



Nursery & Garden Industry
Queensland



Shamrock Plants: Improving Nursery Production Efficiency

“We’d identified that we had demand for our product that we didn’t have the production facilities to meet so we investigated how to increase our growing area to meet the demand”

Joe Eliasaf

Shamrock Plants is located at Carbrook in Brisbane's southern suburbs, with the business being owned and operated by Joe & Jodie Eliasaf. Shamrock Plants are specialist growers of gerberas, garvinea, mini roses, lavender, and other flowering lines; selling to retail nurseries and big box stores.

Shamrock Plants was established in 1986, with Joe and Jodie purchasing the business in 2015. The nursery occupies a 4-hectare site with 1-hectare currently used for nursery production.

Shamrock Plants has two water

sources supplying irrigation water to the nursery. The main water source is a 2 megalitre dam, with a 25,000 litre water tank storing rain water for pesticide application and propagation misting. The dam provides the majority of water for nursery production, and is of generally good quality, but can suffer algal and floating water weed growth during the warmer months. The algae and floating weeds are managed by aeration and the addition of beneficial microbes.

Water used for irrigation is pumped from the dam through a media filter. Irrigation water is



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disinfested by injecting chlorine after the filter and before the water flows into a 110,000 L lined steel water storage tank.

Plants are grown mainly in covered igloos with some shaded and open growing areas also being utilised. The existing growing areas are of an age where additional maintenance is required and an upgrade programme is in progress to repair these areas.

A basic sub-surface drainage system has been installed, which collects water from the growing areas, before draining through a system of pipes and open drains to the storage dam.

In 2017, the irrigation pump needed to be replaced, and it was decided that a pump with a variable frequency drive (VFD) was the best option. Advantages of using VFD pumps include reduced energy consumption, more even pressure and flow rate delivery, and reduced system breakages. While VFD pumps can reduce energy consumption, small units may only achieve modest energy reductions. Estimated annual electricity savings from installing this system amounted to \$77.



Shamrock Plants took the opportunity to become involved in the Queensland Government funded Energy Savers Plus Program Extension (ESPPE) project. In this project, an energy audit was conducted on all systems, and among the recommendations made was the installation of a 20-kW solar photovoltaic system (solar PV system). After further investigation, it was decided that a 30-kW solar PV system was going to offset all on-site electricity costs and be a more cost effective option. The 30-kW solar PV system was estimated to provide savings of 62,634 kWh/annum amounting to \$19,345/annum with a payback period of 2.2 years. The solar PV system was subsequently installed, and is now significantly reducing electricity consumption from the grid.

Joe and Jodie had identified the current growing facilities could not effectively meet the demand for their product. Various options around upgrading the existing facilities to increase production capacity were investigated before deciding to build a new covered growing area adjacent to the existing growing areas.

“ We found the new growing area was more efficient to use and produced superior quality plants.”
Jodie Eliasaf

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There were a number of advantages in adopting this approach including:

- installation of modern technology, growing systems and efficient plant handling systems,
- upgrading water storage and distribution systems,
- installation of efficient irrigation systems, and
- installation of an effective recycling system to reduce water use. Recycling was a major consideration in the development of the new area, as the current water supplies were identified as being a potential limitation to production.

Considerations for developing the new growing area were:

- Water security.
- The location of the growing area in relation to the existing facilities to maximise labour efficiency.
- The type of structure constructed to minimise costs while giving the required plant growing environment.
- The environmental control systems required for ventilation, air movement and humidity management.
- Benching systems for ease of use, airflow and effective plant hygiene.
- Layout of benches and pathways within the structure.
- Irrigation water supply requirements to the growing area, both quality and quantity.
- Irrigation system types and specifications.
- Irrigation water disinfestation requirements.
- Pumping and irrigation system controls required.
- Design of drainage water capture and recycling systems, and how these integrated with the existing drainage system, new water storage in tanks and disinfestation systems.
- Alternative water sources.
- Availability of contractors.
- Cost/benefit comparisons of the various alternatives identified.

The growing structure decided on was a multi-span igloo structure, with 6 gutter joined igloos each 28 metres long and 10.5 metres wide, with a 3.5 metre gutter height.

