

# THE COLLATION AND COLLECTION OF HEIRLOOM FRUIT AND VEGETABLE CULTIVARS



## **Nicholas David Gowans**

The Pratt Foundation/ISS Institute Overseas Fellowship

Fellowship supported by The Pratt Foundation



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# Executive Summary

The aim of this Fellowship was to obtain first hand practical experience of heritage fruit and vegetables, and their relevance in Australian horticultural production systems. The knowledge and skills obtained overseas can be shared with others who have an interest in the practical application of these processes and the subsequent lessons to be entrenched into future horticultural programs and research and development. There are lessons indicative of the new challenges for 21st century food production, climate change, and frameworks for sustainable options entrenched in this Fellowship.

The majority of cultivar related research and traditional production techniques have their foundation in the 'Victorian Era' (1838–1901) with a United Kingdom focus and the colonies of the British Empire located in temperate zones from that period. It specifically related to the temperate regions of Victoria.

Heritage vegetables also contain positive characteristics that are historically evident in heritage fruit and vegetable cultivars including resilience and resistances that may assist in the production of future food sources. This required resilience may be against drought, water-logging, pests and disease resistance – all of which are important in dramatic events predicted in climate change models.

Key areas of investigation included:

- determining the various stocks of heritage cultivars still in existence, still available and useful to the Australian production horticultural sector
- determining what sort of monitoring and classification for identification of heritage species is best practice in the British Isles
- Identifying the gaps in nomenclature and classification for heritage varieties in Australian horticultural production
- determining the best delivery of training and information for heritage varieties to be delivered to the market sectors and educational institutions.

Heritage cultivars and organic production methods are experiencing significant interest from the marketplace, and training (both initial training and further training) is essential to meet the increasing demand for grown fruit and vegetables. Education is the key to ensuring the survival of this valuable resource. Knowledge transfer is essential to establishing a collection of material available for both consumers, as well as professionals. Effective distribution of knowledge will assist cultivators to achieve the aim of not only preserving the horticultural heritage of Victoria, but also working towards an economically and environmentally sound society.

The demise in heritage fruit and vegetable stock has been underpinned by market forces and a lack of public awareness as to the importance of diversity in food security and supply. Furthermore, a trend in food-based horticulture involving the movement from cultivars deemed 'public inheritance' to those privately owned 'plant breeders' has impacted upon Australian production systems. In response to these factors, the collation and presentation of an 19th century horticultural archive of food-based plant material and production techniques must address opportunities for reducing society's footprint upon the planet and educate and reconnect the populace with its food production techniques.

The following report provides an overview of the Fellowship experience and detailed accounts of processes and practices. In addition, the report concludes with a series of recommendations for government, industry, the business sector, professional associations, education and training providers and the wider community.

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# Abbreviations and Acronyms

APNI	Australian Plant Name Index
ASHA	Australian Society of Horticultural Science
AUSVEG	Australian Vegetable Peak Industry Body
BFA	Biological Farming Association
BIS	Biodiverse Information Standards
CBD	Convention on Biological Diversity
CSIRO	Commonwealth Science Industry Research Organisation
DEFRA	Department for Environment, Food and Rural Affairs
DPI	Department of Primary Industry (Victorian Government)
ECPGR	European Cooperative Program for Plant Genetic Resources
ESFEDS	European Science Foundation European Documentation System
FAO UN	Food and Agriculture Organisation of the United Nations
FAST	Food and Allied Services Trades
GVP	Gross Value of Product
HAL	Horticulture Australia Limited
HDRA	Henry Doubleday Research Association
IK	Index Kewensis
ILDIS	International Legume Database and Information Service
IPNI	International Plant Names Index
ISHS	International Society for Horticultural Science
ISS Institute	International Specialised Skills Institute Inc
IPM	Integrated Pest Management
IPNI	International Plant Names Index
MSB	Millennium Seed Bank
NCCPG	The National Council for the Conservation of Plants and Gardens
NIAB	The National Institute of Agricultural Botany
NOF	National Orchard Forum
OPCAA	Ornamental Plant Collection Association Australia

# *Abbreviations and Acronyms*

PGRG	Plant Genetic Resources Group, UK
RBG	Royal Botanical Garden, Edinburgh
RHS	Royal Horticultural Society
RIKEN	Rikagaku Kenkyusho (Institute of Physical and Chemical Research, Japan)
RIRDC	Rural Industries Research and Development Corporation
RNG	Royal National Gardens, Reading, UK
SAC	Scottish Agricultural College
SMTA	Standard Material Transfer Agreement
SRW	Southern Rural Water
TDWG	Taxonomic Database Working Group (forerunner of the BIS)

# Definitions

Where possible, the following definitions have been sourced by accredited international bodies, particularly as there is some conjecture and blurring as to what actually constitutes some of the nomenclature. Sourced material is acknowledged, as concise and brief explanations have been used to minimise confusion.

## **Annual**

A plant that completes its life cycle, from seed to seed, in one growing season.

## **Abioto**

The non-living factors such as water, sunlight, temperature, geographical features found in an ecosystem that affect the survival of living organisms in that ecosystem.

## **Biennial**

A plant that completes its life cycle in two years. Generally, in the first year, growth occurs followed by flowering, fruiting and seed production in the second year.

## **Binomial**

The two-part scientific name consisting of a genus name and a species, cultivar, group, series, or hybrid epithet denoting an individual variety within a genus.

## **Cultivar**

A variety of plant that has been produced and maintained through cultivation, not through natural or 'wild' evolution.

## **Design**

Design is problem setting and problem solving. Design is a fundamental economic and business tool. It is embedded in every aspect of commerce and industry and adds high value to any service or product - in business, government, education and training and the community in general. *Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.*

## **F1 Hybrid**

First generation resulting from a cross mating of distinctly different parental types. F2, F3, F4, etc. are annotations for subsequent generations.

## **Food Miles**

The distance food is transported from the time of its production until it reaches the consumer. (It has been estimated that 25% of the CO<sub>2</sub> released into the atmosphere by humans is a direct result of us not growing our own food. *Digger's Best, Garden Ideas p.2: [www.greenfinder.com.au/green/The-Diggers-Club](http://www.greenfinder.com.au/green/The-Diggers-Club)*

## **Foundation Seed**

Primary source of seed of a genetically identified variety from which all increases are made.

## **Fruit**

A fruit is a ripened ovary of a plant along with any attached parts that developed with it from the flower.



## **Germplasm**

A germplasm is a collection of genetic resources for an organism. For plants, the germplasm may be stored as a seed collection or, for trees, in a nursery.

## **Heirloom**

Heirlooms are defined as 'good non-hybrid varieties, which have been improved through generations and have adapted to regional climates'. Heirlooms are true-to-type open pollinated varieties that are publicly owned and can be grown and saved.

## **Hybrids**

Hybrids are sexually produced from plants that are not genetically identical. The next generation of seed is not true to type, so seed can't be saved and growers must return to the merchant year after year.

## **Index Kewensis**

An international plant name index of over 400,000 species, maintained by the royal gardens, Kew, UK

## **Monocultures**

The agricultural practice of producing or growing one single crop over a wide area. Single systems are generally less stable than mixed systems.

## **Open Pollinated**

A seed that produces offspring just like the parent plants. Open-pollinated seed allows growers to harvest and save for the following year.

## **Organic Agriculture**

Organic (biological) agriculture and horticulture relates to material grown and manufactured in a manner that adheres to set standards, as defined by the UK soil Association in 1987 (Attachment 4).

## **Skills deficiency**

A skill deficiency is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. There may be individuals or individual firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the IP to themselves; and over time they retire and pass away. Firms likewise come and go. *Reference: 'Directory of Opportunities. Specialised Courses with Italy. Part 1: Veneto Region', ISS Institute, 1991.*

## **Stochastic**

A stochastic process is one whose behaviour is non-deterministic in that a system's subsequent state is determined both by the process's predictable actions and by a random element. Even 'expert' stochastic practitioners, acknowledge that outcomes result from both known and unknown causes.

## **Sustainability**

The ISS Institute follows the United Nations NGO on Sustainability, "*Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" Reference: [http://www.unngosustainability.org/CSD\\_Definitions%20SD.htm](http://www.unngosustainability.org/CSD_Definitions%20SD.htm)

## **Temperate**

The temperate zone extends from between 35 degrees to 60 degrees north and south of the equator and this region has four distinct seasons. (*Suman Singha, Concise Encyclopedia, p115*)

# Acknowledgments

Nicholas Gowans would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide him throughout the Fellowship program.

## **Awarding Body - International Specialised Skills Institute (ISS Institute)**

**We know that Australia's economic future is reliant upon high level skills and knowledge, underpinned by design and innovation.**

The International Specialised Skills Institute Inc (ISS Institute) is an independent, national organisation, which has a record of nearly twenty years of working with Australian industry and commerce to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management. The Institute has worked extensively with Government and non-Government organisations, firms, industry bodies, professional associations and education and training institutions.

The Patron in Chief is Sir James Gobbo AC, CVO. The ISS Institute Board of Management is Chaired by Noel Waite AO. The Board comprises Franco Fiorentini, John Iacovangelo, Lady Primrose Potter AC and David Wittner.

Through its CEO, Carolynne Bourne AM, the ISS Institute identifies and researches skill deficiencies and then meets the deficiency needs through its *Overseas Skill Acquisition Plan (Fellowship Program)*, its education and training activities, professional development events and consultancy services.

Under the Overseas Skill Acquisition Plan (Fellowship Program) Australians travel overseas or international experts travel to Australia. Participants then pass on what they have learnt through reports, education and training activities such as workshops, conferences, lectures, forums, seminars and events, therein ensuring that for each Fellowship undertaken many benefit.

As an outcome of its work, ISS Institute has gained a deep understanding of the nature and scope of a number of issues. Four clearly defined economic forces have emerged out of our nearly twenty years of research. The drivers have arisen out of research that has been induced rather than deduced and innovative, practical solutions created - it is about thinking and working differently.

### **A Global Perspective. 'Skills Deficiencies' + 'Skills Shortages'**

Skill deficiencies address future needs. Skill shortages replicate the past and are focused on immediate needs.

Skill deficiency is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the focus of the work of ISS Institute.

There may be individuals or firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the IP to themselves; and over time they retire and pass away. Firms likewise come and go. If Australia is to create, build and sustain Industries, knowledge/skills/understandings must be accessible trans-generationally through nationally accredited courses and not be reliant on individuals.

Our international competitors have these capabilities as well as the education and training infrastructure to underpin them.

Addressing skill shortages, however, is merely delivering more of what we already know and can do to meet current market demands. Australia needs to address the **dual** challenge – skill deficiencies and skill shortages.

# Acknowledgments

Identifying and closing skills deficiencies is vital to long-term economic prospects in order to sustain sectors that are at risk of disappearing, not being developed or leaving our shores to be taken up by our competitors. The only prudent option is to achieve a high skill, high value-added economy in order to build a significant future in the local and international marketplace.

## **The Trades**

The ISS Institute views the trades as the backbone of our economy. Yet, they are often unseen and, in the main, have no direct voice as to issues which are in their domain of expertise. The trades are equal, but different to professions.

The ISS Institute has the way forward through its 'Master Artisan Framework for Excellence. A New Model for Skilling the Trades', December 2004. The Federal Government, DEEWR commissioned ISS Institute to write an Australian Master Artisan School, Feasibility Plan.

In 2006, the ISS Institute established an advisory body, the **Trades Advisory Council**. The members are Ivan Deveson AO; Martin Ferguson AM, MP, Federal Labor Member for Batman; Geoff Masters, CEO, Australian Council of Educational Research; Simon McKeon, Executive Chairman, Macquarie Bank, Melbourne Office, and Julius Roe, National President Australian Manufacturing Workers' Union. ISS Institute also puts on record its gratitude to the former Chairman of Visy Industries, the late Richard Pratt, for his contribution as a member of the Trades Advisory Council.

## **Think and Work in an Holistic Approach along the Supply Chain - Collaboration and Communication**

Our experience has shown that most perceive that lack of skills is the principal factor related to quality and productivity. We believe that attitudes are often the constraint to turning ideas into product and a successful business; the ability to think laterally, to work and communicate across disciplines and industry sectors, to be able to take risks and think outside the familiar, to share – to turn competitors into partners.

Australia needs to change to thinking and working holistically along the entire Supply Chain; to collaborate and communicate across industries and occupations - designers with master artisans, trades men and women, Government agencies, manufacturers, engineers, farmers, retailers, suppliers to name a few in the Chain.

## **'Design' has to be seen as more than 'Art' discipline – it is a fundamental economic and business tool for the 21st Century**

Design is crucial to the economic future of our nation. Australia needs to understand and learn the value of design, the benefits of good design and for it to become part of everyday language, decision making and choice.

Design is as important to the child exploring the possibilities of the world, as it is to the architect developing new concepts, and as it is to the electrician placing power points or the furniture designer working with a cabinet-maker and manufacturer. As such, design is vested in every member of our community and touches every aspect of our lives.

Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way. The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs - whereby individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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# Acknowledgments

## Fellowship Supporter

The Pratt Foundation was established in 1978 by Richard and Jeanne Pratt with the shared vision of supporting charitable enterprises and adding value to philanthropy. The Foundation is now one of the largest private sources of philanthropy in Australia. In the words of its mission statement, it aims “*to enrich the lives of our community*” and, in the words of Jeremiah, it works to fulfil this aim in a spirit of “*kindness, justice and equity*”. Gowans would like to thank them for providing funding support for this Fellowship.

## Supporters

Gowans would like to acknowledge the support and assistance of the following people and organisations involved in the development of this Fellowship program:

- Clive Blazey, Digger’s Club
- Jan Croggan, Senior Historian, Sovereign Hill Museums Association
- Rob Dimsey, Best Production Manager, DPI Horticulture, Department of Primary Industry (Victoria)
- Bruce Draper, Australian Garden History Society
- John Harrison, Retired Horticultural Lecturer
- The Honourable Joe Helper, Minister for Agriculture and Minister for Small Business, Victorian Government
- Pamela Jellie, Australian Garden History Society
- Euan Laird, Program Manager – Horticulture, Department of Primary Industry (Victoria)
- Dr Gregory Moore, Honorary (Senior Fellow), Melbourne University (Formerly Head of Burnley Campus)
- Rob Pelletier, Rob Pelletier Pty Ltd
- Tony Slater, Department of Primary Industries (Victoria), Potato Breeding Program
- Tim Sullivan, Deputy Chief Executive Officer, Sovereign Hill Museums Association
- Tony Thake, ‘06 The Pratt Foundation/ISS Institute Fellow Horticulture teacher, University of Ballarat (TAFE).<sup>1</sup>
- Phil Tulk, Collections Supervisor, National Trust of Victoria
- Clive Winmill, Badger’s Keep (no longer trading) Sovereign Hill Museums Association, Department of Primary Industry

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<sup>1</sup> The skill deficiencies Thake researched were • Practical ability to carry out restoration works • Higher level skills to sensitively maintain heritage gardens • Project work to link the planning with the practical restoration works • Environmental change affecting restoration works

# Acknowledgments

## Those Involved in the Development of the Overseas Program

- Jim Arbuckle, Head of Fruit Collections (Wisley), The Royal Horticultural Society (RHS), The Soil Association
- Phillip McMillan-Browse, The Eden Project, The Lost Gardens of Heligan
- Anthony Boulder, Hampton Court Palace
- Marian Bellerby, The National Fruit Collection
- Kate Evans, East Malling Research Centre
- Hannah Parrish, National Institute of Agriculture and Botany (NIAB), Robinsons Seeds, Thompsons and Morgans Seed Company, The National Trust (United Kingdom), Henry Doubleday Research Association Heritage Seed Library
- Stuart Wale, Scottish Agricultural College (Aberdeen)
- Mark Podswillo, Chelsea Physic Garden
- Pamela Jellie, Australian Garden History Society, Ornamental Plant Collection Association Australia (OPCAA)
- Community groups:
  - Skipton Garden Club
  - Ballarat Horticultural Society
  - Creswick Landcare Group
  - Ballarat Horticultural Society
- Overseas affiliates:
  - Marion Bellerby, The National Fruit Collection – Brogdale
  - Dr Stuart Wale, Lecturer, Scottish Agricultural College
  - Dr Kate Evans, East Malling Research Station
  - Philip McMillan-Browse, Foundation Member, 'Lost Gardens of Heligan' and 'Eden Project'
  - Allan Gilbert, Horticulturist and Author

## Australian Organisations/Individuals Impacted by the Fellowship

### Australian Not-for-Profit Organisations

- Sovereign Hill Museums Association, Ballarat, Victoria
- Ornamental Plant Conservation Association of Australia (OPCAA), Royal Botanic Gardens, Melbourne, Victoria

Also:

- Australian Garden History Society
- Horticulture Australia Limited
- National Trust of Victoria
- Rare Breeds Trust
- Australian Horticultural Society
- Rare Fruits South Australia

# Acknowledgments

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- Bob Magnus, Woodbridge Fruit Trees, Woodbridge, Tasmania
- Clive Blazey, Digger's Club, Dromana, Victoria
- Goodman's Seeds
- Eden Seeds
- New Gippsland Seeds
- Heritage Fruit Trees

## **Other Australian Organisations**

- International Society for Horticultural Science (ISHS)
- Australian Society of Horticultural Science (ASHA)
- CSIRO – Plant Industries

Also:

- Horticulture Australia Council
- Australian Food and Grocery Council
- Rural Industries Research and Development Corporation (RIRDC)
- Australian Vegetable Industry Development Group
- Ausveg

## **Special Acknowledgements**

- Angela, Kate Emma and Patrick Gowans
- Jim and Terry Gowans
- Mary and Frank Donovan

# About the Fellow

**Name:** Nicholas David Gowans

## **Employment**

- Head of Gardens and Landscape, Sovereign Hill (up to 2008)
- Horticultural Officer, Department of Primary Industries (Victoria)

## **Qualifications**

- Associate Diploma of Applied Science (Horticulture), Melbourne University, Burnley Campus, 2000
- Bachelor of Parks Management, Deakin University, 2005
- Post Graduate Certificate in Climate Change for Primary Industries, Melbourne University (current studies)

## **Memberships**

- Victoria Racing Club
- Melbourne Cricket Club
- North Melbourne Football Club

Gowans is currently employed by the Department of Primary Industries (Victoria) as the Horticultural Climate Adaptation Officer for Southern Victoria.

The ISS Institute/Pratt Foundation Fellowship created an opportunity for Gowans to capitalise upon a broad range of industry experience in order to assist in the preservation of valuable genetic material that may provide options for future Australian horticultural food production. He recognises that it is not possible to exploit ecosystems indefinitely; and as land managers, custodians and educators who recognise that there is a responsible threshold, we must adopt the principles of ecologically sustainable development, both for our own benefit and to share that knowledge with our stakeholders.

A blend of tertiary education in business, horticulture and ecology has allowed the Fellow to have a unique view of the physical environment and industry landscape. Prior to this, he was Head Gardener at the iconic tourist attraction Sovereign Hill and also ran his own landscaping and horticultural company in Melbourne.

Philosophically, the future direction of food production is very important to Gowans, and it underpins much of his approach to his career. He has found common ground with many of the Western District farmers, and spends the bulk of his time improving knowledge and methods of transfer through liaising with growers of the district. Gowans aims to encourage a dynamic relationship in order to promote sustainable, efficient and profitable production techniques.

However, Gowans firmly believes that success relies upon the cross pollination of ideas, people and planning. He believes that sustainable practices and the understanding of past practices work towards a balanced and profitable future.

On a personal level, Gowans lives in the small town of Skipton with his wife and three young children where he is actively developing his one acre allotment into a low maintenance, productive garden. He also enjoys snorkelling, Australian zoology, gardening, Australian botany, hiking, bird watching, literature, football and horseracing.



# Aims of the Fellowship Program

The Fellowship aims were to foster awareness of heirloom fruit and vegetable cultivars and provide training to tradespeople and practitioners with a botanical, agricultural or horticultural background. The Fellowship provides an ideal catalyst through which the collation and collection of heirloom fruit and vegetable cultivars could become a nationally and internationally significant archive of knowledge and plant material in this field.

An emphasis upon annual vegetables has been identified as the primary point of research for this report given the presence of several competitive advantages. These advantages arise as a consequence of entrenched characteristics involving efficiency and ecological traits. On this note, whilst there is an emphasis upon organic production as part of this report, the emphasis is based upon the easy marriage of the terms 'heritage' and 'organic'. This is not to say that modern production methods and heritage varieties are mutually exclusive.

Given the immense scope of this project, focus was placed upon temperate annual vegetable cultivars to provide a template for other horticultural food products. This choice aims to increase Australia's horticultural market share and competitive advantages. Consideration was also given to the issues of water use and climatic change and their impact on the selected products. With the opportunity to study the re-acclimatisation of horticultural production with regard to new climate, market influences and ownership of materials, two commodities have been selected as flagships for further investigation, heritage potatoes (*solanum tuberosum*) and heritage cider apples (*malus spectabilis*) varieties.

In terms of opportunity, and market differentiation of products already grown on a large commercial productive scale, the transition into a 'value added' cultivar for these varieties provides a first point of entry to prove the value of heritage cultivars.

With regard to databases, the large scale of horticultural food production, and the relative abundance of cultivars have meant that certain food growing plants are not included in a number of listings. Cereals and grains are not included, and only some legumes are reviewed. In many instances these can be classified as agricultural cropping systems, rather than horticultural food based products. For example, the Fellowship focused on temperate area production, similar to many parts of the British Isles, and targets fruit and vegetables of high gross values of production for the Victorian horticultural sector.

In order to achieve the Fellowship aims, a research voyage to the United Kingdom was undertaken in order to establish the genetic attrition of heritage fruit and vegetable stocks. Research included an analysis of the reasons for their demise and market opportunities that are becoming evident in the modern food bowl. The ultimate realisation of the Fellowship was to recognise that 'a list of names' would not suffice in the database and that the 'genetic fingerprinting' of cultivars was essential to clarify the depth of the gene pool.

## Identifying the Aims and Objectives

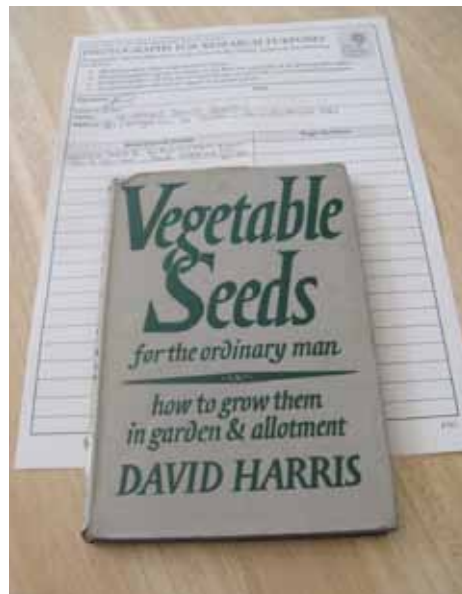
The Fellowship addressed the detrimental impact of the erosion of this historical asset on society, while providing an opportunity to address the natural advantages of re-establishing heritage cultivars within a unique, historic setting such as Sovereign Hill. In addition, issues including the current lack of recognition, training (skills and knowledge) in this field was also addressed.

# Aims of the Fellowship Program

Key objectives were to scope the feasibility of or make recommendations to:

- Development of a Plant Database of 'Heirloom Fruit and Vegetable Cultivars.'**  
 The formation of an historical database listing the importation of fruit and vegetable cultivars throughout the great Victorian era of plant exploration creates a census document and a benchmark against which we can measure the depletion of available stock to modern society.
- Extension of Plant collection archive**  
 The formation of an historical collection of heirloom fruit and vegetable cultivars the aim of which is to safely preserve genetic material for future generations.
- Investigation of Traditional Production Techniques**  
 The research and extension of traditional sustainable garden methods and their practical application within the museum setting will illustrate how modern and traditional methods of horticulture differ.

## The Findings and Opportunities



*Once a common sight on a Gardener's Bookshelf, these seed catalogues are now a valuable insight into the past – and provide a measuring stick for horticultural diversity as we compare them to the limited choices of today.*

The Fellowship provided an opportunity to identify and source cultivars from Australia and internationally and for these to be integrated into a national fruit and vegetable-breeding program. Actual trials, research and plant breeding are not part of this Fellowship. The further opportunities presented in this research may 'add value' to the current market by training producers in the traditional methods and techniques with current scientific practices, production opportunities and international benchmarks.

The ultimate realisation of the Fellowship was to recognise that a simple 'list of names' would not suffice in the database and that the 'genetic fingerprinting' of cultivars was essential to clarify the depth of the gene pool. In many instances, Europe is completing the genetic fingerprinting of their 'found collections' and has found that linking with the internet-based databases and research institutions would provide the overall best outcomes and further opportunities.

This Fellowship aims to be a catalyst describing how Australian horticulture might take its existing competitive advantages to become a sustainable, productive and economically sound industry.

# The Australian Context

## Description of the Industry

The need to develop this historical, research-based and practical project is critical as its effectiveness is lessened as the march of time claims previously widely cultivated varieties.

This bank of irreplaceable plants has shrunk alarmingly in recent times, and the trend continues. Fashions, trends and tastes have also threatened the existence of many heirloom varieties of plants, as society changes the landscape and cuisine to reflect their short term desires and time poor lifestyles.



*Globalisation and the demand for year round quality and even standards have homogenised production techniques. Photograph: Nic Gowans (Chelsea Flower Show 2008)*

A specific focus of this Fellowship is to highlight the lack of awareness and training available for the survival of these food sources. Although they were the pillars of our forefathers' agricultural and horticultural production base, the importance of such production in terms of satisfying local sustainable demand and influencing regional diets and culinary traditions are concepts from which society has departed.

