Irrigation essentials
for North Coast farmers in NSW

Success stories

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Users are reminded of the need to follow safe work practice when applying any techniques described in this publication. This includes identifying, assessing and managing any occupational health and safety risks.

Introduction

This booklet is a follow up publication to **Irrigation essentials for North Coast farmers in NSW**. It features five north coast farming enterprises that have implemented five principles of sound irrigation management.

1. Prepare an irrigation drainage and management plan (IDMP)
2. Choose irrigation system components that best suit the situation
3. Use water efficiently, know when and how much to irrigate
4. Manage fertiliser inputs and nutrient losses
5. Monitor and maintain irrigation and fertiliser management systems

These irrigation success stories will inspire both new and experienced irrigators to design efficient irrigation management systems. A list of useful resources is included at the end of the booklet.

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Nursery recirculation maximises water use efficiency

Alstonville Palms Nursery

Managers	Debbie and Ron Deckys & Stan and Isabel Leach
Enterprise	Wholesale ornamental plants
Location	Alstonville
Soil	Red Ferrosol; medium clay loam; plants grown in potting media
Irrigated area	8 ha
Water source	Two on-site plastic-lined dams; licence allocation of 64 ML per hectare from Youngman Creek, Richmond River catchment

It's all in the irrigation drainage and management plan (IDMP)

In planning their irrigation system the managers of Alstonville Palms called on people with expertise and experience. A major component of the planning process involved the development of an IDMP, which the nursery managers consider to have been well worth the effort.

> ***"The IDMP is an owner's manual that anyone who owns the property now or in the future can use. It was well worth the initial effort involved in developing the IDMP for the nursery"***

An important innovation was the design of a closed loop irrigation and drainage system that collects runoff water from the nursery and diverts it to two plastic lined irrigation water storage dams with a combined capacity of 17 ML.

While the legal water allocation for this nursery is 64 ML per hectare, the recirculation system means that the nursery only needs to extract 2-6 ML per year from Youngman Creek. The managers of the nursery estimate a $75,000 return for each ML water used in the nursery.

Choose irrigation system components that best suit the situation

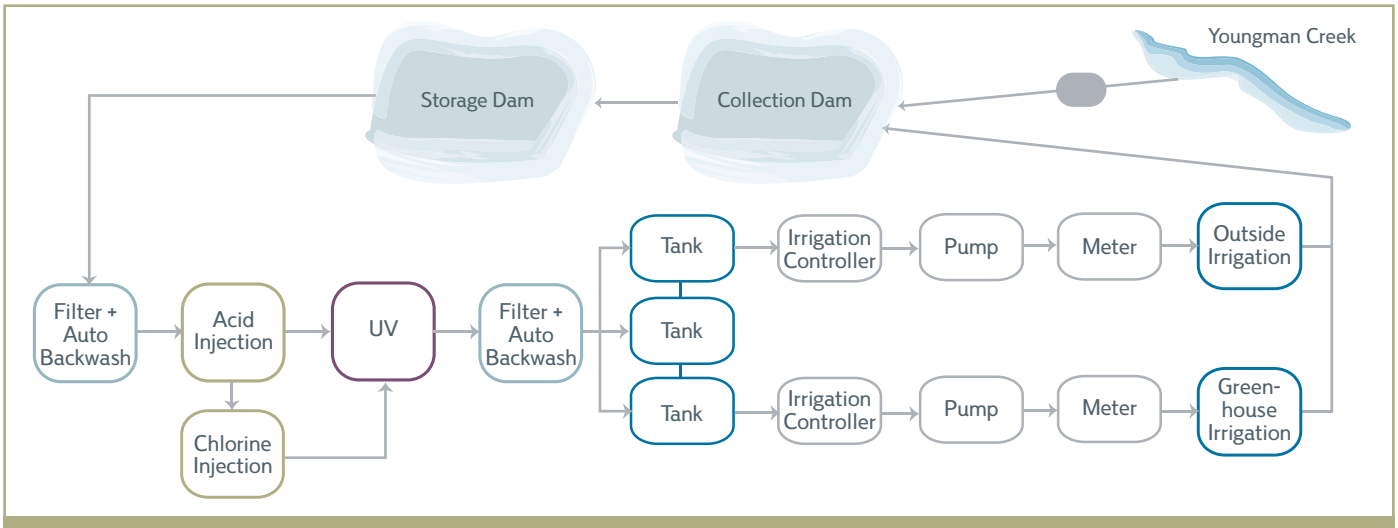
The nursery's irrigation system depends on two on-site plastic-lined dams. The Red Ferrosol soils are highly permeable so a good quality plastic dam lining was essential. Aeration and the addition of organisms into the dam water help control algae.

