment

[1] Clarke, M, Chudleigh, P, and Simpson, S. (2010) NY08016: Economic Assessment of HAL Investment in Four Project Clusters for the Nursery Industry, Horticulture Australia Limited, Sydney.
[2] Clarke, M, Chudleigh, P, and Simpson, S. (2010) NY08016: Economic Assessment of HAL Investment in Four Project Clusters for the Nursery Industry, Horticulture Australia Limited, Sydney.

are made. If there was an accurate measurement recorded then a comparison would no doubt show the level of public investment into the sector represented is lacking. As the nursery industry delivers a range of benefits not solely attributed to the Agricultural portfolio we believe increased levels of public support should be made available to grow the industry capacity.

III. Consider the effectiveness of the current RDC model in improving competitiveness and productivity in the agriculture, fisheries and forestry industries through research and development;

The effectiveness of the model in 2010 obviously needs review as the technological environment is different now compared to when the model was established in 1989. Information is available instantaneously and research results can be accessed by levy payers. One of the key areas for potential improvement is for the data from other sectors to be easily accessible. Within the Horticulture Australia Limited (HAL) RDC model which our industry operates under, there is a definite move to greater awareness of key research undertaken in other cropping systems. This should be replicated across other RDC's so key research expenditure can be built on rather than duplicated. This data would need to be in a form which leads to increased productivity or has the interpretation that makes research relevant to an individual business. We do not believe the RDC model has effectively addressed the extension aspect of the opportunities to ensure research outcomes are effectively and efficiently transferred to on-ground activities, but this may be a result of priority setting rather than model structure.

IV. Examine the appropriateness of current funding levels and arrangements for agricultural research and development, particularly levy arrangements, and Commonwealth matching and other financial contributions to agriculture, fisheries and forestry RDCs;

Overall funding levels for this key sector of the Australian economy are reducing due to the cutback of investment by State agencies. These cuts are due to increasing pressures in other areas of investment. The private sector must therefore spend more to maintain a 'business as usual' position and this has been at a time when external factors such as drought, have had a major impact on business viability.

State Governments have largely abandoned research and extension services and this has dealt a significant blow to the innovation and productivity of the agricultural sector, particularly industries such as the NGI located in peri-urban environments. For example, under the draft plan from the National Horticulture Research Network (NHRN) there was not a single entity identified to be the lead agency for this sector.

Indeed, at a Federal level, there is a distinct lack of research and extension of production in the peri-urban environment, an environment that accommodates large numbers of nursery production businesses in major cities across Australia. Interestingly, it is in these environments that rising regulation, especially with regards to environmental compliance, has placed significant pressure on businesses. This does not reflect the major contribution that the industry makes to public good.

V. Consider any impediments to the efficient and effective functioning of the RDC model and identify any scope for improvements, including in respect to governance, management and any administrative duplication;

NGIA can only comment on the effectiveness of HAL in managing the investment in the Horticulture sector. The Nursery sector has distinct differences to many of the other industries within the HAL portfolio. Improvements are being driven by HAL in the areas of across industry collaboration and process improvements and communications have improved in recent years. This is due to increased capability of industries involved with HAL and also the responsive structure represented by the Industry Owned Corporation i.e. HAL.

As an industry which benefits from outcomes of investment in R,D&E, it is critical that the RDC model be structured to eliminate duplication and remove the barriers to collaborative projects that have a common impact, recognising the regional variability's that exist in a continent as diverse as Australia.

VI. Consider the extent to which the agriculture, fisheries and forestry industries differ from other sectors of the economy with regard to research and development; how the current RDC model compares and interacts with other research and development arrangements, including the university sector, cooperative research centres and other providers; and whether there are other models which could address policy objectives more effectively;

The key difference with other sectors of the economy is the diversity represented by Agriculture, Fisheries and Forestry and the spread of 'small to medium' enterprises throughout all areas. A Primary Producer Levy or industry Tax reflects a commitment from the Industry and this may be more equitable than the Innovation grants or tax breaks provided by Government to other sectors, where only the large players can benefit and productivity improvements are not accessible to the whole of industry.

Ownership of the research process and outcomes is one of the key benefits and a feature that needs to be built on and communicated with the production sector. NGIA R,D&E activities are largely funded via the Nursery Pot Levy which is managed by HAL. As a member of HAL we also have the capability to extend the levy funds by having matched Voluntary Contributions. This arrangement means that the NGI involves all key players within the industry supply chain and enables a far greater degree of extension activity to deliver the outcomes of industry research to the production sector and supply chain. It is well documented that the level of extension and research being undertaken at State agency level has dropped off considerably and in our sector it is practically nonexistent. This is simply conveyed in Figure 1 below.

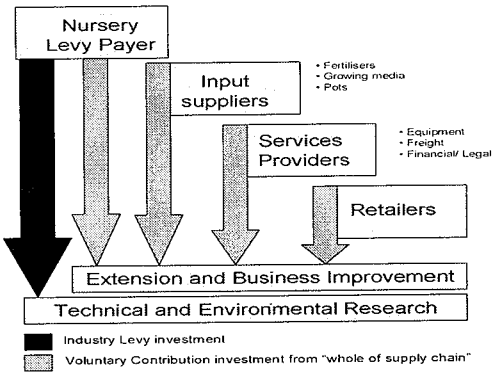

Figure 1: NGIA Research, Development and Extension model

The 'ownership' of this process by industry can be demonstrated by the involvement in training programs identified by industry as a key requirement for understanding the research outcomes.