## The Australian Horticultural Market

An outline of the two main sectors of fruit and vegetables follows. It needs to be recognised that horticulture in Australia is extremely diverse, and also comprises nuts, nursery products, extractive crops, cut flowers and turf, none of which were included as part of this Fellowship.

In Australia, fresh fruit and vegetables are sold through direct contracts with:

- major retailers
- wholesale contracts
- fresh produce markets.

# The Australian Context

The Australian Fruit Industry is strongly oriented towards servicing the domestic market. Around 84 per cent of production in 2002 was consumed in Australia.

*Reference: 'Australian agriculture and food sector stocktake', p.47. [www.daff.gov.au](http://www.daff.gov.au) › Agriculture and Food Home*

The individual industries are highly diverse in their size, operational complexity, organisational arrangements, maturity, and marketing and supply chain focus. Some industries are highly regionalised, while others are more broadly based.

At this point, the research for this project is aimed at local Victorian market opportunities, and export opportunities are not part of this commercial analysis.

Central to this is the concern regarding the ecological/carbon footprint of food production techniques, genetic modification of foodstuffs and society's detachment from its food bowl.

A further point of note was the movement towards food availability being moved towards products attached to the private varieties as opposed to public inheritance types. Heritage varieties remain, for the most part, public inheritance.

## The Australian Potato Market

- Potatoes are Australia's largest vegetable crop, accounting for 17.4% of total vegetable production with a gross value of \$465.1 million in 2005–2006.
- Potato production is slowly but steadily falling:
  - 1997–1998 = 1,371,606 tonnes of production
  - 2004–2005 = 1,288,269 tonnes of production.
 (*Source: Agricultural Commodities Various Years ABS Catalogue 7121.0 2007–8*)
- Supplying domestic markets has been the main focus of potato growers.
- Exports are important, but there is little growth and the search for export markets is underway although hindered by trade barriers.
- Trade pressures are growing in the processing area with imports of frozen potatoes trending slowly upwards.
- State potato production for the three major production states are as follows:
 

- Victoria	22%
- South Australia	31%
- Tasmania	23%
- Financial year 2006–2007 was the first time Australia has recorded a negative balance of trade in potatoes since 1997–1998.

## Market Segments

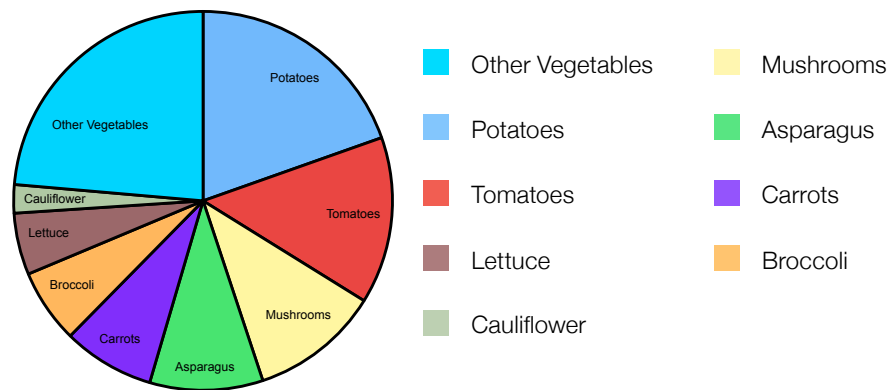
The Australian Potato Market can be divided into four segments, those being:

- fresh market potatoes
- processed frozen potatoes
- processed crisps
- seed potatoes.

# The Australian Context

For the purpose of this industry development, the market segment for heritage potatoes would be ‘fresh market potatoes’. The type of potatoes that currently fall under this category are: Sebago, Coliban, Nadine and Desiree.

### Percent of Gross Value of Production – Vegetables 2002–03

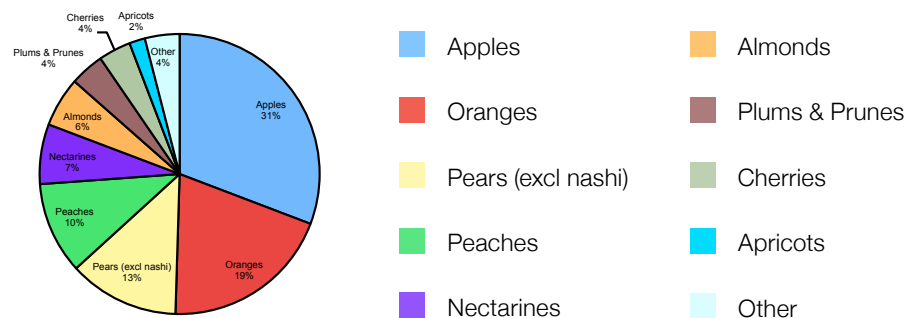


In 2002–03, Victoria was the third largest producer of potatoes, behind South Australia and Tasmania (ABS 7121.0). However, of the vegetable crops produced in Victoria in 2002–03, potatoes had the highest market value of \$A106 million, with major markets for both seed and fresh potatoes (ABS 7503.0). Victorian vegetable production accounted for 24% of the total Australian vegetable production in 2002–03 with asparagus, tomatoes and broccoli the major contributors (ABS 7121.0).

### The Apple Cider and Pear (Perry) Market

Primarily grown in Northern Victoria, apples and pears were the second and fourth largest produced fruit commodities in Victoria. Victoria produced 36% of Australia’s apples and 87% of pears. At the market place, apples were worth \$A160 million and pears \$A83 million in 2003–04 (ABS 7503.0).

### Percentage Gross Value of Production



Fruit 2002–03 (Excluding Nuts and Grapes)

# The Australian Context

## Competition in Export Markets

Fresh pear exports have dropped significantly in the last couple of years as local products are being out competed by South African products in Australia's traditional markets. The value of pear exports has halved since the late 1990s and this threatens the Victorian Pear Industry, which produces 87% of Australia's pears. The Department of Primary Industry's agribusiness unit is working through issues with local pear exporters, together with Horticulture Australia Limited, Apple and Pear Australia Limited and Northern Victoria Fruitgrowers Association Limited.

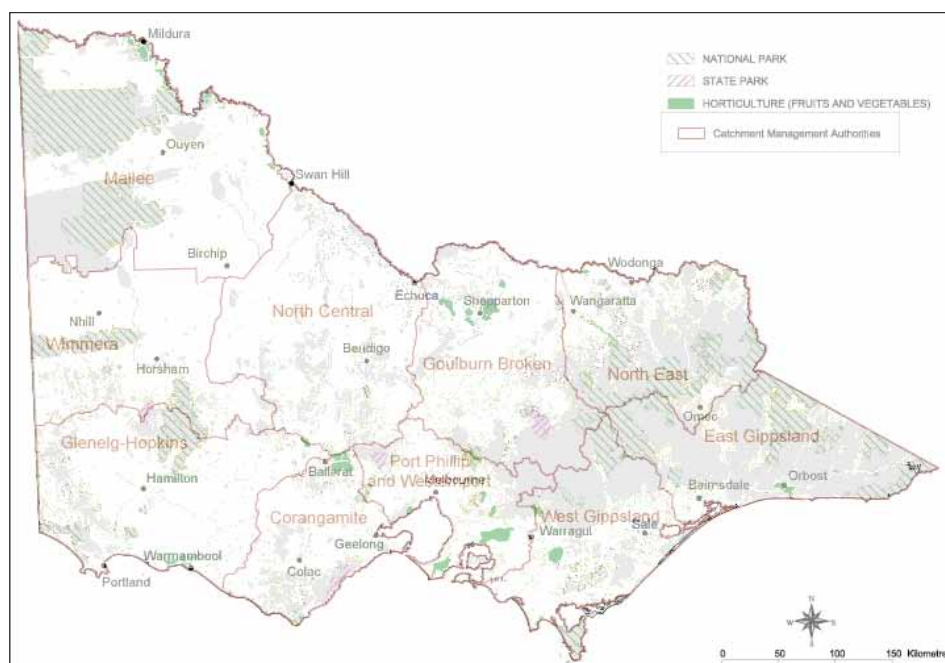
## Varietal Information for Potatoes

A distinct point of difference between the consumer of the fresh market potato based in the United Kingdom and their Australian counterpart is the recognition of potato varieties and the subsequent availability of the range of varieties.

<http://www.ausveg.com.au/assets/contentitems/public/6521/29682.ausveg.a1.poster.pdf>

## The Victorian Horticultural Market

In Victoria, horticultural industries represent 20 per cent of the value of agricultural production Gross Domestic Product (GDP) with a gross value of \$1.8 billion per annum. This value is steadily increasing as water is being transferred from low value uses to higher value horticulture uses.



Location of horticulture production areas in Victoria. Source: Victorian Resources Online.

Victorian vegetable exports are firmly focused on Asian markets, the largest being Japan, Singapore, Hong Kong and Malaysia. New Zealand, as the second largest vegetable export destination, is the only non-Asian country in the top nine export destinations for Victorian vegetable products.

# The Australian Context

The key driver which positions this report in the larger Australian context is that it plays an important role in providing re-acclimatisation of horticultural production to new climate and market influences. This is then framed in the larger industry strategies and government policy development for climate change and drought.

The research and subsequent commercialisation provides the opportunity to encompass substantial horticultural industry growth in regional Victoria, matching cultivar selections with climatic and situational advantages

## SWOT Analysis

A SWOT (strengths, weaknesses, opportunities and threats) analysis provides a useful avenue for summarising the current situation and the implications of addressing, or not addressing, the need for ongoing skills associated with assessing future directions for the collation and collection of heirloom fruit and vegetable cultivars.

### Strengths

- Preservation
- Altruistic
- Noteworthy and necessary
  - Taste
  - Texture
  - Quality
- Seasonality
  - Epicurean appeal
- Historical stories and interpretation
- Climate change adjustment and cultivar selection
- Knowledge and homocultures
  - Decrease artificial inputs
  - Decrease expense
  - Increase percentage of organic material
  - Increase funding available
- No recognised literature/a niche field
- Raising public awareness – consumer choice
- Apparent groundswell
- Organic pricing – premium prices
  - Opportunity to be a price maker/leader
- Industry support and funding opportunities
- Field could fund further study opportunities

# The Australian Context

## Weakness

- Major undertaking
- Unrelenting/unending
- Turning data into skills and knowledge, then product availability
- No definitive Australian data/knowledge/literature
- Move away from monoculture mentality/broadacre farming
- Organic production expensive start up/certification
- Stock may not be in Australia
- Quarantine issues
- Plant breeder rights
- Some breeders have 'secret society' mentality
- Quarantine issues in imported product
- Import and export parameters of various cultivars

## Opportunities

- Macro/big picture aspect is prime for further research and development
- Climate change issues, the concept of 'food miles', and calculating carbon production inputs
- Changing techniques needed to adapt to drought and climate change
- Production issues, and a market based economy
- Local market opportunities as grocery retail costs increase
- Existing micro-business mean little economy of scale
- Organic techniques
- Growing seasonally reduces inputs
- Organic research increasingly viable as fertiliser costs increase
- Profit incentive for 'Green Lifestyle'
- Profile of cultivars
- Government support due to infant state
- Industry organisational support for 'micro businesses'
- Academic connections
- International mimicry – appear to be behind UK market
- Transport of seeds and plants ready to travel
- Alliance with various 'Friends' action groups



# The Australian Context

## Threats

- The erosion of the vast gene pool of vegetables
- Drought reduces crop cultivar varieties
- Drought closes micro businesses
- Do our varieties have less or more:
  - disease resistance
  - yield success
  - uniformity
  - days to harvest
  - transport issues
  - shelf life?
- Storage and viability of seeds
- Quarantine regulations
- Lack of pollinators
- Cross pollination

## Market Opportunity and Development

In order to establish the viability of the knowledge and how it may serve the marketplace, a production paradigm has been established to highlight the cost benefits and differences in production techniques.

In general, the 'traditional' paradigm is designed to evaluate potential benefits of elements of the existing and often out-dated system, while the 'modern' production paradigm reflects the modern supply chain and production emphasis.

### The Production Paradigm

The true competitive advantages, both quantitative and qualitative can be measured in the following 'Production Paradigm' chart:

<b>Traditional</b>	<b>Modern</b>
Local	Global
Sustainable polycultures/specialist	Monoculture/critical mass based
Organic	Chemical/artificial
Accountable and traceable	Faceless and corporate
Increased regional economy driven	Corporate shareholder/return driven
Low 'food miles'	Unknown 'food miles'
Minimal packaging	Extensive branding and packaging
Minimal preservatives (technique based)	Preservative based (artificial)
Harvest moon/abundance/celebrated	Refrigerated/cold supply chain/logistics
Seasonal	All year round supply
Family based meals	'Instant fill'

## The Australian Context

The demands of the consumer have led to the Market providing details of each element of where the food comes from, how it is grown and even discussing farmyard ethics at the breakfast table.



