

Looking Back Looking Forward: Learning from the Past in Preparing for the Future

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Summary

This presentation was an overview of the history of the International Plant Propagator's Society in Australia as well as an historical perspective on the Australian

nursery industry and how those activities influence our horticultural professions today.

INTRODUCTION

The first farm in Australia was established on the current site of the Royal Botanic Gardens Sydney with seeds and plants brought by the first fleet in 1788. This is the birthplace of Horticulture and Agriculture in Australia. This location in the garden, is still growing vegetables today and is the oldest producing garden in the country.

Horticulture and Agriculture were important to the new settlement, in feeding the population, trying to understand this new land climate and soils, with many failures along the way, which were learning experiments.

It is recorded that William Macarthur commenced the setting out and planting of his Camden Park Garden in 1817

with other garden areas and orchards following. Due to commercial necessity, a commercial nursery was established in the 1840's and soon after, construction of heated greenhouse and propagation houses. These greatly improved the efficiency of the production nursery and plants which were able to be grown, but also improved the efficiency of the plant breeding operations. This nursery became the preeminent nursery in the mid-19th century, responsible for many ornamental and fruit tree introductions. The Camden Park Orchard was one of the largest commercial orchards in Australia through to the late 1970's.

The Nursery Industry associations became formalised in Victoria, South Australia, NSW and Queensland in the early 1900's after federation. They were established as an opportunity to enjoy social interaction on a business-like level, to discuss issues affecting their operations of the day, including supply of stock, stock losses, employment, wages, and other industrial matters.

Soon after, the industry found it necessary to come together on a national basis to discuss common problems and to collaborate on common goals. They became increasingly conscious of the importance of consulting with government for their perceived prosperity and knowledge of legislation. Interestingly, Biosecurity with plant movement between States and banning importation from South Africa were among key areas of focus (Greenlife Industry 2022).

IPPS History

International Plant Propagators Society, IPPS, commenced in 1951, with the first meeting in Cleveland Ohio with 70-80 people in attendance. Rules and guidelines were established which are still in place today. One key area is: "It is not where you work or where you come from, It is you, the propagator, who is important, with the knowledge you have to share."

This was the basis of IPPS motto: **To Seek and Share.**

The foundation was spear headed by Mr Jim Wells, from New Jersey in the United States, who was the first IPPS president. Through his enthusiasm and support from interested people, further regions were established in Australia, New Zealand and Great Britain (Dawkins 1996).

Jim Wells travelled to Australia in 1973 for a meeting with interested people in the aim of establishing an Australian region and attended the first meeting held in October 1973 at Leura, which saw the establishment of IPPS in Australia, with Edward Bunker being elected the inaugural president. May 2022 and we are celebrating the 50th IPPS Conference meeting being held in Australia.

We have had passionate plantmen and women involved in Horticulture over the years, who have had a quest of continuous improvement, working together, and sharing knowledge that has enabled us to learn from the past in preparation for the future.

Theodore Roosevelt is quoted as saying "I believe that the more you know about the past, the better you are prepared for the future".

Looking forward to the Future: Environmentally sustainable production systems

Education

Education is a key component in developing and preparing future plant propagators and horticulturists. Project based teaching, focussing on problem solving and understanding the principles, should be the basis of any tertiary education, on farm training and developing career pathways.

A key part of my early training was from my Dad, Grandfather, and lecturer Murray Richards at Massey University, in being able to understand the importance of observation and understanding. When solving a problem, it is very easy to focus on the symptom as the cause, but quite often it is another variable which is influencing the symptom, which then through understanding the growth cycle, production cycle or process you can then progressively work through, whether the problem you are dealing with is disease or insect, environmental, mechanical, cultural, nutritional or water management. The plant is not able to communicate verbally but is communicating to us through the signs it is displaying. These principles are important to compliment the use of technology in the future because if you don't understand the principles, you are not going to be able to interpret the answers from the data you receive, or the systems being designed and implemented.

The other key lesson from my Grandfather was that you can gather a group of people together at a starting point and show them a destination, a lot of people will focus on the destination and completely miss the detail in the journey as they travel from A to B, again the importance of observation. The only time you will experience the sunset is if you stop, look up and

stand in awe, looking down you will easily miss the beauty and the detail of the close of a day. Observation is a key skill in growing crops and a key life skill.

Biosecurity

It was interesting reading one of the points for the reason for the National Nursery Association, back in the early 1900's, was recognising the importance of what we now call Biosecurity.