As noted earlier, there is a distinct lack of extension activities being administered at a State level. As such, the Australian NGI has invested in an IDO network to enable the transfer of R&D outcomes to the wider industry. This network provides advice to all sectors of nursery and garden industry relating to technical, environmental and horticultural issues. This resource is involved with on-property assistance and independent accreditation audits as part of the Nursery Production Farm Management Scheme (FMS). It also aims to generate links with research organisations and provides industry representation with State Government agencies to ensure the industry is represented on key issues. Linkages developed by the IDO have been successful in some States in generating additional R&D projects and is detailed in a later section. This network is also responsible in coordinating, and in many cases, facilitating training to the wider industry. The IDO network is considered one of the most valuable resources supported by industry R&D investment.

In addition to this network, R,D & E funding is utilised to create and deliver industry specific training programs and research into what are the gaps in training that the wider industry see as critical for business development. Education and skill development is vital to the development of strong, robust businesses and a competitive, thriving industry. Indeed, many of the training courses are a necessary part of industry improvement and complement Nursery Production FMS accreditation, and certification audits. A summary of the number of workshops as well as participants is presented in Table 2. Despite a reduction in the number of workshops held, the number of participants has grown significantly since 2007.

Table 2: Training Course Years Ending June 2007 to 2009: Number of Workshops and Participants.

	Workshop Type	2007	2008	2009	Total
Number of Workshops	Compliance	25	30	42	97
	Business	31	56	35	122
	Technical	54	57	60	171
	Total	110	143	137	390
	Year on Year Growth		30%	-4.2%	
Number of Participants	Compliance	263	359	458	1080
	Business	841	854	608	2303
	Technical	1007	842	1259	3108
	Total	2111	2055	2325	6491
	Year on Year Growth		-2.7%	13.1%	

VII. **Examine the extent to which RDC's provide an appropriate balance between projects that provide benefits to specific industries versus broader public interest including examining interactions and potential overlaps across Governments and programs, such as mitigating and adapting to climate change; managing the natural resource base; understanding and responding better to markets and consumers; food security, and managing biosecurity threats.**

It would be inappropriate for NGIA to comment on the extent to which RDC's operate their projects, however as a key member of HAL, our observations suggest that HAL are focused on delivering balanced outcomes to benefit all horticultural industries and the broader public. This has been achieved through investment in across industry programs and involvement with collaborative industry/Government partnerships. Our opinion is based through our direct involvement in several HAL projects including Horticulture for Tomorrow and the Horticulture Water Initiative. Both of these across industry projects have delivered considerable benefits both on-farm and to the wider community. More recently, HAL played a lead role in the Climate Change Research Strategy for Primary Industries (CCRSPI) network, a collaborative partnership, operating under a mandate from Primary Industry Ministerial Council (PIMC) and Primary Industry Standing Committee (PISC), to develop and deliver a coordinated and collaborative national framework for the

implementation of climate change research programs in the horticultural industries. Managing biosecurity threats in horticultural industries is facilitated through collaborative partnerships between industry and Government through the Emergency Plant Pest Response Deed (EPPRD) administered through Plant Health Australia (PHA).

PUBLIC VERSUS PRIVATE BENEFIT OF RESEARCH FUNDING IN THE NGI SECTOR

The R,D&E undertaken by NGI delivers both private and public benefits. The private benefits are captured by retail and production nursery businesses in Australia, and relate to benefits in the form of increased (or maintained) levels of sales and cost savings on inputs (e.g. chemicals, fertilsers, energy and water). The growth of the distribution channels over the past 10 years is presented below in Figure 3. It is evident that although there is productivity growth associated with the NGI, this has significantly plateaued in the years 2004-2007 which reflects the severe impact of the drought and widespread water restrictions that were in place in all urban markets across Australia. Despite these challenges, the research and extension activities undertaken by the NGI enabled the industry to survive through what was essentially a regulatory block on the industry's ability to trade. Water restrictions on consumers also resulted in a regulatory ban on their ability to maintain their living assets, i.e. the trees, lawns and gardens in parks and gardens across Australia.

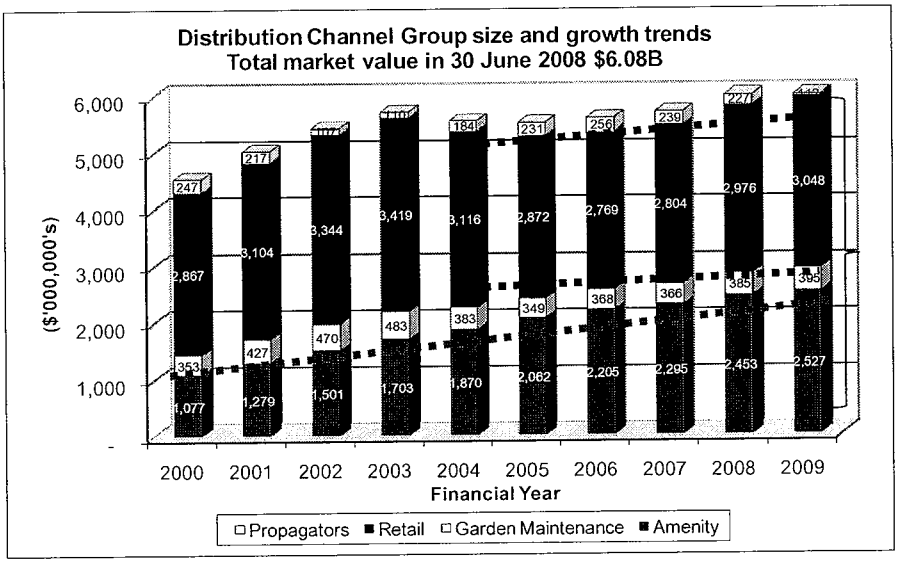

Figure 3: Size and growth of the distribution channels in the NGI (Market Monitor 2010)

The ongoing liaison with water supply utilities and provision of accurate data has seen a shift from restrictions to conservation measures and greater education of consumers. This development has seen the industry recover in recent years. The capability that the industry had in guiding businesses through this period reflects the comments made by Hunt and Birch in their submission to this inquiry that relate to extension services[3]. They comment that extension services also provide critical institutional and human capital in times of crisis or adversity in addition to sustaining on-farm and industry productivity.

