

# NURSERY PAPERS

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## A generic economic decision model for the nursery industry to assess proposed changes to a business

Many production nurseries are faced with making business decisions on a daily basis such as production planning, irrigation management, human resource issues and other operational matters.

In recent times the issue of water use efficiency and managing water resources has been of increasing concern to many nurseries. A change in managing water use efficiency usually comes at a cost to the business but if nothing is done this could have a greater detriment.



# A generic economic decision model for the nursery industry to assess proposed changes to a business

Assessing the water use efficiency and operating cost data of four nurseries pre and post retrofit to industry Best Management Practice (BMP)

During 2007, the Department of Primary Industries and Fisheries, Queensland (DPI&F, Qld) undertook research to "Increase Adoption of Innovative Irrigation Technologies in Australian Nurseries" on behalf of Nursery & Garden Industry Australia (NGIA).

Part of this work was to conduct two irrigation system retrofits to industry irrigation best management practice (BMP) in production nurseries and examine the savings in water and operating costs achieved. This work is profiled in the November 2008 Nursery Paper, 'Upgrading an irrigation system can improve water uniformity and reduce your operating expenses'.

The savings achieved in the two study retrofits were linked to two private retrofits operating to irrigation BMP criteria [Mean Application Rates (MAR) <25 mm/hr, Coefficient of Uniformity (CU) of >85% and Scheduling Coefficients <1.5]. The comparison nurseries were chosen using the following criteria:

1. Had documented water use records for a period of 3 to 6 months before and after the irrigation system retrofit/upgrade
2. Had system efficiencies data for before and after the upgrade
3. Were willing to provide financial records for the previous financial year

The information was used to compare water savings, dollar return and increase in business potential of the case study nurseries via a cost/benefit analysis.

The aim was to determine the economic implications for the four production nurseries prior to the changes being implemented to the irrigation systems.

The method used to assess the "base case" (prior to retrofit) and the changed case (post retrofit) of the case study nursery businesses is a standard discounted cash flow (DCF) investment analysis framework. The DCF estimates the Net Present

Value (NPV) or Lump Sum Present Value Equivalent of the incremental cash flow stream over the term of the investment. It arises directly as a result of estimating the difference in the annual cash flow pattern for the business, with and without the proposed changes. Thus the NPV determines the present day value of any investment over the period of time at the quoted discounted rate.

The NPV result determines whether a proposed investment is likely to be viable or not. An investment is said to be viable if the NPV is positive at the quoted discount rate of 7% over the investment time of 10 years for the generic economic model.

This project has led to the development of

a generic economic decision model utilising a series of economic spreadsheets for the nursery industry to assess proposed changes to a business in regard to water saving technologies to allow growers to plan and implement water use efficiencies based on a return on investment.

It will also provide estimates on other operational cost savings such as reduced electricity cost, plant throw outs, fertiliser and chemical usage.

The model should be used by an Industry Development Officer during a nursery assessment to ensure all appropriate data is considered to provide an accurate suggested outcome.



## Nursery retrofit case studies

### Case study nursery 1

This was a shrub and tree nursery occupying 0.8 ha of production with a 15 year old irrigation system built as the nursery expanded. Prior to the retrofit 70% town water (15.2 ML per year) and 30% Dam water (6.5 ML per year) were used for irrigation. The retrofit allowed a significant reduction in the amount of town water required as less water was being applied and more runoff was being collected and reused within the nursery.

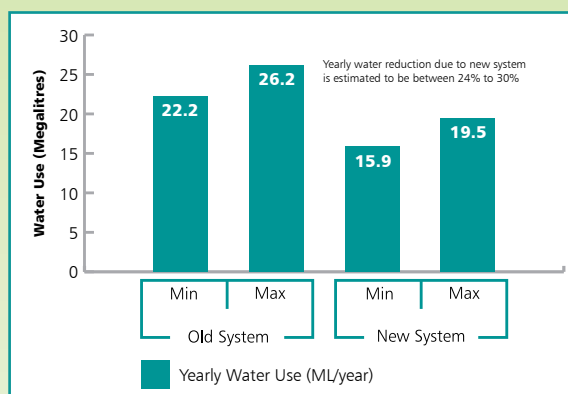
A total outlay of \$77,594 was spent on the retrofit for the irrigation system, disinfestation unit and labour. The retrofit allowed annual water savings of 9.4 ML per year from the old irrigation system. The major financial savings were in the reduction in town water usage to only 13% of the new water usage equating to a saving of \$24,070 inclusive of associated cost savings of less plant spoilage and labour.

### Case study nursery 2

This nursery had 1.2 ha under production and has been in operation for several generations with a 15 to 20 year old irrigation system installed as the nursery grew over generations.

Performance data pre-retrofit was CU 66 to 91%, MAR was excessively high at 14 to 51 mm/hr and the SC ranged from 2.1 to 5.0. The total irrigation use was 24.5 ML per year with water provided by a dam.

The changes to the irrigation system were significant with a total outlay of \$38,240. The retrofit yielded an estimated saving of 6.5 ML per year. Due to the nature of nursery using existing dam and recycled water from collection drains, the total savings in water are relatively low.



Nursery 2  
Yearly Averaged Water Use

### Case study nursery 3

This was a seedling propagation nursery operating for around 18 years. The previous irrigation system consisted of Moss and Pope rotoframe sprinklers with irrigation performance data: MAR of 26.9 to 28.5 mm/hr, CU between 66.4 and 76.1% and SC ranging from 3.04 to 4.51.