The National Biosecurity and Sustainable Plant production Project NY20001 is the single largest research and development pot levy investment which our industry is making. It is a key investment in the future to better manage pest and disease issues on farm and simplify interstate and intrastate plant movement. It has facilitated legislative change to allow on farm certification of crop being shipped interstate, which has been history making, and given the producers involved greater flexibility and cost savings.

Pohlman's Nursery have stated that the program was saving their organisation in excess of \$300,000/annum. Pohlman's Nursery was recognised as the Farm Biosecurity Producer of the year for 2021 for their contribution to the development and implementation of Biosecure HACCP on farm, in conjunction with Greenlife Industry Australia (GIA) and Horticulture Innovation Australia (HIA). This has strengthened the recognition of the innovation and importance of this program within Horticulture and is a key investment in future proofing our industry and preparing it for export and Biosecurity incursions (Australian Biosecurity 2021).

Biosecurity will continue to be one of our greatest challenges as an Island nation in preventing insect and disease issues which

are not here at present. Horticulture, inclusive of the Nursery and Garden Industry, will continue to focus on monitoring and research efforts to exclude these problems and continue to highlight the most critical pests and diseases that would have major economic damage to our nations horticultural production, along with impacting our native flora and fauna.

Mother Plant production

Viewing ancient vineyards in Germany 3 years ago has given me a clear focus in re-looking at our Mother Plant production. Ultimately, healthy roots equal healthy shoots, relooking at irrigation and nutrition management, improving the soil flora, and canopy management are all lessons that we can observe from other horticultural production systems.

Lessons learnt from the past continue to focus on the importance of stock plant management and cutting production as the foundation principle in producing a quality healthy plant with the desirable characteristics of the mother plant.

Observation of field mother stock of *Buddleja* in the Midwest USA, which can get covered by up to 1 metre of snow, demonstrates that the cold kills off the top growth and the plants reshoot from basal juvenile growth. The snow does the equivalent of what we would do in Australia with cutting hard with a chainsaw.

Nutrition management to ensure the correct balance in the harvested cutting to ensure it gets the maximum advantage when harvested and developing roots.

Managing the canopy to engage better light and air movement, as well as making

it more effective for spray treatments, harvesting of cuttings and production of juvenile growth.

Soil flora improvement, through additives of bioflora, composting and mulching are the basis of regenerative agriculture, which is a new buzz word, with continuous improvement of soil to aid nutrition and water management - the ultimate aim of producing a healthy root system.

Tissue culture will continue to be expanded and play an importance in the clonal production of high health high volume food and ornamental crops. Tissue culture is playing an important part with Banana production and other clean stock programs including Potato's, Ginger, Sweet Potato, Berries. With the industrial scale and replicability, we will see more automated systems enter this production system when high volumes of similar crop lines are produced.

Tissue culture will continue to play a key role in being able to import new genetics into this country through high health protocols and testing and being able to move larger volumes in smaller cubic capacity.

Growing media

With the supply chain disruption of the last 2 years in preparing for the future, a priority is looking at longer term alternative substrates that are locally sourced and produced.

Alternative substrates that have the nutritional buffering capacity along with air filled pore spaces for root development and moisture management.

This has been a key risk management area identified by the Nursery Industry and has

been further highlighted in the last period with the major fires in timber plantations in the Southern States of Australia which removed significant bark production. Together with rising energy costs and some timber mills converting to green energy and burning the wood waste for a higher return on investment rather than being sold for mulch or future growing medias.

There is further competition for wood waste from broad acre horticulture for soil improvement on vegetable crops and orchards/vineyards as compost or mulch.

Peat – how much longer will this be able to be mined before environmental concerns and legislation make it prohibitive?

Coir is a renewable resource. Is there an opportunity to develop a COIR industry in the pacific nations to supplement production from Sri Lanka and to be a primary source for Australia and New Zealand alleviating potential supply chain disruption.

What other renewable products need to be explored that can support container-based production systems?

Waste management

Waste management is a broad cost centre for all businesses. Understanding what is causing wastage and being able to eliminate/reduce in the propagation/production system has a direct bottom line improvement. Understanding the production cycle in all steps is a critical point in being able to understand the cause and eliminate.

With sustainability principles options of reduce, reuse, recycle of waste streams also prevents product going into landfill. The PP5 closed loop recycling project is leading the way amongst horticulture

industries. It was foresight by both Norwood Industries and Garden City Plastics nearly 40 years ago to use the same plastic product in the label and pot manufacture which is making this project possible. This project is reducing product going into landfill but has become a valuable resource and raw material component with supply chain disruption and higher oil prices for pot manufacturing (Garden City Plastics 2022)

Wouldn't it be a significant step if the majority of plastic used was from recycled product. With the developments of plant-based resin technology biodegradable pots will become more mainstream but have the challenge of overcoming in our climatic zone temperature and rainfall extremes.