The nursery managers sourced irrigation equipment from a local supplier who calculated the specifications for the pumps and other system components. Water pumped from the dam is moved through several holding tanks as it passes each stage of filtration and chemical and ultraviolet sanitation.

These components are more complex than a 'pump and deliver' system used in broadacre cropping, but essential for nursery water re-use. Electronic controllers operate the system to minimise labour costs and optimise water use efficiency.

Aerial photograph of Alstonville Palms. The result of sound planning is evident in the layout.

Depending on pot size, either drip emitters or sprinklers are used to deliver water to plants. When choosing the types, number, flow rates and position of sprinklers and emitters, consideration was given to evenness of distribution and the absorption rate and water holding capacity of the potting mix. Any excess irrigation and rain water runs through gravel beds with underlying 200 gm plastic sheeting that carries the runoff to drainage channels that empty into the collection dam.



Schematic diagram of each of the major components of Alstonville Palms irrigation and drainage system.

Nursery recirculation maximises water use efficiency (continued)

Use water efficiently, know when and how much to irrigate

Alstonville Palms uses a class A evaporation pan to monitor plant water use. The pan is installed under shade cloth to simulate conditions inside the nursery's shade houses. Evaporation from the pan is measured and recorded at the same time each morning. The evaporation value is then multiplied by appropriate crop coefficients to determine the amount of water required to replace water used by the plants in the previous 24 hours. The irrigation manager then adjusts the run times on the automatic irrigation controller, and the irrigation system takes over from there.

"All it takes is 30 minutes to run through the procedure each morning and then the system pretty much looks after itself. Another important advantage of scheduling irrigation this way is that it minimises runoff from the nursery, resulting in cleaner water which subsequently reduces energy costs and work associated with algae control and cleaning filters."

To guide irrigation inputs, a Class A evaporation pan is used as an indicator of plant water use in the nursery.

Manage fertiliser inputs and nutrient losses

While managing fertiliser and plant nutrients in a wholesale ornamental plant nursery differs from nutrient application in broadacre crops or orchards, the basic principle is the same: provide nutrients to meet plant requirements and minimise losses of expensive fertilisers.

Nutrient applications are tailored to the specific plants produced in the nursery. Quantities were originally based on research findings and then adapted over time. Slow release fertilisers are mainly used because the nutrients are only released as plants use them, which minimises losses.

The recirculated irrigation and drainage system used in the nursery collects nutrients that leach through the pots and stores them in the on-site dams. By recycling the water the nutrients are also recycled which results in a 10-20% reduction in fertiliser inputs. By capturing runoff and nutrients in the dams, few nutrients are released into the environment.

Monitor and maintain irrigation and fertiliser management systems

The nursery managers and staff have each completed a WaterWise training course which has increased their ability to monitor and assess the performance of their irrigation system. Monitoring includes regular testing and maintenance of pumps, regular cleaning of filters, and checks on the operation of irrigation emitters and the water distribution uniformity of sprinklers.

Where drip irrigation is used, several of the drip emitters are placed in rain gauges to monitor application rates in mm units that are easily related back to mm units recorded for pan evaporation. Another simple innovation is the use of plastic bags around pots to determine how much water passes through the pot. If there is too much water the irrigation manager adjusts the crop coefficients.

Algal growth in the dams and annual testing of water in the dam provide indicators of fertiliser use efficiency. Any increases or peaks may indicate excessive fertiliser inputs.

Monitoring also means revisiting previous plans and investing time in thinking about how things can be improved. For instance, the managers have identified that the irrigation efficiency could be improved significantly by reducing evaporation from the storage dams.