*The demands of the consumer have led to the Market providing details of each element of where the food comes from, how it is grown and even discussing farmyard ethics at the breakfast table.*

# Identifying the Skills Deficiencies

## Definition: Skills Deficiencies

The ISS Institute embarked on its initial market research in 1990. A result of this research was the identification of an important category, that of skill deficiency. This is the key emphasis of the ISS Institute.

As already established, the definition of a 'skill deficiency' is *"where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas."*

## The Australian Playing Field

The current structure of heirloom fruit and vegetable growers revolves around a small, dedicated group of enthusiasts who have their cultivars secreted away in backyards and private collections. Many of these enthusiasts are of the older generation of gardeners. The march of time makes it difficult to maintain their collections and there is little chance to pass on their skills or plant material to an institution or individual. Many children of the modern era have no connection or understanding of 'home grown' produce.

The National Trust, Petty's Orchard, and various seed-saving networks specialising in heirloom varieties are assisting in perpetuating these cultivars. However, there is no recognised collection or locale to ensure the survival of these varieties. Consequently, the release of cultivars into the community assists in ensuring their survival in perpetuity, but this market approach is placed at risk by fashions, trends and the viability of these small boutique organisations.

Herbariums, Botanic Gardens and private collections have all played a valuable role in maintaining the diversity of plants, however, often the focus upon ornamentals, has seen the principles focused upon this section of horticulture.

The Australian National Herbarium website contains a wealth of information related to Australian herbariums, in particular the 'virtual herbarium' page which identifies the locations of the various national and state herbariums.

<http://www.anbg.gov.au/cpbr/herbarium/>

The expansion of Australia's population, the climate challenges of the modern era and the need for dramatic answers in a short period of time (as early as 2030) require collaborative innovations. The opportunities to 'fast track' the economics of research, collection management and global resources through a combined 'horticultural think tank'-with a base focus upon production horticulture-would lever our genetic opportunities into the next phase of development. The ownership (public versus private) would need to be established at the conception of such a group of thinkers.

Specific targets are sectors with interests in heritage varieties include organic growers, Bio-dynamic growers, and permaculture groups.

## Research

Background research highlights the diversity of both ornamental and edible material available to the horticulturists of previous eras, particularly during the 19th century. Traditional domestic and regionally specific production developed traits designed to fit the domestic

# Identifying the Skills Deficiencies

harvest and match the work on cultivated varieties developed by our forefathers. Much of this material has been lost or survives unidentified in home and botanic gardens. We are on the verge of losing a valuable genetic resource for future generations.

Globalisation – the quest for critical mass efficiencies and the market's love affair with logistics and assured supply have activated pathways for commercial juggernauts to dominate production. As such, the pathway for genetic attrition has been different for each geographic sector, depending upon their exposure to the new market. The new market is under threat due to a myriad of reasons including increased input costs and the capacity constraints of labour and fuel.

## Opportunities

Despite this, different factors lend weight to the same outcome and new opportunities are being developed to reverse the attrition. When heritage techniques are placed in the context of traditional systems of production, a cost benefit and lifestyle measure may appeal to certain market segments. In 2007–2008, vegetable seeds outsold their ornamental counterparts for the first time on record.

It is possible to capitalise on this situation. An opportunity exists to market information to separate industry groups whose philosophies are aligned with organic and heritage production techniques.

As such, there are both commercial and domestic market opportunities becoming apparent in resurrecting heritage varieties. They provide a valuable germplasm for plant breeding material, and other criteria include the potential to counteract the new concerns of high food prices and food accountability.

## Training

Training (both initial training and further training) is essential in meeting the increasing demand for organically grown fruit and vegetables.

Training using a component-based framework will assist in filling the information void with regard to heritage cultivars. Several platforms are available for this communication, including:

- amateur
- public
- household
- industry
- professional and trades people

Affiliated with this research, skills deficiencies are identified that need to be highlighted and addressed as being important to activating this work:

- identification of heirloom cultivars
- parochial nomenclature and cultivars.

# Identifying the Skills Deficiencies

## **The Issue – Selling the Need to the Market**

Two key components in the worldwide strategy to overcome these issues are:

- preservation of food biodiversity
- embrace methods of 'low input sustainability'.

Water availability, cost models and future security of supply are significant longer-term issues for many Australian horticulturists. By changing water use we directly change land use and the communities and industries that produce Australian food. These issues are yet to effect the United Kingdom production chains.

Economic sustainability, social concerns, ethical practices, fair trade and other non-physical issues have an important place in how we address future food production needs. The 'Convention on Biological Diversity' (Attachment 7) encapsulates some of these parameters.

# The International Experience

The following outlines the overseas visits and interviews which took place during the Fellowship trip.

## East Malling Research Station

*Meeting with Doctor Kate Evans*

### State of Play

Dr Kate Evans stipulated that the East Malling research station was in a state of transition, and that the traditional focuses of Research Stations in the field of plant breeding and quality horticultural practices was under threat due to corporate pressures and a reduction in funding from the public purse.



*Government run research centres were keystones to horticultural and agricultural development in both Australia and England last century. Much of their work (and available funding) is now shared with private enterprise and the public domain is becoming harder to source.*

This pattern can also be evidenced in Australia, although is probably more evident through a review of agricultural research publications – due to a limited pool of horticultural institutions in the southern hemisphere.

### Future Trends

Brogdale was being managed by FAST Pty Ltd, whom had taken over the management of the collections, and the germplasm. The scientific research was still continuing, with an emphasis towards collaboration with other peak organisations in the European Union. This too, can be evidenced in Australia.

One astounding comment, which appeared to become a common underlying thread, was that Dr Evans felt that *“within five years there would be no publicly funded horticultural research undertaken in the United Kingdom”*.

# The International Experience

## Why we Should Keep our Germplasm and Collections

Dr Evans stated very strongly *“that the breeding opportunities required parent material, in East Malling Research Centre’s case, apples, to capture inherent sustainability traits and flavour volatiles for future generations”*.

The East Malling Research Centre also is actively fingerprinting their collection material to avoid cultivar mix up in collection management, and to use a system that is robust and transferable across institutions. Two trees had to be on each site to fulfil international treaty obligations. The challenge was to differentiate between ‘novel and rare’ varieties.

## Fingerprinting

Fingerprinting the DNA code in fruit is becoming standard practice. East Malling had finished classifying the Pear Collection and was to finish the Apple Collection in 2009.

They had working groups to classify:

- Malus
- Pyrus
- Prunus.

The convention used, in order to establish common international markers, is from those created by the European Cooperative Program for Plant Genetic Resources (ECPGR).

[www.ecpgr.org](http://www.ecpgr.org)

## Keepers Nursery, Kent

*Meeting with Hamid and Sima Habibi*

Keepers Nursery is an internationally renowned privately run family nursery with a specialisation in heritage fruit trees. The stock of trees was sourced from across the globe, with many trees being sourced from Holland. They had a standing stock of 600 apple varieties.

They listed that their main limiting factor was plant material, which they had sourced from overseas, and also the lack of appropriately trained staff and appropriate land to run a large orchard to meet demand. They actively experimented with rootstock and budding and grafting in order to maximise the number of trees that they could keep in a limited area. They relied on Brogdale as a reputable institution from where they accessed information.

The intensive plantings of trees limited the nursery’s ability to practice organic principles, however, they used many biological controls in their management techniques. Another issue was that their land was surrounded by derelict orchards, which untended, maximised potential spread of diseases, pests and viruses.

The database and website address was critical to the success of their business, with constant upgrades being critical for their market presence. All material was only available in electronic form.

# The International Experience

## National Institute of Agriculture and Botany (NIAB), Cambridge

*Meeting with Hannah Parrish – Potato Extension Trainer, and Bruce Napier – Vegetable Specialist*

The National Institute of Agricultural Botany (NIAB) is based in Cambridge at the heart of the UK plant science community and agricultural and food industries. NIAB is an independent plant research organisation with charitable status. Its overriding charitable objective is the promotion of agriculture, horticulture and arboriculture anywhere in the world. The Institute occupies a position unique in the knowledge-based economy in its ability and commitment to use science in its broadest sense to deliver practical benefits to agriculture.

This research body encapsulates the Fellowship's aim to catalogue existing varietal availability with its 'NIAB Vegetable Finder', which has '35 garden seed catalogues, and an updated database of vegetable and herb varieties. Contrary to perceived wisdom the number of varieties available to gardeners is not shrinking but increasing with 230 extra entries this year. The total list contains over 6,000 names of which just over 400 are herbs and the balance vegetable varieties.

### Australian Context

This pattern can also be evidenced in Australia, although is probably more evident through a review of agricultural research-due to a limited pool of horticultural institutions in the Southern hemisphere.

## Brogdale – FAST Ltd

*Meeting with Tim Biddlecombe*

Tim Biddlecombe approached the perspective of commercial opportunity and the business approach to managing heritage collections, in particular the role of FAST Ltd as custodian of the iconic Brogdale collection. This 'suit and tie' approach to horticulture, whilst necessary, appeared to highlight the need for best practice horticultural practices balanced with minimal capital input. Contract specifications appeared aligned with keeping collections 'alive' – which has certain implications as to the benchmarks for acceptable standards.

FAST Ltd was an example of the public/private partnership models which were predominate in the British horticultural scene. They reflected the continued move away from the publically funded agricultural/horticultural research stations which had closed or been transformed by the new economic models. A similar trend is evident in Australia.

## Lost Gardens of Heligan and the Eden Project

*Meeting with Phillip McMillan-Browse*

The Lost Gardens of Heligan is a keystone garden in English garden restoration. It is recognised as one of the best examples of a privately run commercial operation and was overseen by Phillip McMillan-Browse. McMillan-Browse was a former Director of Wisley Royal Horticultural Society (RHS) and a key driver of the Eden Project.

McMillan-Browse had a strong commitment to making a sustainable business model, whilst aligning both traditional methods and plant material to flag the importance of past lessons in today's future. His definition of rarity was both succinct and surprisingly simple. He stated: "*Rarity is something that you want, and cannot get*". A further philosophy that resounded with the Fellow was: "*When looking at doing the impossible, ask a young person because they do not know that it cannot be done*"



## The International Experience



*The iconic domes of the 'Eden Project' in Cornwall reinforce the need for a haven for biodiversity and have revitalised the local economy as tourists flock to this 'mecca of sustainability' and educate themselves and their families in a world class setting. Photographs – Nic Gowans*

## The International Experience

McMillan-Browse, with Solomon-like wisdom, supported the efforts of heritage fruit and vegetable archiving, but was at pains to point out that many of the species that are no longer available are not around for a reason. They were either not up to the mark, or not worth keeping as superior varieties became available.

He also stated the importance of preserving diversity, particularly for plant breeding, but was of the opinion that of 500 vegetables on the list - perhaps eight may have true potential in productive horticulture.

Special mention was made of Australia's Clive Blazey, of the Digger's Club, as McMillan-Browse proudly showed Heligan's Rainbow Chard. A variety that was extinct in England, and resurrected by Blazey here in Australia from a local seed collector. There is definite irony here, with a focus of the Fellowship, being to source material for Australia from England. It was nice to see the favour be returned.

McMillan-Browse was able to tie many findings into a bundle and reinforce the opportunities, both commercial and heritage based for Australian horticulture and also as heritage plants leading the way as a potential 'tourist mecca'.

### Heritage Seed Library – HDRA

*Meeting with Rachel Crow and Dr Anton Rosenfeld*

The visit to Coventry fulfilled two objectives, and proved that there are definite synergies behind combining the functional, volunteer based philosophies of the Henry Doubleday Research Association and Ryton Organic Gardens. They are both located in the same cluster of buildings and although the philosophies align, their audiences and final intentions differ.

Rachel Crow oversees the practical and hands-on approach to seed saving and archiving. Dr Anton Rosenfeld focuses his attention upon the potential benefits of low input sustainable solutions for agriculture, and works closely with leading farmer groups and government departments to test the merits of alternative approaches to modern farming.



*A meeting of the traditional and the modern as heritage varieties are collected are grown using modern production methods. Note: these plants are also grown in gardens at the Henry Doubleday Research Association. Photograph: Nic Gowans*

# The International Experience

An instance of which was the review of nitrogen fixing legumes in cropping systems to alleviate the need for synthetic, and often expensive, fertiliser additives that add significant cost burdens to the farm enterprise.

These theories carried equal interest to both the modern farming practitioner and the organic counterpart thereby encouraging collaboration, discussion and investment in future agricultural research. This critical mass of interest was also a powerful lobby to government to support these activities.

The modern challenge of climate change was front-of-mind in these field trials, as the nitrogen fixing legumes reduced the application of fertiliser and the escape of nitrous oxide that is a key green house gas emissions source.

## Other United Kingdom Contacts Visited/Interviewed

The listing of contacts also visited, which appears below, is made up primarily of horticulturalists, with discussions focusing on: sources of plant material, horticultural practices and principles involved in keeping a collection and the bio-physical challenges of curating a living museum.