The public benefits associated with the research activities of the NGI are many and are environmental, social and economic in nature. These are discussed in detail in the ensuing section.

PUBLIC GOOD OF NURSERY AND GARDEN INDUSTRY

Before venturing into the on-farm rationale for R&D investment, the downstream improvements and wider public good arising from industry investment into R&D will be discussed. The value of the NGI in relation the social, health, environmental and economic fabric of the Australian community will also be explored.

1. PEOPLE NEED GREEN SPACE

It is well known that humans are innately connected with living systems, a term referred to a biophilia[4]. This concept identified by Wilson (1984) indicates that humans are intrinsically associated with nature, which included plants, animals and weather. It is this connection that indentifies the commodities that the NGI are responsible for (i.e. trees, shrubs and vegetation collectively referred to as greenlife) as an essential component of the community. Indeed, this was evident in recent Newspoll research that indicated 89 per cent of Australians were in favour of more trees and vegetation in their local area[5].

Positioning the value of greenlife in the urban community has been recognised by the Food and Agricultural Organisation (FAO) of the United Nations who consider trees and forests as an essential part of urban development, contributing to healthy cities for healthy people[6]. It is important to note that the global population is shifting from being predominantly rural to being mainly urban and this trend is equally applicable in Australia.

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[3] *Submission* 3, p 3
[4] Wilson, EO. (1984) *Biophilia*. Harvard University Press, Cambridge.
[5] Newspoll Research commissioned by NGIA, 2008
[6] Forests and Trees for Healthy Cities, http://km.fao.org/urbanforestry/ , accessed 4 June 2010.

The recently released *State of Australian Cities 2010* report indicated that in June 2008, 75 per cent of Australia's lived in cities, and noted that Australia's population is projected to grow to 35.5 million by 2056, with 72 per cent of this growth attributed to capital cities, an increase of more than 10 million people[7]. This level of growth will pose significant challenges on the long term sustainability of these cities including productivity growth, climate change and ecological sustainability all impacting on the liveability of these urban cities.

To overcome these challenges, the *State of Australian Cities* 2010 report called for better management of open and green space in Australian cities. The value of green space in urban communities is fundamental in contributing to the health and wellbeing of these communities. Indeed it has been suggested that people who perceived their neighbourhoods as *very green* have are up to 1.6 times at greater odds of better physical and mental health, when compared with those who perceive their neighbourhoods as lower in greenness[8].

2 HEALTH IMPACTS

In Australia, two key issues in relation to health and wellbeing relate to the rise in obesity and mental health. According to the *Australia: the healthiest country by 2020* report, Australia is one of the most overweight developed nations in the world with over 60 per cent of adults and one in four children overweight or obese, a trend that has been steadily increasing over the last 30 years[9]. In relation to mental health, it has been reported that almost half the total Australian population (45.5 per cent) have experienced a mental health disorder at some point in the lifetime. Moreover this report indicated that once in five Australians aged 16–85 years had a mental disorder in 2007 [10].

Sedentary, indoor lifestyles have largely attributed to a significant increase in health ailments including obesity and metal ill-health in Australia. To address these pertinent issues, a growing body of research has demonstrated that green spaces, i.e. those areas with green life, provide significant psychological benefits for their users. Barton and Pretty (2010) clearly demonstrate this in a recent study involving 1,252 participants of green

[7] State of Australian Cities (2010) Major Cities Unit, Infrastructure Australia. http://www.infrastructureaustralia.gov.au/files/MCU_SOAC.pdf , accessed 4 June 2010.
[8] Sugiyama, T, Leslie, E, Giles-Corti, B, & Owen, N. (2008) Associations of neighbourhood greenness with physical and mental health: do walking, social coherence and local social interaction explain the relationships?, *Journal of Epidemiolgy and Community Health*, vol. 62, no. 5.
[9] Australia: the healthiest country by 2020. Technical Report No 1 Obesity in Australia: a need for urgent action Including addendum for October 2008 to June 2009.
[10] The 2007 National Survey of Mental Health and Wellbeing (SMHWB), http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4326.0Main%20Features32007?opendocument&tabname=Summary&prodno=4326.0&issue=2007&num=&view=, accessed 4 June 2010.

exercise, i.e. physical activity in the presence of nature. This study found that both men and women showed self esteem and mood improvements following green exercise and more importantly, it was noted that the mentally ill had one of the greatest self esteem benefits[11].

A recent report commissioned by Beyond Blue, Australia, confirmed that the natural environment improves health and well-being, as well as preventing disease and helping people recover from illness. The authors of this report indicated that efforts must be made in Australia to improve quality of life in all neighbourhoods and cities through increasing access to natural environments. In other words, enhancing the green infrastructure in our urban cities. In fact, it was noted in the report that people living in towns and cities should have access to natural green space of at least two hectares in size, located no more than 300 metres (or five minutes walking distance) from home[12].