Recirculated water from the nursery reduces fertiliser inputs by up to 20% and prevents nutrients being released into the environment.

These simple innovations monitor irrigation inputs in the nursery.

When the dam liners need replacing, the managers will consider rebuilding the dams with a smaller surface area so that they can be covered with shade cloth. This innovation will reduce evaporation, which can account for 46% of water lost from the system, and reduce the need to run aerators and sanitation to control algae.

"To manage it you must monitor and measure it"

Time spent keeping records saves time and saves water

PF and PC Stacey

Managers	Phil and Patti Stacey
Enterprise	Custard apples and low chill stonefruit
Location	Victoria Park (Alstonville Plateau)
Soil	Red Ferrosol; medium clay loam
Irrigated area	6 ha
Water source	33 ML licensed allocation from Gum Creek, Richmond River catchment and 3.3 ML stored in harvestable rights dam

It's all in the irrigation drainage and management plan (IDMP)

A local irrigation supplier provided the Staceys with most of the technical information they needed when planning their irrigation systems. The Staceys also invested time in developing knowledge of irrigation hardware and an understanding of water budgeting. Some of this knowledge came from completing a WaterWise training course.

Much of the early planning for this orchard was formalised and built upon further during the process of developing an IDMP. The Staceys understand the importance of keeping and utilising records and in their planning process, decided what types of records they would keep and how they would use them.

Being clear about the reasons for irrigating is an important step to inform the planning process. For the Staceys, irrigating gives their farm business an edge. Irrigation is used to achieve ideal fruit size and quality and to hold custard apples on the trees for longer, enabling fruit to be sold late in the season when market prices are higher. It also ensures consistent production in extended dry periods, an important adaptation to climate variability.

Choose irrigation system components that best suit the situation

In choosing irrigation system components, the Staceys had to contend with a near 200m elevation lift from Gum Creek to the orchard. The on-site storage dam breaks the lift into two 100m sections. This means it takes less energy and costs less to irrigate from the on-site dam, so water is only pumped from Gum Creek when the dam needs topping up. A local supplier helped the Staceys choose Helical rotar pumps that run at around 1.2 Mpa (175 psi on the old scale).

The water delivery components of the Staceys' irrigation system include standard plastic wares for irrigation pipes and delivery lines. Microsprinklers and double in-line drip tape are used in various parts of the orchard, with increasing favour toward the more efficient drip irrigation. Two important components of the system are a sand and gravel filter to reduce blockages and maintenance of irrigation emitters, and flow meters installed at several stages throughout the irrigation system to monitor system performance.

Helar rotor pumps lift water 200m in two 100m stages from Gum Creek to a storage dam and then into the orchard.

A harvestable rights dam provides water security during extended dry periods.

Use water efficiently, know when and how much to irrigate

Converting to drip irrigation has been an important step toward achieving water use efficiency on the Staceys' orchard. However, efficiencies have also been gained by keeping and using soil moisture records to guide irrigation inputs. Tensiometers are installed at several locations in the orchard at 30cm and 60cm depths.

Soil moisture is checked most mornings using a handheld data logger. The target range for soil water potential (soil moisture) is -10Kpa to -20Kpa within the effective rootzone (to 60cm depth). When the tensiometers placed at 30cm depth read between 20Kpa to 25Kpa the Staceys know to irrigate. When readings from the 60cm deep tensiometers start to rise it is time to stop irrigating.

By comparing records for tensiometer readings and irrigation inputs over time the Staceys know how much irrigation water to apply to raise soil moisture to the target of -10Kpa. This strategy maintains readily available soil moisture and minimises deep drainage by confining movement of irrigation water to within the rootzone.

Manage fertiliser inputs and nutrient losses to the environment

Fertiliser inputs are managed by using a crop removal nutrient budgeting approach. A spreadsheet, developed by the Staceys, is used to calculate fertiliser inputs with formulas based on standard crop replacement values. By also comparing results from soil analyses with recommended soil nutrient optimums the Staceys can assess the performance of their fertiliser program.

Leaf analysis is also used to determine plant nutrient uptake. Evidence of plant nutrient deficiencies or excesses when there are optimum nutrient levels in the soil, indicates that a factor associated with the soil's chemistry, such as soil pH, may need adjusting. It may also indicate other problems such as over- or under-watering, insect attack or disease.