In many instances, these were large collections with substantive staff and long-term strategies. The interviews took a 'convergent' storyline to the above descriptions, and therein are covered here. Key findings have been embedded throughout the document.

*(NOTE: Where 'Also' appears, the named individual shared dual titles and roles)*

- Dr Stuart Wale  
Head of Crop Services  
Scottish Agricultural College (SAC)  
Aberdeen, Scotland
  - Anthony Boulding  
Horticultural Manager – Gardens and Estate Team  
Historic Royal Palaces  
London, UK
  - Tim Biddlecombe  
Managing Director  
Farm Advisory Service Team  
Faversham, UK
  - Jim Arbuckle  
Royal Horticultural Society (RHS),  
Surrey, UK
- Also: Royal Horticultural Fruit Group  
RHS Garden  
Woking, UK
- Also: International Society for Horticultural Science
- Also: UK National Fruit Collections
- Colin Randel  
Vegetable Product Manager  
Thompson & Morgan  
Ipswich, UK

# The International Experience

- Susan Robinson  
Robinsons Vegetables Seeds And Plants  
UK
- Sylvia Travers  
Lost Gardens of Heligan  
UK
- Garden Organic  
Ryton  
Warwickshire, UK

## Learnings and Outcomes of the Overseas Research

The Fellowship provided sponsorship to travel to England to map and monitor the key sources of 'heirloom fruit and vegetable varieties', as a majority of the stock imported during the Victorian era of the nineteenth century and the associated production techniques were sourced from the UK. Site visits within the UK were identified so as to ensure that the Fellowship aims and objectives would be achieved. Visits were arranged with professional horticultural bodies, such as the Royal Horticultural Society (RHS), to observe examples of heritage species and management techniques. Gardens of note included Hampton Court Gardens, The Lost Gardens of Heligan and The Eden Project.

There were some key points of learning identified during the Fellowship, which differed from the original planned approach that the Fellow expected to discover before the trip. In short:

- The primary purpose of the Fellowship was designed with a 'taxonomic intent', meaning that the naming of plants was to be the benchmark comparison between Australian and the British Isles.
- The shifting sands of scientific research and the confusion behind names led to the focus being moved towards the 'genetic fingerprinting' of heritage cultivars to be of key concern, rather than standard titles or generic naming.
- This genetic fingerprinting was most common in the peak research institutions and had consistent research threads across the European Union.
- The development of the genetic databases were evolving, and electronic database management meant that a 'static report' was not appropriate to monitor the learnings.

The Fellowship uncovered that a more efficient and effective way to classify heritage fruit and vegetables was through the development of a strategic alliance with existing collections managers and researchers in the United Kingdom.

## The Challenge

The challenge remains to know what to save with the resources that we have available and to create a system to review and what will be an ongoing task. This is a quest approach as there will always be another generation of mouths to feed, changing technologies and a changing planet.

The food and traditions from the past are our public inheritance and will only remain so by the vigilance and commitment from those people who demand a choice of what they and their children put in their mouths. At this point the Fellow acknowledges the statements and thinking of Australian Horticulturist, Alan Gilbert, as part of the outcome realised from this Fellowship and is indebted to him.

# The International Experience

In the realm of horticulture specific to the temperate zones of Victoria, Australia, much of what was gained has been lost. Succession planning of valuable historic resources becomes essential if we are to provide a solid, balanced and realistic set of actions to mitigate the problems, both immediate and those identified in modelled futures.

These artifices are physical, in the need to preserve and activate the opportunities provided in the genetics of the plant materials painstakingly selected by our forefathers, but also more ethereal and transient as part of the skills base and the horticultural practices and principles that have embodied traditional production.

## Key Findings

The key findings from the various bodies and individuals visited have been consolidated into a structured format identifying actions required, as outlined later in the 'Recommendations' chapter.

### Lessons from England

#### The Good Ideas – Opportunities

The key opportunities that need to be embraced are:

- The secret to sustainability lies in diversity and rotations.
- The secret to rotation is the appropriate utilisation of diversity and patience.
- The biggest threat to diversity is rarity (Phillip McMillan-Browse wisely described rarity as *"Something you want, and can't get!"*).
- The diversity of fruit and vegetables is under threat in the public domain and choice of foodstuffs is consequently being limited by commercial ownership.

#### The Threats – Roadblocks to our Strategy

The key threats to the horticultural diversity of heritage cultivars are:

- Lack of funding for continued management and care of horticultural collections, specifically the genome collections.
- The prevalence of plant breeders' rights to be used in horticultural businesses.
- The resultant need to cull, so as to save only those cultivars that are of commercial value and illustrate potential for breeding programs.
- The need to avoid duplication of cultivars due to synonyms and 'convergent evolution' of previous breeding.
- The need to have scattered clusters of plant material, information and data to protect stocks from stochastic events, national regulation, breeders' rights jurisdictions, pest and disease outbreaks and climate change events.
- The gradual reduction of plant material due to viruses and disease.
- The threat of institutional compartmentalisation fracturing collections and public benefit opportunities.
- There is no standardised trialling in the UK that shares results with everybody.
- Standardised trialling is required for the active fingerprinting of the 'found' collection material to avoid cultivar mix up in collection management, and to enable a system that is robust and transferable across institutions is becoming standard practice.

# The International Experience

## Activating the Public – Small Hands Turn the Wheel

Forums that exist in the United Kingdom include:

- The RHS
- The National Trust
- Allotment and community gardens
- School gardens
- Botanic garden collections
- Plant nurseries
- The Henry Doubleday Research Association
- East Malling Research Centre
- Brogdale
- Agrifood Industry groups (ie Apple Cider Industry, Organic Sector, etc)



*Allotment gardens are popular throughout the United Kingdom and are an emerging pastime for city-based Australians. Each member is given a small area and a tremendous wealth of community spirit, and knowledge is exchanged. Many allotments have a substantial waiting list. Photograph: Nic Gowans*

## Summary of Findings

The findings of this report can be summarised as follows:

- The key information in Europe is broken into fragmented centres of research – each focusing upon a separate genus or commodity.
- This research is being undertaken by cooperative research partnerships between traditional research hubs and commercial enterprise.
- New technology and genetic information is making ‘traditional’ information and nomenclature less important.

# The International Experience

- Varieties are becoming increasingly tied up by private ownership and bureaucratic hindrances (including a term called 'bio-piracy').
- Australia appears to have little understanding of the European context.
- There is little need for Australia to replicate the science, but to develop collaborative networks to share the knowledge.
- Australia needs to collate and identify its food based plant material into a central forum in order to align itself with potential opportunities.
- There are distinct opportunities for plant breeding of cultivars in the commercial sector and for marketable quantities of specialist material in the domestic sector.
- Smaller and larger-scale enterprises are well positioned to respond to new opportunities.

## **Structure of United Kingdom Horticulture – Types of Horticultural Institutions**

There were several interactions between key horticultural industry types, with the dominance, funding and importance of each agency (ie National Trust, RHS) being more prominent than they are in Australia.

### **Government Based Traditional Research Agencies**

The first category of research was information sourced from peak research organisations:

- East Malling Research Station
- Brogdale – National Fruit Collection (FAST)
- National Institute of Agriculture and Botany (NIAB)

### **Not-for-Profit/Non-Government Organisations**

The second category of research was not-for-profit/non-government organisations that facilitate public learning and conservation through the delivery of their service. This group includes government owned municipal parks with a heritage focus:

- RHS Gardens
- National Trust properties
- Museums
- The Museum of Garden History
- The Victory Garden

### **Large Commercial Entities**

The third category includes the commercial enterprises that play a role in the industry and have profit as their primary motive:

- Keepers Nursery (nursery based)
- Robinson's Seeds (nursery based)
- Thompson and Morgan Seeds (nursery based)
- The Eden Project (tourism focus)
- The Lost Gardens of Heligan (tourism focus)

# The International Experience

## Micro Businesses

Small micro-organisations and outlying groups were also visited, but in these instances they formed more of the 'renaissance' wing of conservation methods. As such, they are provided more as references as to the level of importance that they play for future actions. These include commercial and not-for-profit groups such as the Henry Doubleday Research Association (HDRA), the Eden project and Keepers Nursery.

- Henry Doubleday Research Association
- Heritage Seed Library
- The Eden Project
- The Lost Gardens of Heligan
- Yalding Organic

The context and scope of the findings, whilst transferable to the Australian industry horticultural scene, differ substantially in terms of the size of the market, the number of producers and the immense nature of trade between members of the Economic Union.

## Horticultural Markets – Scope of Market Size and Complexity

The size and complexity of the horticultural market place across Europe, and the trade based cross-pollination of commodities humbled the Australia horticultural playing field.

This was apparent in the following areas and activities:

- dollar based market value
- information availability
- institutional knowledge
- cooperation between firms
- technology
- strategic direction.

## Key Market Size and Complexity

The obvious factors attributed to the variation of market sizes between Australia and the United Kingdom were:

- potential market size
- logistics of distance
- cultural age
- climatic factors
- ethnic diversity and preference.

There were also several less noticeable, but important points of difference between the United Kingdom marketplace and Australian horticulture:

- Many of the horticultural producers in England have obtained significant government support to assure that production levels can compete with the European marketplace.
- Labour shortages were overcome through the use of immigrants, mainly from Poland.



## The International Experience

- The organic market for fruit and vegetables has up to twenty-five percent market share.
- Many enterprises mixed modern and organic farming methods.
- Organic fruit and vegetables attracted a price premium.
- Food miles were an emerging consideration as to consumer purchasing behaviour.
- Private horticultural research was becoming standard and public research was being reduced.
- The National List scheme played a significant role in affecting cultivar diversity.
- Small hubs of diversity were promoted through volunteer and not-for-profit based groups (ie Allotment Gardens and The Heritage Seed Library).
- There appears to be a preference for the modern trend of public/private partnerships and subsequent co-investment between commercial and public entities.
- Several traditional research centres had been closed, or moved into tender based commercial agreements (ie Brogdale, East Malling Research Centre).
- Climate change policy and research dominated many of the future production implications and partnership agreements.

# Knowledge Transfer: Applying the Outcomes

The challenge for modern society is to feed its ever expanding population, adjust to changing climates, manage pests and diseases, manage land and water resources, control increasing energy costs and create 'low input' sustainable production systems. This movement was becoming dominant in the United Kingdom in May 2008.

The time appears ripe for change. A shift in tastes, consumer attitudes and concerns regarding the environment and growing conditions are changing the manner in which Australians view their fruit and vegetable stocks. This shift presents opportunities to provide for a range of niche plantings and alternative techniques that reflect modern social and science based horticultural production in this country.

The consensus from those visited and interviewed in the United Kingdom was that the information transfer to Australia of their accumulated knowledge provided no immediate threat, as our trade market in horticultural products are not in direct competition. The information collated from the research tour is part of a large body of work by the United Kingdom specialists; intended to be made available on the Internet for the public good. This international attitude assisted in focusing the parameters of this report, and in identifying downstream research movements that quickly became apparent during the Fellowship visit.

This report is a foundation document designed to highlight the skills deficiencies in this area, and to summarise the potential alternatives to current production systems and stocks. Currently, there is no consolidated data in the public domain charting this information in Australia. European countries have small pockets of commodity specific information and their governments and corporate research bodies are actively researching this body of knowledge.

In order to optimise outcomes and opportunities, Gowans recognises the importance of ensuring that the knowledge obtained as a result of the Fellowship is shared with others.

Applying the outcomes is directly linked to creating a 'pathway to profitability'. This may take many forms involving government, non-government, the private sector, and the householder to play a role in ensuring food diversity for Australia.

This report provides an opportunity to identify and source cultivars from Australia and internationally to be integrated into a national fruit and vegetable-breeding program. Trials, research and plant breeding are not part of this Fellowship. It is intended that the opportunities presented in this research will 'value add' to the current market by providing information to producers regarding traditional methods and techniques, current scientific practices, production opportunities and international benchmarks.

## Case Studies

The database concept of heritage potatoes and apple cider cultivars is designed to be a flagship for broader commodity groups, and is a prototype to inform horticultural growers of the competitive advantages of these cultivars.

*For further information on the Australian Horticultural Industry see 'The Australian Context' chapter within this report.*

# Knowledge Transfer: Applying the Outcomes

## Heritage Potatoes

The key United Kingdom agencies which contributed to these learnings are the:

- British Potato Council
- Scottish Agricultural College
- National Institute in Agriculture and Botany (NIAB).

<http://www.niab.com>

The web address provides excellent background information and existing knowledge transfer techniques and will provide the latest evolution in the strategic thinking of the potato industry. The British Potato Variety database, available via subscription through the British Potato Council, is the benchmark research tool for breeding and genetic information in the United Kingdom.

Potatoes are the fourth largest food crop internationally, and account for 20% of all vegetable production in Australia. There are approximately 1.3 million tonnes of potatoes produced in Australia annually, valued at \$480 million dollars annually at the farm gate.

Potatoes are the dominant production vegetable in the Victorian economy with significant trade volumes, albeit in limited varieties, being traded interstate and overseas.