3 Improved Communities

In recent times, there has been growing support for greater green space in our urban communities. In November 2009, Housing NSW launched the 'Green Street Program' to improve the environment around many public housing areas. As part of this program, 15,000 trees were earmarked to be planted over three years in selected main streets, community gardens and neighbourhood parks. The program also offered plants for public housing tenants to beautify their own yards to enhance the streetscape[13]. This project valued at $30 million was designed to improve the quality of life for thousands of public housing tenants across NSW. The NGI, landscape architects, local councils, residents other not-for-profit organisations like Boystown are collaboratively working together on this project. This driving force behind this program was the growing recognition that green space can have a major positive impact on people's quality of life in social housing and enhance wider-community relations. For example, researchers have shown that crime decreases in neighbourhoods as the amount of green space increases and that vegetation has been seen to alleviate mental fatigue, one of the precursors to violent behaviour[14].

[11] Barton, J. & Pretty, J. (2010) What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science & Technology*, DOI: 10.1021/es903183r.
[12] Natural England's Accessible Natural Greenspace Standard (ANGSt), http://www.naturalengland.org.uk/ourwork/enjoying/places/greenspace/greenspacestandards.aspx , accessed 4 June 2010.
[13] Green Streets Program http://www.housing.nsw.gov.au/NR/rdonlyres/6022C00A-EAAB-415A-B477-918A07E82D00/0/GreenStreetbrochure.pdf , accessed 4 June 2010.
[14] Kuo, F. & Sullivan, W. (2001) Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior*, 33(3), 343-367.

4 URBAN PLANNING AND HEAT ISLAND EFFECTS

Threatening this access to urban green space is the design of new urban developments in cities across Australia. In a report titled *Where have all the gardens gone? An investigation into the disappearance of back yards in the newer Australian suburb*, it was noted that these newer suburbs have dwellings that extend near to the boundary of the plot and, in consequence, near to adjoining dwellings minimising the size of the backyard[15]. It noted that there is very little private amenity space to the rear of the dwelling and in extreme cases none at all. Moreover, these new urban developments also contribute to the phenomena of the Urban Heat Island Effect (UHIE), where urban areas become warmer than the surrounding rural countryside, often by several degrees[16]. This phenomenon is potentially deadly for city dwellers as heat stress associated with elevated temperatures is linked to higher rates of human mortality and illness, particularly amongst vulnerable demographics such as: the elderly; lower socio-economic classes; and residents in high density, older housing stock with limited surrounding vegetation[17].

A key aspect to highlight is the role of vegetation in alleviating the impacts of the UHIE and providing the community with green space in response to the shrinking backyard. Vegetation can provide thermal climate amelioration through evapotranspiration and shade, resulting in tremendous relief to counteract the effects of UHIE. Effectively, these benefits can reduce the need for energy expenditure through air-conditioning use directly translating to considerable energy savings.

5 ENERGY SAVINGS AND CLIMATE CHANGE

NGIA is currently engaged in levy funded research through the University of Melbourne to quantify the role of vegetation in alleviating the impacts of UHIE in four Melbourne suburbs using a street tree evaluating model developed by the United States Department of Agriculture[18]. Data generated through this modelling has shown that 11,253 GJ of energy savings valued at $468,373 is provided by the street trees in these four suburbs. These savings result from energy saved through decreased natural gas use in winter and reduced energy use for air conditioners in summer. Other results generated using this modelling relate to a suite of benefits including air pollutant removal, carbon sequestration

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[15] Hall, T. (2007) Where have all the gardens gone? An investigation into the disappearance of back yards in the newer Australian suburb, Urban Research Program, Research Paper 13, Griffith University, Brisbane, QLD.
[16] Oke, TR. (1982) The energetic basis of the urban heat island. *Quarterly Journal of the Royal Meteorological Society,* 108, pp. 1-24.
[17] Smoyer-Tomic, KE, Kuhn, R. & Hudson, A. (2003) Heat Wave Hazards: An Overview of Heat Wave Impacts in Canada. *Natural Hazards,* 28, pp. 463-485.
Rankin, DW. (1959) Mortality associated with heat wave conditions in the Melbourne metropolitan area, January and February, 1959. *Australian Meteorological Magazine,* 26, pp. 96-98.
[18] Fairman, T. (2010) Using Stratum to Estimate the Benefits of Street Trees in Melbourne, Victoria. Masters Thesis, The University of Melbourne, Australia.

and storage and enhancing the aesthetic and property values of our communities. These aspects are discussed in subsequent sections. It should be noted that this work has been pioneered by the NGI levy invested through collaborations with University of Melbourne. However, this research is preliminary and requires extensive follow up to quantify the benefits of vegetation in communities across Australia.

Other levy funded research to validate the benefits associated with vegetation in the urban environment is currently underway through multi-partner collaborations at the University of Melbourne. With support from the NGI levy, researchers from the faculties of Engineering, Architecture and Forest and Ecosystems Science as well as Masters Research students are conducting experiments to quantify and model the thermal load on buildings with and without tree shade. The project will also directly quantify the dollar benefit urban trees provide through reduced energy use in the heating and cooling of buildings. The benefits of deciduous and evergreen broadleaf trees are also being investigated as part of this Australia first study. One of the key aspects of this study will be a visual display to raise the awareness of energy and thermal load benefits that planting trees in the urban landscape can provide by temporarily locating this study at the Melbourne International Flower and Garden Show at the Carlton Garden in 2011 as part of the industries ongoing communication with consumers and the wider public.