Nutrient budgeting and soil and plant analyses allow the Staceys to monitor and regulate the input and availability of soil nutrients, resulting in efficient fertiliser use and minimal nutrient losses to the environment. Splitting a season's total fertiliser inputs into several applications also improves efficiency and minimises losses.

Tensiometers and an EnviroSCAN© monitor soil moisture and guide irrigation inputs.

Monitor and maintain irrigation and fertiliser management systems

The Staceys regularly check each component of their irrigation systems and also use flow meter and pressure gauge records to detect any problems. Differences between the volume of water entering the pump and delivered to the orchard may indicate unseen leaks. A reduced flow rate in or out of the pump may indicate a blocked filter or early signs of a mechanical problem.

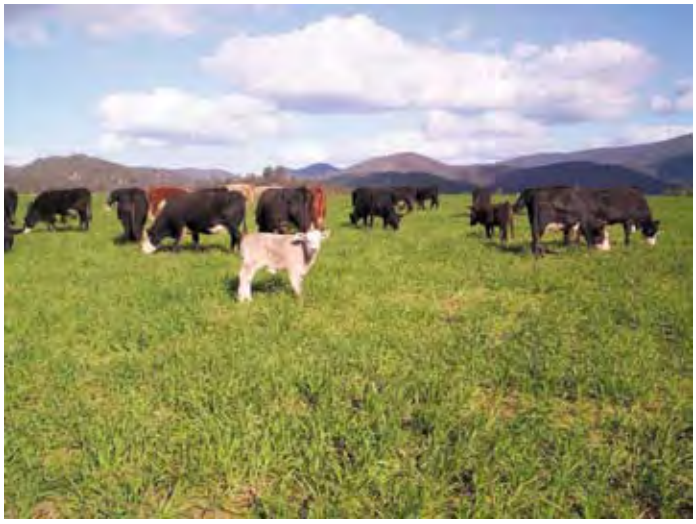
The Staceys' investment in record keeping is the backbone of their irrigation management and farming system. They record their observations daily in a farm diary so they know where management on the farm is up to at any particular time which enables them to prioritise tasks. Time invested in keeping records saves time spent elsewhere on the farm and results in efficiency gains that save money and reduce waste.

"I don't understand how anyone could farm successfully without keeping and using records to support and prioritise on-farm management decisions"

A more efficient broadacre irrigation system

Jackadgery Park

Managers	Keith and Carol Mercer
Enterprise	Integrated beef and broadacre crops: pasture (rye), legumes (soybeans, adzuki beans, cow pea) and cereals (oats, maize, barley)
Location	Jackadgery
Soil	Brown and grey alluvial loams overlaying light to medium clay
Irrigated area	60 ha
Water source	101 ML harvestable right and 350 ML licensed alllocation from Mann River, Clarence River catchment

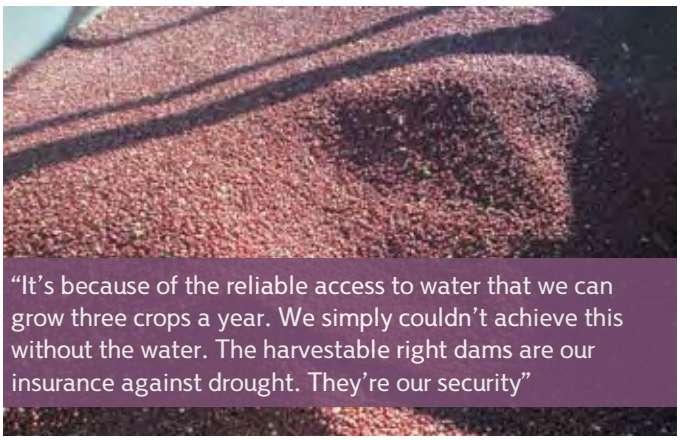


It's all in the irrigation drainage and management plan (IDMP)

The Mercers irrigated for two decades before developing their IDMP. Concerned about inefficiencies, they decided to evaluate their existing irrigation system through the process of developing an IDMP. They employed a consultant and sought advice from irrigation experts including state government irrigation officers. They also completed an irrigation management course to improve their understanding of irrigation scheduling. All of their ground work was pooled into the IDMP with the outcome being a thorough understanding of their goals, their property and the natural resources that support their farming system. Soil analyses revealed the plant-available water-holding capacity of the soil and this, combined with a climate analysis, helped them develop a water budget. A water budget estimates the amount of irrigation water required and is a critical step in planning water access and storage.