Average water use was 9.5 ML per year as monitored by town water usage and with increasing costs for town water an irrigation specialist was commissioned to retrofit the nursery to improve water use efficiency, reduce town water use and input costs.

The water source was modified by reinstating a bore which supplied 78% of the nursery water and supplementing town water at 22% to meet irrigation needs.

Prior to the retrofit town water use was a concern and a limiting factor due to the cost involved. Installation of tanks to allow bore water treatment and filtration to improve irrigation water quality has allowed alternative water to be used.

The new irrigation system meets irrigation BMP and has reduced annual water use to 5.1 ML. The retrofit has provided annual water savings of 4.4 ML from the previous system with 1.1 ML per year of town water used for irrigation compared to 9.5 ML per year which represents a significant cost saving.



The brass Moss sprinklers are still used by many nursery businesses for irrigation – albeit with poor irrigation performance and water use efficiency

### Case study nursery 4

This was a tree nursery operating for several generations with 2.7 ha of cropping under production. Prior to the retrofit the nursery was reliant on town water with overhead irrigation and manual scheduling. Drainage and run off collection was poor with slope required to drain excess irrigation and rainfall run off from the growing areas.

The increasing cost of town water and a need to improve production efficiency lead to the decision to upgrade the irrigation system over several years. This included recommissioning an old 1.3 ML dam and drilling a bore to supplement irrigation water. Collection drains were built to channel run off back to the dam and a biological filtration system was installed to treat the dam water.

Irrigation performance data were not recorded by the owner prior to the retrofit, however the owner stated they would not be in business if the irrigation system was not improved encompassing overhead, drip and micro irrigation.

Improvements in irrigation performance and the installation of collection drains have substantially reduced the reliance on town water whilst reducing infection from pathogens.

The new irrigation system meets irrigation BMP and has reduced annual water use to 34.7 ML per year. More importantly the previously 55.5 ML per year of town water has been reduced to 6.9 ML by supplementing bore water (3.5 ML) and dam water (24.3 ML) to fulfil irrigation requirements.

The retrofit has provided annual water savings of 20.8 ML from the previous system which represents a significant cost saving. The key savings have been in water (\$63,463) and reduced throw outs (\$43,200) equating to \$106,663 per year prior to adjustments in depreciation.



Nurseries with excessive application of irrigation and drainage impediments are prime candidates to see returns in investment from irrigation upgrades and growing bed surfaces.

## Economic outcomes via economic model

### Case study nursery 1

The economic assessment of the retrofit demonstrates significant financial savings in water which will allow the nursery to see a return on the investment in approximately 3 years. With reduced operating expenses thereafter this will see a positive return on the investment by the nursery of \$24,070 with a cost benefit ratio of 3.2 or for every \$1 dollar invested \$3.20 will be returned over the 10 year period.

### Case study nursery 2

The economic assessment of the retrofit indicates financial savings of \$831 per year, however with the outlay of around \$38,240 the net benefit over a 10 year period is projected as neutral. Whilst an economic return on the investment is not extensive, the ability of the business to operate in drought conditions with improved water security is an investment alone.

### Case study nursery 3

Collectively, after adjustment for depreciation, the water and associated cost savings were around \$16,375 per year. The economic analysis has identified the year to return on investment is within the fourth year after the retrofit with a benefit cost ratio of 2.8 or for every \$1 invested \$2.80 will be returned over the 10 year projection period.

### Case study nursery 4

When other business data is entered into the economic model, water and associated cost savings of approximately \$89,463 per year after adjustment for depreciation have been established. The year to return on investment is within the third year after the retrofit with a benefit to cost ratio of 3.7 or for every \$1 dollar invested \$3.70 will be returned over the projected 10 year period.

## Conclusion

The results of the economic analysis show three of the four nursery case studies returned a positive NPV at a discount rate of 7% over a period of 10 years.

The results for case study 1, 3 and 4 are positive and indicate the outlay for retrofitting an old irrigation system which has poor water use efficiency and high reliance on town water is an extremely good investment. Reducing the cost of water was achieved by substituting town water and reducing the amount of water used with other sources.

For industry, the key to achieving a positive return on investment for upgrading irrigation systems is to first assess the existing irrigation system performance and the current costs of operating. Once data is established you can then compare the performance data to industry BMP in irrigation performance and determine the likely water use savings you would expect to achieve. The cost of any alternative water source and outlay to achieve the retrofit can then be assessed using the generic economic model to measure the net worth of the outlay.

The information generated from this research regarding more efficient irrigation systems provides a robust business case for industry to invest in implementing more sustainable production technologies.

## Supporting References

- Nursery Industry Water Management Best Practice Guidelines (updated 2005) available to download from NGIA website [www.ngia.com.au](http://www.ngia.com.au)
- Managing Water in Plant Nurseries (2nd edition) available to purchase from NGIA website [www.ngia.com.au](http://www.ngia.com.au)
- Nursery Papers May 2006 Issue no. 4, How efficient is your business water management ?
- Nursery Paper August 2006 Issue no. 8, Scheduling irrigation to maximise efficiency
- Nursery Paper January 2007 Issue no. 1, Water use in the nursery and garden industry
- Nursery Paper May 2008 Issue no. 3, What is NIASA and how can it benefit you
- Nursery Paper November 2008 Issue no. 9, Upgrading an irrigation system can improve water uniformity and reduce your operating expenses

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