The Australian potato industry is the single largest vegetable commodity in the country. In 2006 Victoria contributed approximately 22 percent of the nation's total production volume with a GDP of \$155 million.

Tony Slater, from the Department of Primary Industries (Victoria) Breeding Program, provided the following assessment as to why new breeds and old varieties had an important role to play for the Australian Potato Sector.

*"Despite potatoes being a valuable food crop for Australia, the current main commercial cultivars suffer from a number of production and quality issues. Disease susceptibility, tuber distortion, internal disorders, and storage problems, to name just a few. Disease susceptibility, in particular, can be potentially damaging for the industry, but it can be managed through selecting certain parent characteristics of heritage cultivars.*

*Australia is also predicted to be severely impacted by climate change. As well as the expected increase in temperature, rainfall in southern Australia is predicted to decrease significantly, with fewer but heavier rain events. Potato production under these changing conditions will require cultivars that are more tolerant to heat and drought.*

*New cultivars, either bred locally or off shore, are needed in Australia that have traits to overcome these issues. Research is needed into the physiology and genetics of these important traits that will lead to the development of cultivars suitable for Australian growing conditions".*

In order to activate and promulgate the knowledge of this Fellowship, heritage potato varieties form the basis of the recommended data base production.

# Knowledge Transfer: Applying the Outcomes

## Cider Apples

The key United Kingdom agencies which contributed to these learnings are the:

- East Malling Research Centre
- Brogdale heritage fruit collection
- FAST Ltd

The apple industry in Victoria and Tasmania is entering a reshaping period due to the effects of trade adjustments from New Zealand and other overseas markets.

The United Kingdom has a burgeoning market in apple cider production and there is significant opportunity to activate a niche market in the development of a Cider Apple Industry. A focus on available apple varieties traditionally used for cider illustrates market opportunities for our economy.

An influx of interest into 'boutique brewing' in the Australian beverage industries has saturated the marketplace with a multitude of regionally based micro-breweries designed to produce beer, and spilling over into regional produce hubs with a strong tourism focus.

The quest for a competitive advantage, to establish a point of difference, has uncovered that strategically and operationally cider making can 'add value' to existing enterprises and access new markets.

# Recommendations

## Summary of Fellowship Results

There is an underlying groundswell in Australia from people passionate about plants with a common purpose to collate and archive both information and material pertaining to heritage fruit and vegetable material. These individuals, although united by a common purpose, lack cohesion and a structured framework for their ambitions.

The limiting factors that need to be addressed in Australia are:

- The biophysical environment, including land value, drought and water limitations.
- The marketplace and economic conditions.
- Appropriate support mechanisms.
- A lack of governance and standardised agreements.

The context of the English heritage landscape of which fruit and vegetables are but one component appears to be strongly funded and supported. A range of mechanisms creating fertile ground for the continued resurgence of these valuable germplasms is urgently required.

## Spillover Findings

An interesting aside deriving from the broader research was the discovery that there was insufficient cultivar selection information for all fruit and vegetables - not just heritage varieties. These market information gaps appear frequently in the horticultural industry, and may provide an opportunity to streamline production efficiencies and market supply and demand opportunities. Collaborative work with Burnley College, University of Melbourne and the Department of Primary Industry, Victoria, will assist in optimising the information and knowledge of this Fellowship report.

There is, however, a spillover opportunity to embrace local, sustainable production methods using the research and subsequent commercialisation to provide the opportunity to encompass substantial horticultural industry growth in regional Victoria by matching cultivar selections with climatic and situational advantages. Central to this is the concern regarding the ecological/carbon footprint of food production techniques (food miles), genetic modification of foodstuffs and society's detachment from its food bowl.

## Summary of Recommendations

This Fellowship report provides a foundation to highlight the skills deficiencies in this area and summarise the potential alternatives to current production systems and stocks. As established previously there is currently no consolidated data in the public domain charting this information in Australia and, therein, the commercial opportunities arising from availability of such information.

European countries have small pockets of commodity specific information and their governments and corporate research bodies are actively researching this body of knowledge. The balance of responsibilities, ownership and research matters are in a state of flux - and this echoes the situation occurring in Australia.

European horticulture is in a period of re-adjustment as it balances the repercussions of the European Union trade implications, carbon pollution reduction schemes, the bio-physical affects of climate change and the redistribution of investments (public and private dollar) created by the global financial crisis.

# Recommendations

These parameters also appear in Australia, although it may be argued to a lesser extent, and that we are 'five years behind' in some of this thinking.

In Victoria, the current approach to primary production methods has been to review the traditional 'role of government', which basically means that actions such as research and development is shared with private enterprise.

Activities such as plant breeding to which much of the focus of this report is aligned, has a market space opportunity for the commercialisation of that material. Public inheritance breeding programs are not viewed as current 'role of government'-albeit government will need to play a role in the importation and regulation of material and subsequent patent and ownership issues where they affect the public benefit.

## Government

Government at all levels to support the aims of this Fellowship to review and enhance:

- Federal Government support to develop and initiate appropriate incentive schemes.
- On-shore manufacturing/value adding for on-shore primary industry food production.
- Federal Government Trade Policy to prioritise low biodiversity/rare food germplasm for breeding and conservation programs.
- Federal and State Government-enhance skills and training across all horticultural education sectors.

The Department of Primary Industries (Victoria) is undergoing a significant shift in focus to adjust to new market and climate challenges. The key avenue for recommendations in this report would be well aligned with the: *'Agriculture and Fisheries Four Year Strategy 2010–2014'*.

This strategy document was in production at the point of printing. However, a changing emphasis towards 'developments of plants (grains, horticulture and forage crops) that are better suited to the predicted drier and more variable production environment<sup>2</sup> was front-of-mind in strategy. This is part of focus area 1.1 'New and Improved Products Through Genetic Technologies'.

## Federal and State Government Bodies

The key objectives of the Fellowship were to scope the feasibility of, or make recommendations to:

### **Development of a Plant Database of 'Heirloom Fruit and Vegetable Cultivars.'**

The formation of an historical database listing the importation of fruit and vegetable cultivars throughout the Victorian era of plant exploration creates a census document and benchmark against which we can measure the depletion of available stock to modern society.

### **Organisational Alignment**

Herbariums (both State and Federal) are well positioned to capture some of the recommendations of the report, albeit many herbarium activities have not (to the best of my knowledge) had a productive horticultural focus.

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<sup>2</sup> 'Agriculture and Fisheries Four Year Strategy 2010 -2014.' Discussion Draft p.17

## Recommendations

There is also a 'virtual herbarium' which does a lot of work and has existing databases. Alignment with these organisations would be an advantage in ensuring that the 'non-living' static science and plant material could be stored and accessed by key stakeholder groups. These groups may be public, private or non-government organisations.

As a supplement to the 'Herbarium approach Botanic Gardens' Kitchen Garden program (ie Stephanie Alexanders Kitchen Garden program), outdoor museums such as Sovereign Hill and home gardens would be able to house the 'living collection'. These discussions are expanded later in the document.

Example Websites for Herbariums Include:

<http://www.anbg.gov.au/cpbr/herbarium/>

<http://www.chah.gov.au/avh/avh.html>

[http://www.rbg.vic.gov.au/research\\_and\\_conservation/herbarium](http://www.rbg.vic.gov.au/research_and_conservation/herbarium)

### The Millenium Seedbank Project Alignment

Several conservation programs exist around the globe. Victoria's collection is located at the Victorian Conservation Seedbank, whose brief at this stage does not include productive horticulture. Lessons and strategic alliances would be able to be developed through the mirroring of this project - in a similar fashion as how that project had its origins in Kew (England).

'The Victorian Millenium Seedbank' (MSB) partnership (the Victorian Conservation Seedbank) was launched by the Minister for Environment in August 2005. It is a collaboration of the Royal Botanic Gardens Kew, the Royal Botanic Gardens Melbourne, and Victoria's Department of Sustainability and Environment. It will collect seed of Victoria's nearly 400 endemic plant species (ie species not known to occur anywhere else in nature) and other species of a high priority, because of their vulnerability to extinction, or their critical value to threatened communities. The seed will be cleaned, dried and stored as duplicated seedlots at two sites: the National Herbarium of Victoria at the Royal Botanic Gardens Melbourne, and at Kew's Millennium Seed Bank at Wakehurst Place, a historic property in West Sussex, England, both in facilities that maintain the seeds at  $-20^{\circ}\text{C}$ .<sup>3</sup>

### Recommendations

- Development of a plant database of 'heirloom fruit and vegetable cultivars' using the standardised genetic fingerprinted approach as already used in the European research community.

It is also envisaged that this work will be framed by the 'International Treaty on Plant Genetic Resources for Food and Agriculture' developed by the Food and Agricultural Organisation (FAO), in November 2001. This legally binding treaty covers all plant genetic resources relevant for food and agriculture.

- Heritage fruit and vegetable cultivars present a significant opportunity to add to the range of product and diversity in the Australian market whilst increasing the overall value of the industry.

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<sup>3</sup> [http://www.rbg.vic.gov.au/research\\_and\\_conservation/seedbank](http://www.rbg.vic.gov.au/research_and_conservation/seedbank). Accessed 16th October 2009

## Recommendations

Currently, a lack of readily available and accurate data on important traits of these cultivars is severely hampering efforts to identify material that can be used in their genetic improvement programs and to improve overall horticultural production efficiencies.

- The lessons from the United Kingdom, aligned with the Fellowship objectives are to take the path of least resistance and to replicate and transfer the learnings from the peak United Kingdom and European Union research institutions.
- A self regulated approach needs institutional support and guidance, rather than the doctrine of forced regulation:
  - The Fellowship study initially worked from the premise that the move towards large-scale industrial production was the primary cause in the attrition of species diversity.
  - Resultant investigations have revealed whilst industry played a role in this, it was the flow down from the regulation of industry through legislation and bureaucratic red tape that has caused a downward cascade of species numbers since the 1970s.
  - The key legislation in this issue was The National List. Subsequent streamlining of European policy and free-trade issues has compounded this problem. Such factors would have only a limited impact on the Australian industry, as a high level of bio-security concerns underpin our international context rather than market dominance and trade forces.
  - As such, the results have come to the same end, albeit through different systems and processes. The United Kingdom and Australia are both in need of the protection of fruit and vegetable cultivar diversity for the common reasons stated in this research.
  - Governmental and industry trends of mimicking existing systems may lead to unforeseen attrition of cultivars through the indirect knock down effect of well intended but inappropriate legislation and strategy.

### Extension of Plant Collection Archive

The formation of an historical collection of heirloom fruit and vegetable cultivars to safely preserve genetic material for future generations.

### Recommendations

- To create an economically sound model to ensure the extension of existing plant collection archives using government and non-government institutional arrangements.
- To create, support and lobby for suitable institutional support for the Australian collection of heritage fruit and vegetables and horticulture, in general:
  - A disturbing thread detected throughout the visit to the United Kingdom, was the lack of confidence of key researchers to envision any publicly (ie government) funded horticultural research conducted within five years.
  - This confirms a major shift away from the traditional role of government, and is a reflection upon the new era of government only playing a role when there is evidence of market failure, with industry development to be driven by privately owned, commercial interests.
  - As is evident in Australia, public/private partnerships have become the norm to fill the void traditionally worked by government. The economic crisis of 2007–2008 has shifted the ground on which these market based instruments and investments are structured.



# Recommendations

- The increased cohesion of food-based initiatives which already play a role in the grass roots awareness of food production are well positioned to be catalysts for change:
  - New institutions or a change in the strategy of existing organisations moving towards models emulating The Heritage Seed Library and The Henry Doubleday Research Association would provide a hub for information and enlightened science-based literature for all members of society. Sovereign Hill Museum's Association stands in a position to roll out the collection concept.
- The Australian horticultural industry needs multiple forums to keep diversity alive and accessible to the public - these forums are both the physical manifestations of the plant collections and the active advocacy of their survival in the cultural mindset of the community and also in the larger government and private sectors.
 

In many instances, the thing to remember is that, in our quest 'it is the small hand that turns the wheel', and the smaller players have traditionally been the custodians of the plant material and knowledge.
- The knowledge transfer has its foundation in communication and awareness strategies, which include:
  - Raising industry awareness of the advantages of heritage/open-pollinated seeds by the provision of workshops and information sent to training bodies.
  - Identifying supply and demand for heritage fruit and vegetables.
  - Construction of a national database of heritage fruit and vegetable producers and suppliers.
- The Fellowship provided an opportunity to identify and source cultivars from Australia and internationally to be integrated into a national fruit and vegetable breeding program. The opportunities presented in this research may add value to the current market by training producers in the traditional methods and techniques with current scientific practices, production opportunities and international benchmarks.

## Industry

### Investigation into Traditional (Low Input Sustainability) Production

An investigation into traditional low input sustainable production methods is required to identify gains that can be made in both the short term and long term.

