Innovation through adversity: tricks of the horticultural trade©

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INTRODUCTION

Often underrated, the horticulture industry is one of diverse opportunities and one which accommodates some of the most innovative problem solvers of any industry in operation today. The purpose of this report is to both share some of my experiences with such opportunities and innovation but also spur discussion and creativity within the International Plant Propagators' Society's members. The intention is to achieve this by showcasing what can be accomplished in horticultural production in situations where little or no conventional resources are available and to then pose the question of what could be achieved when taking these ideas and innovations and combining them with the means and resources available in developed countries like Australia.

The visual content of this report has been collected over the last seven years during a period of international placements focused on production horticulture. A pursuit I would not have started if not for IPPS who in 2009 granted me the opportunity to participate in the Australian region of IPPS's South African Exchange Program. This exchange allows participants to see first-hand, the contrasts in the nursery industry in South Africa and sparked a continuing pursuit for travel and horticulture research internationally. In subsequent years leading to this presentation I have found opportunities from scholarships to volunteer work to study and work in horticulture in locations including: Tanzania, Nepal, Solomon Islands, South East Asia, Israel, Turkey, Jordan and Egypt. All of these opportunities and more can be accessed with relative ease and I strongly encourage any inclined horticulturalist to look into such opportunities as they are largely underutilised.

DISCUSSION

From value-adding potted plants with old ostrich egg shells from a nearby farm, to utilising toiled roll inserts for nursery tubes and using repurposed 44-gal oil drums as water boilers, in South Africa there is a definite thought of "If you can, use it". The relaxed regulation of industry has proved to be a great way to foster innovation. Ease of acces to coconut coir has aslo led to the industry often incorporating hydroponics into traditional growing operations. *Eucalyptus* stock plants are grown in raised hydroponic beds eliminating proximity to soil borne pathogens and at one site these cuttings were then struck airoponically using no media and potted up by hand after producing roots.

Heading north to Tanzania subsistence horticultural operations become more prevalent however it working in this scenario still provided ideas that could benefit operations elsewhere. Particularly successful in this project was the implementation of a school production and demonstration garden. For this project students were photographed during each stage of the growing process at completion an instructional book was produced in swahilli featuring the students themselves providing the steps to success. This was received with great enthusiasm and offers the potential for the knowledge to be transferred to other family members and not just the participants themselves. This idea could be utilised by retail nurseries and garden centers seeking to create an experiential environment. A short book template could be created and designated photo stations located in the nursery. The book could be printed on the spot providing a positive experience and lasting marketing memento for the nursery. These innovative ways to engage customers are emerging around the world and another good example was seen in Israel, were the garden centre sold plants and also various terracotta and ceramic pots. They provided a station and potting mix were

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customers could take the plant they had chosen and pot it into the pot they had chosen using free potting mix and an assortment of bows and ribbons suited to gifts.

Look to the South pacific and work in the Solomon Islands requires innovation on a daily basis. One such innovation was taking a serious pest problem in the giant African Snail and turning it into a positive by utilising the snails' shells in an unconventional medium mix. It was found that the shells contained98% calcium carbonate deposited in an organic matrix with the remaining 2% consisting of compounds of Fe, Mg, Mn, Al, Na, K; perfect for increasing air filled porosity and providing a slow release fertiliser.

Among diverse challenges, many villages are located on coral outcrops with no arable land so vertical hydroponics systems were constructed using coconut husks for media and giant bamboo for structures. Manure teas were then brewed for nutrient supply.

There are not many countries that could be considered more innovative than Isreal the home of Netafim drip irrigation, Home Biogas stations, the LivingGreen Rooftop Farm and GrowBox emergency relief aquaponics farms. However, perhaps the most impressive of Israel innovations are the farming operations of the Negev. This Rocky desert covering more than half of Israel receives as little 31 mL of annual rainfall in some areas, yet farmers are producing 45,000 tons of tomatoes including 8,000 tons of cherry tomatoes annually. They do this by growing in channels isolating plant roots from surrounding saline soils and using fossil water deposits that can be up to 3,500 ppm in total dissolved salutes. Fortunately these are predominately calcium carbonates and calcium sulphates, so less detrimental to plant health in high doses as other salts often present in such water supplies. Other nutrients are then nutrients supplied making the systems virtually hydroponic. An interesting result has been noted when growing with such saline water. Smaller sweeter fruit is produced which poses a problem for shelf life but the dry weight of biomass is near equivalent so the practice is ideal for dried produce.

I came across another innovative way that nurseries may engage their customers when visiting Indonesia's Bogor Botanic Gardens. Here Dr. Sofi Mursidawati was working with the giant and endangered flowers of the region including the world's biggest flower, *Rafflesia arnoldii* and one of the world's biggest inflorescences, *Amorphophallus titanum*. Dr. Mursidawati spoke of the plight of the *Rafflesia* which she is fostering at the gardens. Here she maintains a display plant by taking wild flower buds of the wholly parasitic plant and grafting them onto a host *Tetrastigma* vine. In a strange twist these flowers have all bloomed as females and as the viability of the plants pollen is only about 8 h, no pollination or seed production has ever been able to occur.

What may be of most value to nurseries though, is the public interest in these flowers. Dr. Mursisawati also spoke of using 2 tons of silica gel to transport both *A. titanium* and *Rafflesia* to Taiwan where they received over 400,000 visitors. In South Australia people queued for over an hour in 2016 to glimpse *A. titanium* in bloom. While the event only lasts about 48 h and takes around 7 years to occur imagine the reward for the nursery when opening its doors for public sales the days that plant does flower!

CONCLUSION

Back home in Australia there does not tend to be the adversity that spurs innovation in some of the aforementioned scenarios but non the less there are some great illustrations of modern innovation particularly in South Australia, host to this year's IPPS Australia annual conference. The Australian Plant Phenomics Facility and the Plant Scan System located at the University of Adelaide's Waite campus, provides state of the art growing facilities and root mapping services that do not disturb the rootzone or introduce unwanted radiation that may influence growth; a great asset for research into our industry.

South Australia has more land devoted to hydroponic farming than any other state and Sundrop Farms' Seawater Greenhouse at Pt Augusta leads innovation in this field. The greenhouse utilises solar energy to purify seawater that is then used for hydroponic growing. Carbon dioxide produced in heating processes is harvested and pumped back into growing operations to support growth and the list of innovation at this site goes on.

So the country is not lacking in innovators but imagine what could be achieved if

everyone was doing this, not just the big end of horticulture and imagine if the practices of developing countries were not discounted but combined with additional means. The industry would certainly be better for it.

In closing, to get the best out of horticulture, growth in the industry needs to be fostered and supported. Make opportunities, take opportunities, innovate, seek and share.