Greenwaste/prunings which traditionally have been burnt are an important resource for providing mulch or compost to improve soil.

Mechanisation and Technology

From planting and harvesting of cuttings, tasks traditionally completed by hand, mechanisation is developing in conjunction with AI to take some systems to the next levels.

Mechanisation ensures replicability of results but will continue to play a vital role due to shortage of labour and people willing to do the more menial tasks performed by hand. With the forecast global population increase and subsequent production required to feed the population, robotics will play a significant role in making timely harvesting possible.

The latest ISO planting equipment is fully automated but has created a production system which requires the correct sizing of cutting to ensure the robots are able to handle

the material. With the ability to run extended hours, particularly when seasonal timing is tight, along with labour supply.

The Rapid Antigen Tests which we are using for COVID testing will be developed further for rapid pathogen testing on crops.

Is it possible that we may have chips or nanobots in the vascular system of major crops which is feeding real time data of nutritional, water management and growth of the crop potentially ensuring that there is no stress in the crop? When we visually see changes in a crop it takes time to reverse any detrimental actions which real time data would be ahead of.

Protective cropping will continue to play a greater role where shade was created by using brush or trees to the modern synthetic shade cloths to reduce risk of crop failure and the flexibility of not being hindered by weather events to ensure sales targets are reached and return on investment. Further development and understanding of light spectrum will play a role in disease and insect management as well as aiding plant growth and fruiting development.

The use of drones has only begun, with successful use now in applying pesticides, use of infrared technology in assessing plant health and using of drones in applying beneficials in horticultural crops such as strawberries and fruit tree production. Drones are being used in Cotton production to do flyovers with high-definition cameras for insect monitoring with the data being analysed and forwarded to the grower with updates on insect populations and locations on the farm linked to the electronic mapping system coordinates.

The latest Tevel Aerobotics drone harvester, which is harvesting apples, has attracted the attention of Kubota who have made a direct investment into this company.

Kubota and Yamaha have also made direct investment into an innovative robotic strawberry harvester which is a clear direction in where they see the next stage of advancement in AI assisted autonomous harvesting.

As technology is becoming more affordable imagination will open up more applications in this space.

Robots are currently being used for pot spacing, planting, field mowing and spraying and crop monitoring.

Use of radio and Wi-Fi networks in monitoring field, growth nutritional and water management. I am excited by a recent application we have been able to install using radio for operating field watering and not having to use cabling, it has opened opportunities which previously would have been cost prohibitive.

Golden Grove Nursery through the Hort Innovation funded project 'Digital remote monitoring to improve horticulture's environmental performance' (ST19024) using the Hort Innovation nursery products research and development levy and the Australian Government's National Landcare Program is a collaborator in this project which is using new technology and monitoring devices with the data being uploaded to the cloud which is improving decision making skills, improving production efficiencies and optimise labour and environmental performance. Hitachi Consulting has supplied the technology as a key direction in investing into future Primary production technology which also includes work with autonomous tractors in the sugar industry (GIA 2022)

Targeted research and development, funded through Horticulture Innovation and Horticulture Industry Levies will continue to be

an important benefit for Horticulture producers in preparing for the future.

Genetics

In ornamental plant production, work will continue to focus on disease and insect resistance, growth habits that don't require plant growth regulators and uniqueness in being the first breeder in new genera for market advantage.

Exciting breeding work by Queensland Department of Primary Industries is focussing on fruit crops small tree, high yield which started with Apples originally going from 30 tonne/acre through to 130 tonne/acre. Tree crops such as Mango, Macadamia and Avocado are being looked at as well as the architecture of the canopy and orchard layout so that the fruit is accessible for future robotic harvesting and to maximise the yield/ha.

These researchers are turning to plant genetics to help solve DNA mysteries and create the horticultural tree crops of the future under \$11.3 million 5-year joint research project.

Delivered through Hort Innovation, this project will develop a breeder's genomic toolkit for tree breeders and researchers to better understand how genes control traits that are valuable to Australian growers, including tree size, yield, disease resistance, and tree maturity (Queensland alliance 2022)

Supply chain disruption

This is a new challenge which has arisen since COVID in 2020 with shipping delays, spare parts and components not being available and new equipment being indefinitely delayed.