6 Childhood Education and Skills Development

The Australian NGI has engaged in other key research projects of wider community appeal to directly address the shrinking backyard and encourage children into gardening. It is well reported that children are spending less time in the garden, resulting in a range of behavioural problems. This phenomena was coined 'Nature Deficit Disorder' by Richard Glover in his 2005 book *Last Child in the Woods: Saving our Children from Nature Deficit Disorder*[19]. This book exposed that children restricted to nature by issues such as the 'lure of the screen' was detrimental to healthy childhood development and for the physical and emotional health of children and adults.

This issue was identified by the NGI as a key research priority and consequently, resulted in the development of the KidsGrow program to tackle this issue head on. This program developed by NGIA provided schools with resources that enabled them to introduce gardening to children. The program was specially created by teachers for teachers and has been designed to provide school children with hands-on gardening projects that are

[19] Louve, R. (2005) Last Child in the Woods: saving our children from nature deficit disorder. Algonquin Books, Carolina USA.

directly linked to the school curriculum. The program exposed students to a range of thinking skills and learning styles and provided students with a solid foundation to get them enthused in nature at an early cognitive age. Scientific data clearly demonstrates that children encouraged to spend more time engaging with nature and given opportunities to learn in an outdoor setting (green education) are more likely to have active exposure to nature embedded in their lifestyle as adults, positively influencing their health and wellbeing[20]. Pretty *et al.* (2009) proposed a funnel of pathways within which all our lives are shaped. This conceptualisation presented in Figure 4 shows that people at the top (healthy pathway), live longer with a better quality of life where as at the bottom (unhealthy pathway) they die earlier and often live years with a lower quality of life. People following the healthy pathway, tend to be active, be connected to people and society and engaged with natural places and vegetation. People following the unhealthy pathway are largely suffering from inactivity, impacted by atomisation of families and the community and disengaged with nature and vegetation.

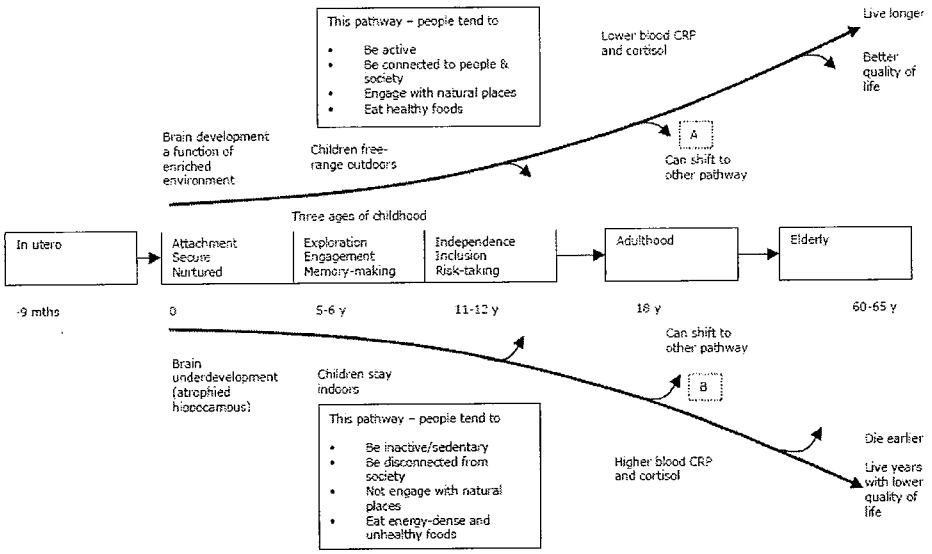

Figure 4: Life pathways indicating children's contact with nature and consequent levels of physical activity affects their well-being but also their health in later life.

7 Air Quality and Pollution Control

Trees and vegetation are pertinent in urban centres to ameliorate air pollution. The value of vegetation has been explored globally and it has been well documented that vegetation can remove air pollutants including particulate matter less than 10μm (PM_{10}), ozone (O_3),

[20] Pretty J, Angus C, Bain M, Barton J, Gladwell V, Hine R, Pilgrim S, Sandercock S and Sellens M. (2009) Nature, Childhood, Health and Life Pathways. Interdisciplinary Centre for Environment and Society Occasional Paper 2009-02. University of Essex, UK.

nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and volatile organic compounds (VOCs). These pollutants are either removed through direct absorption via uptake through leaf stomata or interception into the tree or onto the tree surface[21]. In addition to direct removal, the transpiration and canopy size of trees can reduce ambient temperatures which in turn can directly reduce the frequency and intensity of ground-level O_3, the key component of smog[22].

In Australia, urban sprawl will continue to accelerate air pollution, attributed to growing vehicle numbers. The *State of Australian Cities 2010* report indicated that transport emissions are one of the strongest sources of emissions growth in Australia and is expected to continue, with direct CO_2- equivalent emissions projected to increase 22.6 per cent between 2007 and 2020 - or around 1.58 per cent a year. The report also noted that respiratory conditions are the most commonly reported health conditions among children and young adults and it is estimated that respiratory conditions and exposure to air pollution accounts for 2.3 per cent of all deaths in Australia at present[23]. NGIA are currently researching the capacity for trees to remove pollutants from urban communities in addition to the energy saving benefits discussed earlier. To date, data collected suggests that the street trees in four suburbs can directly remove 2,890 kg of air pollutants per annum. As noted earlier, this research is still in its infancy.