#### Recommendations

- The research, extension of traditional sustainable garden methods, and their practical application within a 'museum setting', and field based works in training institutions will illustrate how modern and traditional methods of horticulture differ.
- To create, support and lobby for suitable institutional support for low input sustainability approaches through the lens of 'climate mitigation'
  - Traditional methods of horticulture and agriculture prior to the 1850s were organic, local and sustainable.
  - The development of chemical- based fertilisers and synthetic/artificial inputs was in its infancy, and techniques had largely passed the test of time to reflect their effectiveness and viability.

# Recommendations

- Characteristically, heritage cultivars have inherent pest and disease resistances that modern day society may have to synthetically reproduce at great cost.
- Companion planting, crop rotation and manure-based fertilisers illustrated an affinity with the soil that has now been largely removed by modern commercial production techniques.

## Professional Associations

Professional organisations, such as those listed in the acknowledgement sections, would primarily be able to provide information, and organise and deliver seminars and intellectual support to further work in the field of heritage fruit and vegetable conservation.

The Fellow is available to discuss the findings and recommendations included in this report with Agri-food Skills Australia and other professional associations in regard to standards and content of seminars and other professional support activities.

## Education and Training

The Fellow is available to discuss the findings and recommendations with AgriFood Skills Australia in regard to standards and content related to currently accredited courses and amendments/additions to those offerings.

The Fellow is also available to discuss the aforementioned with specific universities and TAFE institutes who provide horticultural education and training.

## Community

Increasing community interest in growing their own fruit and vegetables at home and also an increasing set of demands from consumers on the 'supply chain' to have accountable and sustainable production practices are all having considerable impact upon the demand for these products in the nursery sector. At this point in time, the 'seed saver' groups are key agents in the market for heritage seeds. By raising community awareness, seed would become more available through major retailers and this would assist in alleviating the rarity of heritage cultivars by their entry into the mainstream market.

## ISS Institute

ISS Institute to consult with the Fellow to disseminate this report and further to develop a series of seminars and/or workshops with international and local experts to present the report's findings and recommendations related to the future of heritage and conventional fruit and vegetable cultivars, and the advantages of developing the databases mentioned previously in this report.

## Further Skills Deficiencies

Heritage fruit and vegetable cultivars have the capacity to increase the diversity of product available to the Australian market whilst increasing the overall value of the industry. Currently, a lack of readily available and accurate data on important traits of these cultivars is severely hampering efforts to identify material that can be used in their genetic improvement programs and to improve overall horticultural production efficiencies.

## Recommendations

The following activities are needed in order to tease out these deficiencies:

- **Form a strategic alliance with an official, registered archive for ‘the collation and collection of heirloom fruit and vegetable cultivars’ as a forum for public and professional research and development.** Currently, there is no large-scale public institution in the Southern Hemisphere where public and professional bodies are presented with the opportunity to recognise plant varieties to ensure their long-term survival. Herbariums provide an excellent source of dried and preserved specimens, but living collections exist in an ad hoc manner.

Much of the European content and genetic material has already been mapped and collated into a standardised database. Logic suggests that a strategic alliance with these groups may serve the need, create synergies and an exchange of ideas on a global scale.
- **Create a standard, accepted listing of botanical nomenclature, genetic mapping and common names to minimise current confusion.** There is a large amount of confusion as to the classifications and appropriate nomenclature of heirloom varieties of fruit and vegetable cultivars. Regional naming and parochial classification of plant material is currently confusing the accurate collation of available stock. A central database would assist in rectifying this issue.
- **Evaluate the erosion of available ‘Heirloom Fruit and Vegetable Cultivars’ through the creation of a database.** A census of available stock, and sourcing its location in view to propagation, could be compared with the range and diversity of plant materials available in the 19th century. This would assist in the future management of this resource to minimise future losses.

Modern data storage techniques mean that paper based records that have been the traditional ‘holy grail’ of heritage specialists are now being stored electronically, and information disappears as soon as it is outdated or out of fashion.
- **Highlight the lack of awareness and the advantages of biodiversity of heirloom fruit and vegetable cultivars.** The collation and collection of heirloom fruit and vegetable cultivars at Sovereign Hill Museum’s Association provides a forum to emphasise and preserve the cultivars and production techniques of the past.
- **Highlight alternatives to chemical based production methods.** The plant materials that we are endeavouring to preserve, in many instances, were keystones to our gardens and horticultural industry. Characteristically, they have inherent pest and disease resistances that modern day society may have to synthetically reproduce at great cost.

Companion planting, crop rotation and manure-based fertilisers illustrated an affinity with the soil that has now been largely removed by modern commercial production techniques.
- **Illustrating the potential to merge traditional and modern techniques and cultivars to add value to the horticultural industry.** The collation and potential collection of 19th century plant material and traditional methods of cultivation provides a valuable opportunity to compare and contrast modern practices and historical methods. This in turn allows for a renaissance of horticultural diversity in both material and knowledge.

## Recommendations

- **Illustrate practical methods to reduce the ‘footprint of food production’ through traditional techniques.** Traditional methods of horticulture and agriculture prior to the 1850s were organic, local and sustainable. The development of chemical based fertilisers and synthetic artificial inputs was in its infancy, and techniques had largely passed the test of time to reflect their effectiveness and viability.

### A Roadmap to Success

A strategic partnership is to be established as part of a global umbrella to protect cultivars. Limited funding and quarantine roadblocks, that would make the importation of plant materials to Australia difficult, could be turned into a partnership where our plant materials are sent to the United Kingdom for ‘fingerprinting’ and added to the global database if gaps are apparent.

Parent material would be able to stay in Australia, and the genetic data attached. Materials would then have the risk of diseases, pests and viruses removed by half-a-globe of distance, and alternate growing seasons would maximise dormant (or non-dormant) research needs.

A valuable extension of this activity, of a global cooperation of genetic fingerprinting of the ‘found’ collection, would assist in the verification of materials, avoidance of duplication and international research collaboration where regulation and plant quarantine laws inhibit the opportunities to activate positive characteristics within the gene bank.

This would enable ‘tailoring of production’ to specific needs as climate variation and specific needs could be carried out by the country in question using shared foundation knowledge, again strengthened by the specific research needs. The end result would be a powerful, evolving set of international common markers.

Whether subscription-based membership, publicly accessible material or a tiered approach to ownership, potential breeding programs could be open to interested horticulturalists. Already, breeding programs and commercial collaborations between tertiary and government bodies and the commercial sectors are becoming the norm in the early part of the twenty-first century.

After completing his journey and research, the Fellow believes that public/private partnerships may become the sole successful ‘hybrid’ form of research in food production in the future.

### Flagging a Future Trend

Comments made by the majority of the parties interviewed during the Fellowship journey have led Gowans to believe that this merger of research was leading to the underlying fact that there would be no ‘purely publicly funded’ horticultural research within the United Kingdom by 2013.

Limited research into genetic improvement is conducted in Australia. Most improvements come from direct introduction of new varieties through major international breeding companies. By internalising and utilising existing cultivars to maintain a competitive advantage, we reduce costs, maintain organic classification and keep production material in the public domain.

## Recommendations

Botanic gardens and herbariums would be a key group of institutions to manage the science and access to a heritage fruit and vegetable database and partial collection. National Trust and not-for-profit groups would be well advised to maintain mini-collections (perhaps of particular cultivars), to encourage specialisation and also to protect plant materials from stochastic events, which may include pest and disease issues, heat events, infrastructure and financial variances or a range of other occurrences.

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## International Research Web Addresses

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- [http://www.nal.usda.gov/afsic/AFSIC\\_pubs/heirloom/srb9806.htm](http://www.nal.usda.gov/afsic/AFSIC_pubs/heirloom/srb9806.htm)
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- <http://www.worldcrops.org/>
- [http://www.worldcrops.org/documents/vegnotes\\_jan\\_02.pdf](http://www.worldcrops.org/documents/vegnotes_jan_02.pdf)
- <http://www.gardening.cornell.edu/homegardening/scene0391.html>
- <http://www.fao.org/ag/cgrfa/itpgr.htm>

## Other United Kingdom Institutions

- The Soil Association, Bristol, UK
- Horticultural Development Council, Kent, UK
- Department for Environment, Food and Rural Affairs (DEFRA), London, UK
- European Cooperative Program for Crop Plant Genetic Resources Networks (ECPGR) Secretariat, Rome, Italy
- UK Plant Genetic Resources Group (UK PGRG), London, UK
- Community Plant Variety Rights Office – European Union, Secretariat, Angers, France
- The National Council for the Conservation of Plants and Gardens (NCCPG) Guildford, UK

## English Heirloom Specialists

- Thomas Etty Esq, Somerset, UK
- Derek and Judith Tolman, Bernwode Plants, Buckinghamshire, UK
- Gloucestershire Orchard Group, Gloucestershire, UK
- Dave Kaspar and Helen Brent-Smith, Day's Cottage Apple Juice, Gloucestershire, UK
- Rob Watkins, Lodge Farm Trees, Gloucester, UK
- Thornhayes Nursery, Devon, UK
- Highfield Nurseries, Whitminster, UK
- Walcot Organic Nursery, Broughton, UK
- Paul Jasper Nursery, Leominster, UK
- Paul Davis Dolau-Hirion, Fruit Tree Nursery, Llandeilo, UK
- HP Bulmers Ltd, Hereford, UK.
- Butterworth's Organic Nursery, Cumnock, UK
- Phil Corbett, Cool Temperate, Nottingham, UK
- Deacons Nursery, Isle of White, UK

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- Hillier Nurseries (Winchester) Ltd, Romsey, UK
- Frank P Matthews Ltd, Worcester, UK
- Notcutts Nurseries Ltd, Suffolk, UK
- Scotts Nurseries (Merriott) Ltd, Somerset, UK
- John Edgeley, Senior Fruit Lecturer, Pershore College, UK
- Edwin Tucker & Sons, Devon, UK
- National Orchard Forum (NOF) [www.nat-orchard-forum.org.uk](http://www.nat-orchard-forum.org.uk)
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[http://www.ars.usda.gov/main/site\\_main.htm?modecode=19-07-15-00](http://www.ars.usda.gov/main/site_main.htm?modecode=19-07-15-00)
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# Attachments

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## Attachment 1: Suggested Business Development Models

### Business Direction – a Strategic Pathway

#### Real Versus Notional Interest

As part of the Fellowship, and the greater quest to sift, sort and organise heritage plant materials the following selection criteria should be able to differentiate cultivars from those with a 'real value' (commercial and breeding) and a lesser 'notional value' (ie collections based etc).

#### Market Based Opportunities and Curatorial Hierarchy

Real value commodities will have a market-based opportunity to assist in their survival in the modern world. As the material is bred and interspersed, the rarity of the germplasm should be reversed and the collected material be allowed to 'self propagate in the market place' to remove the pressure from collectors and collection houses to match scarce curatorial resources and demands to best effect. The Wollemmi Pine is an example of the market-based methodology being used to preserve germplasm.

#### The Market Pathway

This preliminary investigation is designed to focus upon the gathering of information and knowledge to harness the commercial opportunities for sustainable and diverse horticultural food production for the twenty-first century.

The key investigation revolves around the economically and environmentally sound manner in which the local industry may expand. Several topical issues and social concerns are echoed throughout this topic.

The critical question for business is 'which commercially viable species are not being grown/supplied/cultivar based that may be worthy of market share?'

The two determinants for this are:

- Viability analysis shows ways in which the species can be maintained.
- Market analysis determines what we have already.

Hence, for each fruit or vegetable commodity, the following selection criteria should be used:

- What is the product?
- Does it have downstream potential?
- Does the product have a brand presence?
- What are the supply issues?
- Who owns the product?

From this, a production pathway and business case may be developed based on the potential commercialisation of the material. The commercialisation plan focuses on the key areas of:

- Product viability; market acceptance and uptake.
- Potential distribution networks.
- Plan for raising capital.

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- Administration hurdles (eg quarantine issues, relevant permits or licenses).
- Skills required for the commercialisation of the product, service or technology.

This plan may identify that there is a viable commercial opportunity. Alternatively, it may identify any factors limiting viability that may need more time or work. Such as:

- regional development opportunities
- current grower status
- commercialisation barriers.

The production stages of the production of heritage varieties are based upon the 'production determinants' that include:

- Determining the Market Demands for the crop.
- Being aware of the local selling price of the crop/being aware that seasonal abundance drives the price downwards
  - Adding value to price-drop through pickles, preserves pre-made.
  - Alternatively, provide recipes and information on crop.
- Determining how popular is the crop is. (ie. Demand)
- Determining what is the quality of the crop is.
- Determining if there are differences in the appearance of the crop.
- Determining how popular is the crop is.