"The IDMP played a very important role in building our core knowledge for managing irrigation on our farm. Once you build your core knowledge you don't need to keep going back"

The Mercers are fortunate in that their property has a reliable source of water, but some of their cropped area is rainfed as it is too far from the water source to irrigate. In dry years, having access to water means that the Mercers can still produce up to three crops from their irrigated area, which is critical for maintaining farm income. Under the *NSW Water Management Act 2000* a 'cease to pump' order for the Mann River can be declared during extended dry periods. Two on-site harvestable right dams that can store up to 101 ML provide an insurance policy for such events. The Mercers' irrigation system makes this water last as long as possible during dry periods.



"It's because of the reliable access to water that we can grow three crops a year. We simply couldn't achieve this without the water. The harvestable right dams are our insurance against drought. They're our security"

A more efficient broadacre irrigation system (continued)

The Mann River (left) provides the major source of irrigation water for Jackadgery Park but the 101 ML water stored in two harvestable right dams (right) provides insurance against drought.

Choose irrigation system components that best suit the situation

Before converting their irrigation hardware the Mercers used a big gun irrigator with a lane spacing of 68m and a lineal travel length of 400m. At a travel speed of around 26.5m/hr the irrigator took just over 15 hours to travel the length of the paddock. It had to be manually moved up to 14 times for each irrigation cycle, which required 21 hours labour over 9 days with a total irrigation time of 223 hours. The IDMP process revealed that the slow travel speed meant the crop was typically overwatered by 42%. Summer crops had five days supply of soil water in the root zone, but could only be irrigated every 9 days, so there was a high risk of plants becoming water stressed in low rainfall periods.

Lineal travel irrigator : A more efficient broadacre watering system

The Mercers invested in a lineal travel irrigator with a 200m span which travels the entire length of the paddock, automatically pivots and then returns in the opposite direction. This means that the entire cropped area is irrigated in two lineal runs, with labour only needed to start the system. Water is distributed evenly in precisely controlled volumes.

Use water efficiently, know when and how much to irrigate

The Mercers use tensiometers to indicate when irrigation is needed. Through the soil investigation carried out during the IDMP process the Mercers know that when the tensiometers read -38kPa the soil water available to the crop is running low and that 24mm needs to be applied to raise soil moisture to field capacity. After observing their tensiometers over several seasons the Mercers have learnt that in the summer months irrigation is required every 4 to 5 days.

Manage fertiliser inputs and nutrient losses to the environment

The Mercers employ an independent consultant to work out their fertiliser requirements. Soil testing is undertaken annually and fertiliser input requirements are calculated based on maintaining recommended optimum levels of various plant nutrients in the soil. These recommended optimums were established through field agronomy trials for the crops grown on the farm.

Cattle feed on retained stubble and produce manure that returns nutrients and organic matter to the soil.

The Mercers' cropping system is minimum till and is integrated with cattle grazing. Retained stubble provides fodder used for fattening cattle. By retaining stubble and passing fodder through cattle to produce manure, organic matter is retained on-site. The organic matter stores a significant volume of nutrients that are released slowly to the soil as the organic residues break down. Cycling of nutrients through the farming system contributes toward fertiliser use efficiency and reduces nutrient losses.

The effectiveness of irrigation and nutrient management is monitored by inspecting the crop at each stage of development.

Monitor and maintain irrigation and fertiliser management systems

The lineal travel irrigator requires little maintenance. Maintaining clean oil in the pump, greasing moving parts, keeping electronic components dry and corrosion free, and checking the cable guides for wear keeps the system operating effectively. Any leaks that appear in the irrigation conduits are repaired as soon as possible.