8 Biodiversity and Climate Change

It is important to note that vegetation across Australia provides a suite of other ecosystem services that considerably enhance the environment in which we live. For example, through the process of photosynthesis, vegetation can absorb carbon dioxide (CO_2) and generate oxygen (O_2). Excess carbon generated by this process is stored (sequestered) in biomass. NGIA research into the carbon sequestered in street trees in urban communities has indicated that between 11 and 31 tonnes of carbon per hectare can be sequestered[24]. Given that urban areas are increasing, the carbon sequestered in urban vegetation will become larger and more relevant in future discussions surrounding strategies to mitigate climate change.

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[21] Nowak, DJ, Crane, DE, Stevens, JC. (2006) Air pollution removal by urban trees and shrubs in the United States. Urban Forestry and Urban Greening 4:115-123.
[22] Nowak, D.J. (2002) The Effects of Urban Trees on Air Quality, USDA Forest Service, Syracuse NY, USA.
[23] State of Australian Cities (2010) Major Cities Unit, Infrastructure Australia.
http://www.infrastructureaustralia.gov.au/files/MCU_SOAC.pdf , accessed 4 June 2010.
[24] Fairman, T. (2010) Using Stratum to Estimate the Benefits of Street Trees in Melbourne, Victoria. Masters Thesis, The University of Melbourne, Australia.

The United Nations declared 2010 as the International Year of Biodiversity, celebrating the value of biodiversity in our lives[25]. Biological diversity is an integral resource upon which families, communities, nations and future generations depend on. It serves as the link between organisms, binding each into an interdependent community or ecosystem in which all living creatures have their place and role. Vegetation, an integral component of biodiversity, offers many benefits of which some have already been discussed. Others benefits include[26]:

- Production of food and natural fibre for humans
- Provision of habitat for plants and animals
- Maintaining ground water hydrology
- Stabilisation of climate
- Maintaining soil organic matter
- Enhancing soil nitrogen and recycling of nutrients

To this end, it is imperative to preserve these ecosystem services by preventing and/or minimising biodiversity decline. Building ecosystem resilience is seen by industry as pragmatic in times of growing pressure from anthropogenic and natural pressures for which the future is largely unpredictable. NGIA has had a long history in progress towards minimising biodiversity decline. Currently, there are a variety of industry initiatives, both nationally and state-based that proactively addresses invasive plants, which are considered a major cause of biodiversity decline. The national Grow Me Instead (GMI) program is one such initiative undertaken by industry to decrease the impact and spread of invasive plants. This program aims to eliminate the sale of invasive plants, promote non-invasive alternatives and raise awareness of invasive plants in the gardening community as well as industry.

Grow Me Instead builds onto existing nationally coordinated programs including National Plant Labelling Guidelines[27] and Invasive Plants Policy Position[28] that targets both production nurseries and retail garden centres. When combined, these programs

[25] 2010 International Year of Biodiversity http://www.cbd.int/2010/welcome/, accessed 4 June 2010.
[26] Cork SJ and Shelton D. (2000) Sustainable Environmental Solutions for Industry and Government. Proceedings of the 3rd Queensland Environmental Conference, May 2000, Environmental Engineering Society, Queensland Chapter, The Institution of Engineers, Australia, Queensland Division, and Queensland Chamber of Commerce and Industry, pp151-159.
[27] Nursery & Garden Industry National Plant Labelling Guidelines (2007) http://www.ngia.com.au/Folder;jsessionid=873BBEEAC4D01B98883D7AB913C02355?Action=Download&Folder_id=75&File=NGIA_Labelling_Guidelines_AUG07v1.1.pdf accessed 26 May, 2010.
[28] Nursery & Garden Industry Invasive plants Policy Position (2007) http://www.ngia.com.au/Folder;jsessionid=873BBEEAC4D01B98883D7AB913C02355?Action=Download&Folder_id=75&File=NGIA_invasiveweedspolicy.pdf accessed 26 May, 2010.

demonstrate NGIA's ongoing commitment in tackling the battle against invasive species whilst educating industry and the greater public. The recent launch of the Grow Me Instead website enables greater penetration of industry messages into the wider community. This has been assisted by retail garden centres acting as a direct linkage between industry and the community in delivering research and development outcomes. Indeed, in a recent survey undertaken by NGIA to evaluate the success of industry initiatives associated with invasive plant management, data indicated that that 78 per cent of retail garden centres across Australia actively promoted the Grow Me Instead program. The Grow Me Instead message continues to penetrate into the wider community with the recent launch of the Grow Me Instead website.

9 Increased Real Estate Value

The economic stimulation provided by urban green space is of key importance. For example, vegetation is likely to influence house process by increasing the appeal of properties and consequently, their price by as much as 12 per cent[29]. Research has also shown that vegetated shopping precincts are highly preferred by customers and well maintained shopping precincts have been shown to raise the profile of the calibre of goods and serves offered in these areas. Interestingly, surveyed customers in these landscaped shopping precincts were willing to spend 9–12 per cent more than in un-landscaped precincts and spend more time in these shopping areas[30]. Research conducted by NGI has shown that the economic value of trees in the Melbourne outer suburbs of Craigieburn and Broadmeadows has an estimated combined worth of $1,293,367[31].

In February 2009, NGIA hosted the augural Urban GreenScapes Symposium in Canberra[32] to unveil the multitude of benefits of plants and green-life in the urban landscape. The symposium was attended by some 300 delegates from many sectors including local government, utilities and industry. Presenting at the Symposium was Dr. Greg McPherson, project leader for the United States Department of Agriculture (USDA) Centre for Urban Forest Research, as well as other experts, environmental scientists,

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[29] Luttik, J. (2000) The value of trees, water and open space as reflected by house prices in The Netherlands, *Landscape and Urban Planning*, Vol. 48 No.3/4, pp.161-7.