## **Production Level Factors**

1. Cultivar Selection Criteria - resistance to stresses ie drought, disease, pests:

- Multidisciplinary and International evaluation of cultivars
- Major cultivars of the World
- Diseases
- Dormancy and acclimation
- Dwarfing
- Flower bud formation, pollination, and fruit set
- Fruit colour development
- Fruit growth patterns
- Fruit maturity
- Harvest
- Pests, insects and mites
- Irrigation

2. Production Techniques

Management practices are linked to external or off-farm inputs including:

- Synthetic pesticides
- Synthetic fertilisers

# Attachments

- Irrigation systems
- Growth regulators

Modern Production Methods have numerous shortcomings, including:

- Pesticide resistance
- Soil degradation
- Collateral injury to non-target organisms
- Human health concerns
- Water management
- Salinity
- Fertiliser losses
- Waste management
- Biodiversity conservation

Alternate options to consider include:

- Crop rotation
- Manuring
- Integrated Pest Management (IPM)

### 3. Management Strategies:

- Polycultures
- Risk management
- Scale of enterprises

### **Low Input Sustainability – Strategies for Competitive Advantage**

The Business Model 'Investigating Low Input Sustainability' is designed to share the lessons from organics and traditional systems to evaluate the potential transfer of these learnings into mainstream production techniques.

#### **Production Using Organic/Traditional Methods and Cultivars**

##### **Aim**

- The matching of regional and seasonal variations to the production of a polyculture-based organic system of heirloom fruit and vegetable cultivars.
- Improve the access of small to medium enterprises to quality information on new product development opportunities with regard to cultivar selection of heirloom fruit and vegetables.
- To use the competitive advantages as stated in the production paradigm.

##### **Premise**

- Regionally adapted varieties are best for locally produced foods, not mass produced monocultures.

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- The trend to go back to the food crops with a wider genetic base – the heirloom seeds and fruits - makes sense. These diverse crops were overtaken by hybrids bred especially for supermarket distribution.
- Input costs will be reduced and the reliance on chemical based fertilisers for fruit and vegetable production will be minimised/eradicated by matching product with regional and seasonal parameters using a scientifically based approach. The market is ready to pay a premium for organic, accountable produce which provides a larger range of choices

The report marries into the field of organic production, although this is more due to fact that many of the heritage practitioners prefer this approach of 'stepping lightly' in their production methods. There is opportunity to develop cultivars in a range of production arenas, however, modern trends towards low input production sees organic production as a logical accompaniment for this sector.

Although not to the 'purists', reducing inputs philosophies are designed to activate thinking on matters such as the mitigation of nitrous oxide through the leaching of unused fertilisers and using biological controls as part of a larger IPM systems.

These concepts were attracting significant government funding through a Climate Change Mitigation Focus in the United Kingdom in May 2008. It is designed to flow from the Business Model One production and management strategies.

## **Traditional Methods**

Aims of Organic Production:

- good soil management
- cover cropping
- efficient irrigation/soil moisture content
- integrated weed management
- wind breaks and micro climate
- pasture rotation to reduce parasitic pressure on livestock
- choice of disease resistant crop varieties
- crop nutrition (feeding the soil, not the plant)
- minimise erosion and nutrient run off and leaching
- avoidance of unstable markets
- enhance the wisdom contained in traditional farming systems.

## **Comparative Advantages**

Production Based Comparative Advantages:

- Horticulture is based upon 'Intensive Systems' that require smaller land areas.
- Artificial Inputs can be minimised and potentially recycled.
- Organic material, fertilisers and manures can be sourced close to production area minimising freight and logistics for deliveries.

# Attachments

- Efficiencies from broad acre agriculture can be utilised in small regional towns.
- Small micro-businesses can source materials and supply local regions to test market viability.
- Multiple products can be grown to spread risk.
- Fundamental production techniques underscore many products.
- Inexpensive, unskilled casual labour can be found in small rural communities.
- Stock and Land Agencies carry multiple materials, account options and skilled agronomists with knowledge of area.
- Availability of land in rural areas may be conducive to leasing areas, equipment and storage areas.
- Some crops may be able to withstand artesian water with high salinity as back up production options.
- Options to test alternate production methods ie hydroponics, aquaculture and vermiculture.

## **Industry Based Comparative Advantages**

- Flexible cropping systems means that we can grow what we know we can sell.
- Several crops may be grown each year.
- Irrigation systems are now being fully reviewed and production systems revised.
- Markets are expanding and downstream synergies are being encouraged.
- Availability of artesian water and ground water.

## **Vegetables – The Preferred Starting Point (Timeline for Investigation)**

The rationale for the selection of annual vegetable stocks is a critical starting point and stands from the following observations:

- The nature of perennials (predominantly fruit trees) and their long-lived nature determined that the risk of loss with vegetables was not as great.
- Fruit Trees have substantial research platforms being undertaken in Europe that may be transferred with ease to Australian horticulture.
- The issue of rootstock and scion diversity provided exponentially difficult measurements beyond the scope of the research.

In a market sense, vegetables also provided competitive advantage:

- The ability to collect and reproduce vast quantities of 'true to type' seed in a short time.
- The ability to change and adapt to market demands through short and fast life spans (ie multiple generations).
- Climatic variation/hindrances were overcome through the delaying of planting.
- Testing and research methodology were straightforward when compared to fruit.
- Intensive cropping (yield per area planted) and mixed cropping opportunities were apparent.
- Seed transports and stores well.

## **Attachment 2: Cultivars classification – Real Value Versus Notional Interest**

It is important to separate the research data into two categories. These being:

- cultivars of real value
- cultivars of notional interest.

It is the first field that this Fellowship investigated and formed the basis of this report.

In many instances, the production of these cultivars was specifically tailored to minimal external inputs and local, seasonal production methods. The modern techniques do not reflect these sustainable practices, which have the potential to form a significant competitive advantage in horticultural food production. Many of these varieties show disease resistance and environmental tolerances not found in modern cultivars.

The measure of 'value' is somewhat subjective, however, several criteria must be met for a cultivar to be seen as valuable in horticultural food production.

These criteria include:

- economic Value
- marketable commodity
- rarity/scarcity
- feasibility in growing production.

Much of this material has been lost, or survives unidentified in home and botanic gardens and has significant market and scientific potential. It is either unrecognised, has no protective overlay, or has not been propagated for perpetuity.

Some of the attrition can be directly related to markets flooding non-distinctive cultivars in a burst of opportunity presented by an opening of supply avenues and entrepreneurial frenzy in the late nineteenth century - making them notionally interesting varieties.

Such items will be listed for interest sake where possible and their locations noted, however, in depth analysis will be infrequent.

To maintain the biological diversity of the cultivars, a downstream opportunity in marketing and supplying training and plant material to home gardeners is also to be investigated.

### **Attachment 3: Associated Industries – Marketplace Strategic Alliances**

A non-definitive list of associated groups and concepts appears below:

#### **Industries**

- horticulture
- heritage
- food production
- environment.

#### **Parallel Benefits**

- plant biodiversity
- genetic pool
- perpetuating cultivar survival,
- public awareness and education
- Government support at local, state and Federal levels
- local sustainable food production techniques
- alternatives to monocultures and chemical inputs
- adapting food production methods to climate change
- educational and interpretative opportunities
- industry training targets.

Consolidation Goals register of heirloom fruit and vegetable cultivars key stakeholder Information and data.

Consolidate and formally acknowledge classification systems:

- What was grown?
- The longevity of the cultivar.
- The relative commercial value of the product.

### **Attachment 4: Organic Agriculture Standards**

Organic (biological) agricultural and horticultural systems are designed to produce food of optimum quality and quantity.

The principle methods employed result in practices which:

- co-exist with, rather than dominate, natural systems
- sustain or build soil fertility
- minimise damage to the environment
- minimise the use of the non-renewable resources.

The basic characteristics of organic agriculture are:

- Sound rotations, the extensive and rational use of manure and vegetable wastes.
- The enhancement of biological cycles, involving micro-organisms, soil, fauna, plants and animals.
- The appropriate cultivation techniques.
- The avoidance of fertilisers in the form of soluble mineral salts.
- The prohibition of agri-chemical pesticides.

Organic agriculture involves different ways of structuring and managing the agricultural system. Modern agriculture (post World War II) has often concentrated on inputs of a physical nature, such as cultivation, fertilisers and pesticides.

*'Standards for Organic Agriculture', United Kingdom's Soil Association 1987 (Madge)*



### Attachment 5: Internationally Recognised Measures

The Index Kewensis (IK) – Reference: [http://www.ipni.org/ik\\_blurb.html](http://www.ipni.org/ik_blurb.html)

Since 1885, the Royal Botanic Gardens, Kew, has been indexing names of seed plants at the level of genus and species published since 1753, and of all ranks from family downward since supplement 16, and making them available in a series of bound volumes, the Index Kewensis. Charles Darwin provided funds for the initial indexing effort, which attempted to capture all names back to 1753.

Darwin realised the great need for a list of plant names with bibliographic details of where they were originally published and, since then, generations of biologists and systematists have found the Index Kewensis an indispensable resource for botanical research. The original two volumes of Index Kewensis contained nearly 400,000 names. Some 6,000 additional names are added annually and hard-copy supplements are published at 5-yearly intervals. The most recent supplement was the twentieth, which was published in 1996. Since 1971, records of infra-specific names of plants have also been included in this index and since 1997 details of type specimens have been recorded.

The whole Index Kewensis, now totalling over one million records, has been available in electronic form to staff and visitors at Kew for many years. However, until the launch of (PNI), the only widely available digital format for this data was CD-ROM. Most volumes of Index Kewensis are still available as hard copy.

Index Kewensis and the annual Kew Index list names of genera and species of seed-bearing plants with their place of publication. From Supplement 16 all ranks from family downwards are included. The Kew Index was published annually from 1986–1989 inclusive and includes names of ferns and fern allies as well as the IK data for a particular year. For information on purchasing these publications please see Kew's Scientific Publications Catalogue.

- TROPICOS nomenclatural database at Missouri Botanical Garden
- Database of root-nodule bacteria: held at Rikagaku Kenkyusho Japan (RIKEN)
- Flora Europaea: European Science Foundation European Document System (ESFEDS) database at the Royal Botanic Gardens (RBG) Edinburgh
- Australian Plant Name Index (APNI): nomenclatural database in Canberra
- Royal National Garden (RNG), Morocco: The University of Reading Herbarium, Moroccan collections

## Attachment 6: Global Crop Diversity Trust

<http://www.croptrust.org/main/>

<http://www.organicxseeds.com/oxs/do/Login?paramCountry=188>

Farming throughout the world is underpinned by the vast genetic diversity of agricultural plants. This diversity provides the means for adapting the crops we grow to meet rapidly changing needs and demands. More than 6 million samples of different crops are currently maintained in collections in some 1,500 gene banks around the world. These represent humanity's most important resource in the struggle to feed its ever-expanding population under changing climates, shifting pests and diseases and increasing energy costs.

Yet, in spite of its importance, much of this genetic storehouse remains untapped - a neglect that largely arises from the fact that much of it has yet to be adequately characterised and evaluated. We do not know enough about the collections we are conserving. A lack of readily available and accurate data on important traits can severely hamper plant breeders' efforts to identify material that they can use in their genetic improvement programs.

Priorities for support under the Evaluation Awards Scheme:

### Crops

The Award Scheme will fund the evaluation of crops that are included in Annex I, or that are covered by Article 15, of the International Treaty on Plant Genetic Resources for Food and Agriculture. <http://www.fao.org/ag/cgrfa/itpgr.htm>

### Collections

Priority will be given to supporting the evaluation of collections identified in the relevant crop and regional strategies or other expert consultations and opinions as being of greatest importance within the total global gene pool.

<http://www.croptrust.org/main/strategies.php?itemid=82>

The material in the collections must be available under the terms and conditions of the Standard Material Transfer Agreement (SMTA) of the International Treaty. Proposals that involve the screening of more than one collection will have an advantage, as will proposals that involve the screening for more than one trait. Priority will be given to screening for characters of greatest importance to the poor, and especially those that are important in the context of climate change. Thus, priority will be given to proposals that aim to evaluate for such characters as productivity under low input levels, resistance to pests and diseases, and tolerance of abiotic stresses.

Screening for nutritional or product quality characteristics will be considered when these attributes are important to the health, safety or income of the poorest people. The application of molecular methods will be supported, where appropriate. Where specific traits have been identified as important in the crop strategies, or other expert consultations and opinion, these will be given priority.

## **Attachment 7: Convention on Biological Diversity (CBD)**

The draft document comprises the spirit of the project. It is envisaged that the Convention on Biological Diversity (CBD) from the RHS will continue to be representative of this intention.

In accordance with the CBD, the RHS supplies seed from its garden collections on the conditions that:

- The plant material is used for the common good in areas of research, education, conservation and the development of horticultural institutions or gardens.
- If the recipient seeks to commercialise the genetic material, its products or the resources derived from it, then written permission must be sought from the RHS. Such commercialisation will be subject to the conditions of a separate agreement.
- The genetic material, its products or the resources derived from it are not to be passed on to a third party for commercialisation without written permission from the RHS.
- It is a condition of supply that any publications resulting from the use of the plant material should acknowledge the RHS as the supplier. A copy of any publication, report or data gained from the material must be logged with the Lindley Library of the RHS.