It is already seeing more local manufacturing and will see more Aussie ingenuity in being able to repurpose machinery or adapt parts to ensure machines can remain functioning.

It has highlighted how vulnerable we are in being reliant on overseas manufacturing and shipping for some key production inputs.

Energy

We are experiencing significant increases in energy costs, not only at the diesel bowser, but also with power supply and reliability.

It is another key area to continue to monitor, being a key investment in a horticultural business, as in most cases the main use of electricity is for irrigation, rather than cooling and heating.

My first experience with looking differently at electricity was in 2006, as a participant in an Qld Government EcoBiz project, where we looked at an irrigation pump that needed replacing. The pump being replaced had been purchased at an auction for \$500 was 4kw it was replaced with a 2.2kw pump which pumped twice as much water.

When we did the calculations the new pump cost \$1,200 and was saving \$800/ annum in electricity cost/pumped litres of water.

A variable drive pump set, working on pressure starts, achieved a 30% return on investment with reduced energy costs and the added bonus of not damaging older water mains.

In future proofing our businesses we need to be aware of the potential gaps in electricity supply with the decisions that have been taken to decommission base load coal fired

power stations in New South Wales and Victoria earlier than planned, which potentially could create power supply issues in the next 5-10 years.

Weather, Resilience and Water

There is a lot of discussion about climate change. In the almost 40 years of growing, I have observed that we have had seasons where there has been no overwintering of two spotted mite because of temperatures being higher and over the last few years drier springs leading into summer and periods of intense rainfall.

In Australia with the limited long range climate records, there is a pattern of climatic cycles. The east coast of Australia weather events of this summer has similarities with 1974 which is in essence a 50-year event.

Since European settlement there have been major floods in the city of Brisbane in the following years of January 1841, March 1890, February 1893 which was three flood events a week apart in conjunction with three separate cyclones, February 1931, January 1974, January 2011 and February 2022.

There is on record, from explorer John Oxley and Major Edmund Lockyer, seeing debris in trees ,100 feet above the normal river level in the area of the current Mt Crosby pumping station. It is suggested that somewhere between Oxley's visit in September 1824 and Lockyer's visit in September 1825 the Brisbane River experienced a flood as great as the February 1893. These flood events are still the largest experienced on the Brisbane River and well before the major development that we see today, and the words climate change being used (State Library of Queensland 2022)

On average a major flood event has occurred every 37 years, with a corresponding link to LaNina weather events, with the current LaNina cycle commencing in 2020 and now expected to continue into the summer of 2022. On average LaNina cycles can run between 2 and 3 years.

In our nation, after every major flood there has been periods of extended dry weather. On our own property in this last decade, we experienced the last water spilling over our dam wall in February of 2013 followed by a period of extremely dry springs and below average rain fall which was enough to continue operating. The next spill of water over the spill way was February 13th, 2020 with the storage capacity during the last three years not going below 70%. The summer of 2022 has seen two significant rain events a month apart, which dropped 200mm in a 4-6 hour period.

Studies and research into understanding these weather patterns in the past and the events leading up to the flooding will better prepare us for future weather events.

We have to be prepared for growing crops in periods of extended wet weather which takes a different skill set to producing in a dry season. Water supply will continue to be one of our nation's biggest challenges with providing the balance of water required for Agriculture, Urban, Industrial, Mining development and Environmental flows. Our greatest challenge is providing water for the urban and Industrial users as we are seeing major development increases and no future plans to increase water storage with the exception of planned irrigation water storages being constructed in Queensland.

As producers we need to ensure that we manage our water resources effectively with irrigation and capture and reuse of irrigation tail water to minimise environmental flows and to maximise crop yield. A continued focus on sprinkler technology, growing media, growing environment, alternative sources of water and monitoring technology will need to be key criteria for producers to focus on.

Environmental

As propagators we are producing living natural photosynthesizing products which convert Carbon Dioxide into carbon. This is essential for feeding the world with food crops or as ornamentals, providing the many positive social, environmental benefits that plant material adds to an interior or exterior landscape.

As an industry the pot levy funded project, which is now known as Greener Spaces Better Places, has been instrumental in funding research, using advocates to positively promote the importance of landscape and Urban Forestry and to see legislative change being implemented in cities urban forestry plans. Ultimately seeing more plants being used in landscape.

In conclusion it is an exciting period to be active as propagators with the challenges and opportunities to feed a growing world population, as well as the raised awareness of the importance of plants in both interior and exterior landscape.

Ultimately, all starter plant material is touched by a plant propagator, with the opportunity to influence the outcomes just as our early settlers did and help make the world a more beautiful place.

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