[30] Wolf, K. (2005) Business District Streetscapes, Trees, and Consumer Response, Journal of Forestry, Volume 103, Number 8, pp. 396-400.
Joye, YK, Willems, M, Brengman, & Wolf, K. (2010) The Effects of Urban Retail Greenery on Consumer Experience: Reviewing the Evidence from a Restorative Perspective. *Urban Forestry and Urban Greening* 9, 1: 57-64.

[31] Fairman, T. (2010) Using Stratum to Estimate the Benefits of Street Trees in Melbourne, Victoria. Masters Thesis, The University of Melbourne, Australia.

[32] Nursery & Garden Industry Urban GreenScapes Symposium (2009) http://www.ngiaevents.com.au/sympo2009/ , accessed 4 June 2010.

academics and researchers. The Symposium portrayed that urban green space was a community asset and a necessity for sustainable development of the Australian economy.

10 Community Education

Lastly the industry plays a key role in communicating key outcomes from programs to the whole of the Australian community. This relates to environmental issues or general life skills in sustainability. Radio, television and print media are widely utilised by the industry players to get engagement on a wide range of activities from water conservation, biosecurity awareness and invasive plant management. The benefit of these activities is impossible to cost.

It is evident that many of the benefits discussed above resulting from industry investment R&D are tangible outcomes however many are intangible, such as positive social, psychological and spiritual benefits in terms of community health. Irrespective, the NGIA will play a lead role in delivering key messages about these benefits as well as the results generated through industry funded R&D to the wider public.

ON-FARM BENEFITS OF R&D INVESTMENT

The statutory levy has been integral in maintaining industry productivity and as noted earlier, delivering wider benefits to the community. The distribution of R&D benefits along the supply chain is captured by all sectors of the industry, particularly the production sector. It is important to note that the NGI also has the capability to garner Voluntary Contributions which encourages private investment in R&D activities.

As example of Voluntary Contributions being successfully used to drive private research relates to key research undertaken in 2003–2010 by scientists from University of Technology Sydney with funding from the Indoor Plant Hire Industry. This research examined the effectiveness of potted-plants in reducing total volatile organic compound (TVOC) levels in office air and also investigated the psychological benefits of office plants for reducing stress and negative mood states in office workers. The data from this research reported that TVOC concentrations in offices with potted-plats reduced by up to 70 per cent. The research also reported that staff who had plants placed in their offices showed reductions in stress levels and negative feelings of a magnitude of 30 to 60 per cent, while those with no plants recorded increases in stress and negativity of 20 to 40 per cent. This data is anticipated to encourage greater uptake of indoor potted plants and drive

industry productivity through increased demand. In addition, it will also generate key health and wellbeing benefits to the wider public in addition to those mentioned in the previous section. It should be noted that this data has also been incorporated into the Green Star Building Code, a national voluntary environmental rating system that evaluates the environmental design and construction of buildings[33]. As at 11 June 2010, Eleven percent of CBD buildings in Australia were certified under this Code.

Owing to the diverse nature of nursery production and its customer base, production nurseries typically occur in urban, peri-urban and regional localities across Australia. As such, industry is confronted with a variety of environmental and natural resource impediments that require careful consideration and management to ensure sound environmental outcomes are achieved. Moreover, industry is reliant on natural resources, such as water for irrigation, and consequently it is critical for industry to reduce its impact on these resources. To this end, industry has been proactive to address these issues and invested in R&D to develop a comprehensive Farm Management System (FMS) that provides growers and industry with a systematic based approach to improve business outcomes whilst proactively addressing environmental and natural resource responsibilities, both short and long-term, whilst maximising biodiversity. The FMS framework includes:

1. Nursery Industry Accreditation Scheme Australia – Best Management Practices (NIASA-BMP)
2. EcoHort – Environmental Management System
3. BioSecure *HACCP* – Pest and disease management and risk assessment.

The adoption of the Nursery Production FMS has the potential to reduce production costs in a number of areas, through encouraging the adoption of best management practices. Examples of areas in which savings can be made include water use, chemical and fertiliser use, energy costs and waste disposal costs.

In addition to this program, NGIA is also responsible for funding the provision of minor use permits to ensure industry has access to the latest agrochemicals. The Industry is reliant on the Minor Use provisions provided for by the Australian Pesticide and Veterinary Medicines Authority (APVMA) to gain access to modern pesticides to efficiently combat the various pests, diseases and weeds impacting on the industry. This will become

[33] Green Building Council of Australia http://www.gbca.org.au/media-centre/just-one-plant-will-remove-the-nasties-from-the-air-we-breathe-indoors-and-size-/2596.htm , accessed 4 June 2010.

increasingly important with increased pest pressure arising through a changing climate and ensures that industry has:

- access to new chemistry that may have greater efficacy against the target pest(s)
- pesticides with reduced environmental impact
- pesticides with lower toxicity to humans or minimal off-target impacts (fish, etc)

In developing a Minor Use Permit (MUP), a comprehensive data package must be submitted to the APVMA before registration is approved. The costs for generating and collating such data are high and unsustainable for individual growers and this cost is absorbed by industry investment in R&D. The cost of MUP's has gone from an approximate $60 to more than $2500 per application for over the past 4 - 5 years. This higher cost is due to the APVMA initially increasing the cost of a MUP application ($320 at present; $352 as of 1/7/10) and the increased documentation (application) costs due to the specialist input required plus efficacy, worker exposure and food safety data etc. The benefit to growers by industry investment in this program are many, but primarily will enable growers to have access to registered products that are safe, effective and will not have any harmful effects on humans, the crops or the environment.