The first step in the construction process was to remove hollows from the area. The posts for the igloos were then erected and the trenches for the irrigation mains, electricity and data conduits were dug. The gutters and hoops of the igloos were erected before installing the concrete pathways





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in the igloos. Clear Solarweave® was used to cover 5 of the igloos, with white Solarweave® being used on the 6th igloo to give a more shaded growing environment for crops that would benefit from additional shade. Trenches for the ag-pipe drains were dug, and weed mat laid across the area to protect the 200 µm builder's film from being punctured by rocks in the soil. Geotextile was laid over the builder's film to protect it from damage caused by the gravel on the pathways, before the ag-pipe was laid in the trenches. A layer of 20 mm gravel was spread in the pathways between where the benches were to be located. The circulation fans and overhead irrigation were then installed. The sprinkler system decided on was Netafim SpinNet sprinklers with black jets. In addition to the sprinklers, an area of trough irrigation was also installed to further reduce water use.

The benches under the sprinklers were built using plastic bench tops supported on a steel 'top hat' framework with Besser block supports.

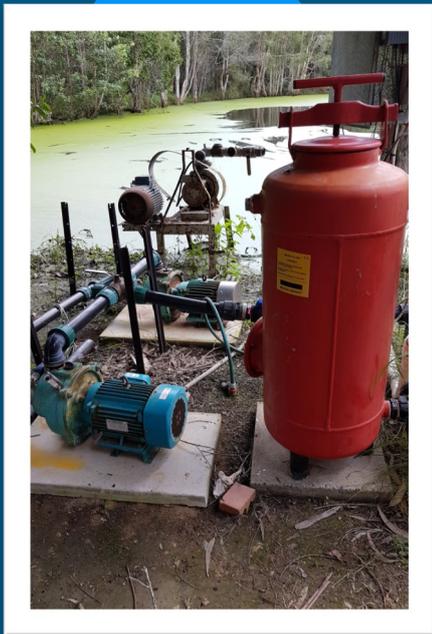
The final step in the construction process was the installation of the 1,250 mm extraction fans to assist with temperature and ventilation control.

While the igloo was being installed work progressed on service infrastructure, particularly the installation of the 110,000 litre lined modular steel water storage tank to store disinfested irrigation water and give a greater buffer of water supply for nursery production.

Once the irrigation system had been installed, the existing VFD pump was relocated, as it had been determined it had the performance required to operate the new irrigation system.



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The approaches to the new growing area were concreted to enable a forklift to move trollies from the area more efficiently. However, this meant that some changes had to be made to WHS procedures, with paths for pedestrian traffic identified, and all staff and visitors required to wear high visibility clothing.

Outcomes: The construction of the new facilities has resulted in an increase of 1,788 m² in growing area, with a potential to grow 24% more stock.

New growing area specifications:

Igloos—multi-span 6 gutter joined igloos each 28 metres long and 10.5 metres wide with a 3.5 metre gutter height. Winter temperatures are a major limitation to production, and it was decided that the focus on environmental management needed to be on having warmer winter temperatures. The greenhouse design chosen was effective for heating, but less efficient for cooling, requiring 1,250 mm extraction fans to manage summer temperatures.

Water sources and storage— 2 megalitre dam for the main irrigation water supply to a 110,000 litre lined modular steel tank used for storing disinfested water for irrigation and fertilising. 25,000 litre tank to store rainwater for pesticide application and propagation misting.

Irrigation water disinfection—in-line sodium hypochlorite injection after filtration and prior to the storage tank.

Pumping system—Lowara 10SV06 – best efficiency point— 10000 L/hr at 54 m head.

Sprinklers— Netafim SpinNet black nozzle, grey spinner, operating at 3.5 bar.

Trough irrigation system— using Klip-Lok® roofing.

Drainage system—graded, trenched, weed mat under builder's plastic for protection, 200 µm plastic lined, ag-pipe, geotextile to protect the plastic lining, and pathways covered with a layer of 20 mm screenings.

Drainage water recycling system—. The new growing area had efficient drainage water collection installed with all the



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collected drainage being returned to the storage dam via the existing surface drainage system.

Benches—plastic bench tops on ‘top hat’ frame supported on Besser block legs.

Environmental control—circulation fans and 6 x 1,250 mm extraction fans.

Irrigation efficiency tests - Mean Application Rate (MAR)—11.3 mm/hr (Best Management Practice (BMP) < 15 mm/hr), Coefficient of Uniformity CU—85.2% (BMP > 85%) , SC—1.3 (BMP < 1.5). While these tests meet the minimum requirements for an efficient system there were areas of improvement identified from the tests where fine tuning of the system would improve the result; trialling different operating pressures and better positioning of sprinklers. It was also identified that airflow through the house can cause significant drying of plants and reduced irrigation uniformity in some areas.

The improvement process has now moved to a fine tuning phase, and learning how to obtain the best results from the new systems. Joe and Jodie are pleased with the early results from the growing area expansion, and with the solar PV system providing the electricity to operate it and the rest of the nursery.

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