VIII. **Examine whether the current levy arrangements address "free rider" concerns effectively and whether all industry participants are receiving appropriate benefits from their levy contributions.**

From the NGI perspective the 'free rider' concerns relate to the sector of the production industry that do not use containers or reuse containers. This is being reviewed as part of an internal levy review. These issues will be resolved through the investments being aligned to Industry Strategic Plans and Government R&D priorities.

Owing to a constrained pool of funding associated with the Nursery Pot Levy, NGIA has leveraged additional funding for research activities through number of Federal and State/Territory government funded projects. This has led to increased R&D activities being driven by industry for private and public good. Since 2005, these projects have been valued at more than $1.5 million. The industry has managed all projects within budget and with the allocated timelines. Each project has had its final report accepted without

alteration and independent auditing of accounts has demonstrated that funds have been appropriately managed as per project contracts/agreements. Projects managed include:

- **Nursery & Garden Industry Victoria – Recycling plastic pots –Packaging Covenant** (2008-2011). Funded by the National Packaging Covenant ($542,800). This project facilitated the introduction of a recycling process for plastic pots, whereby they were recycled into new containers for use by the industry. This has resulted in a major diversion from landfill and the project is currently being evaluated for national roll out.

- **Nursery & Garden Industry Queensland - Queensland Grow Me Instead** (2008-2009). Funded by the Commonwealth of Australia as represented by the Department of Agriculture Fisheries and Forestry under the Caring for Our Country program ($170,000). This project identified, with stakeholders, 30 key invasive plant species within each of the three coastal bioregions of Queensland (Wet Tropics, Dry Tropics & Sub-Tropics) and listing 3 non-invasive alternatives in hardcopy & web based resources for industry and non-industry groups. This project supplemented the national Grow Me Instead project below.

- **Nursery & Garden Industry Queensland - Climate Change Action Plan** (2008). Funded by the National Agriculture & Climate Change Action Plan Implementation Program ($26,000). This project evaluated the impacts of climate change on nursery production and developed a farm ready energy assessment tool. The project identified the industry tipping points, information gaps and undertook strategic energy audits across industry to identify key energy inputs.

- **Grow Me Instead – A national program to engage Nursery and Garden Industry and reduce the impact of invasive garden plants** (2007-2008). Funded by the Commonwealth of Australia as represented by the Department of Agriculture Fisheries and Forestry under the Defeating the Weed Menace Programme ($363,000). This project identified, with stakeholders, 30 key invasive plant species within NSW, ACT, VIC, SA, TAS, NT and WA and listing 3 non-invasive alternatives in hardcopy resources for industry and non-industry groups. The project provided funding for the development of the NGIA National Plant Labelling Guidelines as well as a module in the Australian Garden Centre Accreditation Scheme (AGCAS) program.

- **Extending Nursery Production Farm Management System in Central Qld** (Bundaberg – Rockhampton) (2006 – 2009). Funded by National Heritage Trust

Strategic Reserve ($160,000) & Rural Water Use Efficiency 3 ($40 000). This project delivered Best Management Practices and environmental/natural resource management extension strategies/activities on-farm.

- **Increasing Adoption of Innovative Irrigation and Water Recycling Technologies in Australian Nurseries** (2006-2008). Funded by the Commonwealth of Australia as represented by the Department of Agriculture Fisheries and Forestry under the National Landcare Programme (NLP) - Natural Resource Innovations Grant ($129,748). This project developed an economic cost/benefit model for irrigation of production nurseries to measure the benefit of irrigation technology/concepts and provide cost benefit analyses of irrigation technologies from in ground application.

- **Delivering Environmental Management Systems (EcoHort) to Industry** (2005 – 2007). Funded by the Commonwealth of Australia through the Department of Agriculture Fisheries and Forestry Pathways to Environmental Management Systems and QLD Department of Primary Industries & Fisheries ($160,000). This project focused on introducing EMS to industry through workshops and follow up on-farm EMS assessments and Action Plans.

The current Vision for Australia's greenlife industry, including its nursery, garden, landscaping and related sectors as noted in the Nursery Industry 2010-2015 Strategic Plan[34] is for a 'A unified Australian nursery and garden industry that is productive, profitable and sustainable'. The five objectives as set out in this plan include:

1. Increase the sales value of nursery products and services through marketing and promotion;

2. Enhance the capacity and efficiency of the industry's resources through upgrading industry skills, knowledge and practice;

3. Build industry support through shaping government, public and related industry understanding of the industry's benefits, and enhance these benefits through collaboration;

4. Invest in nursery product/service development to enable the industry to respond to growth opportunities and challenges; and

[34] Nursery & Garden Industry Australia, http://www.ngia.com.au/Folder?Action=View%20File&Folder_id=75&File=NGI%20strategic%20plan%20Final.pdf , accessed on 4 June 2010.

5. Support the industry through services and resources that enhance its capacity to respond to issues, capture opportunities and achieve the vision of this strategic plan.

In order to meet these objectives, this plan will be delivered through the investment framework based around the above funding system which is delivering quantifiable industry benefits but also considerable public benefits. In setting the strategies to meet the objectives as set out in this Strategic Plan, the NGI has consulted closely with the HAL Investment Plan 2010-2015 as well as the Department of Agriculture, Fisheries and Forestry (DAFF) Rural Research and Development Priorities to ensure R&D objectives of the Australian Government were met. This process has ensured significant synergy between the research needs of the sector and the Governments stated research priorities.