Monitoring the effectiveness of the fertiliser program is achieved through annual soil tests, and fertiliser inputs are compared against crop performance. If no gains are observed from increasing inputs of specific elements then inputs are scaled back. If crop performance declines fertiliser inputs are reviewed and scaled up if increased inputs are required.

The lineal travel irrigator requires minimal maintenance.

"The lineal travel irrigator has paid for itself many times over"

Irrigation allows avocado production on sandy soil

Serrata Enterprises

Managers	Chris and Sue Nelson
Enterprise	Avocados and sorghum
Location	Stuarts Point
Soil	Sand; peaty aeric podosol
Irrigated area	30 ha (avocado)
Water source	12 ML per hectare licensed allocation pumped from Stuarts Point aquifer

It's all in the irrigation drainage and management plan (IDMP)

The Nelsons' farm provides a testimony to how sound planning and irrigation management can turn low productivity land into a profitable cropping enterprise.

The Nelsons' land was previously part of a larger asparagus enterprise at Stuarts Point. They first grew potatoes but then converted to avocados, which required a new irrigation system, so they employed a consultant to assess their land as part of the IDMP process.

"Being on sandy soils, if we want to produce avocados, irrigation simply isn't an option, it's a necessity"

The site's free draining sandy soil has low organic matter, limited fertility, and no capacity for storing water in earth dams. The soil can store only 10mm of plant-available water, and with avocado trees potentially using half of that in a single summer day, it was obvious that irrigation was necessary.

As part of the planning process a water budget was prepared and a groundwater resource assessment was undertaken. The water budget provided a forecast of water requirements which, when compared with an assessment of available water, confirmed that access to and supply of water from the Stuarts Point aquifer was adequate to irrigate avocados across the site.

Choose irrigation system components that best suit the situation

Centrifugal electric pumps draw water from the aquifer through a battery of spearpoints installed in an excavated trench to 4m depth. The system uses an automatic station controller and hydraulic solenoid valves, and requires minimum maintenance.

When the farm converted to avocados water was delivered through a solid set irrigation system. This system was gradually replaced with under-canopy micro-sprinklers which are much better suited to horticultural tree crops, where irrigation distribution uniformity is important.

Use water efficiently, know when and how much to irrigate

The Nelsons' enterprise loses little water to evaporation as the water is stored in an underground aquifer, and distributed by under-tree micro-sprinklers. The addition of organic matter has improved the soil's water holding capacity, and mulching has further reduced evaporation losses.

When growing crops on sandy soils, the usual principles of irrigation scheduling based on climatic and soil moisture monitoring can be relaxed a little if historical averages for evaporation are known. In the summer months between December and February pan evaporation at Stuarts Point averages around 5 mm per day. During the winter months pan evaporation averages around 2 mm per day. This is about the same amount of water that a mature avocado tree will draw from the soil.

The Nelsons' avocado orchard is dominated by sandy soils that have little capacity to store water or nutrients.

With plant-available water being only 10 mm, the Nelsons know that the avocado trees will deplete plant available soil water within around two days in summer and within around five days in winter. Consequently, their strategy is simply to apply 5mm each day in summer and every two to three days in the winter months unless it rains. Many years of experience has proven this to be an effective strategy.


Good filtration is critical to the efficient operation of drip or micro-sprinkler irrigation systems.

Irrigation allows avocado production on sandy soil (continued)

Solid set sprinklers (left) have been progressively replaced with efficient micro-sprinklers (right).

Manage fertiliser inputs and nutrient losses

The Nelsons use organic matter, most of it grown on-site, to build soil fertility. The organic matter acts as a low cost slow release fertiliser and provides cation exchange sites where nutrients applied to the soil are stored until the plant needs them. Building up cation exchange capacity is very important in improving water and nutrient storage capacity of sandy soils.

The Nelsons produce their own compost tea and apply it through a mobile spray unit as an organically derived liquid fertiliser. Regular applications of compost tea and organic mulch promote soil microbial activity, which in turn improves soil fertility and may contribute toward suppression of soilborne plant pathogens.

Sorghum is also grown on the Nelsons' farm. The sorghum silage provides mulch and maintains soil organic matter under the avocados.

The Nelsons monitor irrigation water quality and soil and leaf tip testing is carried out twice each year with the results then used to guide the nutrient management program.

Inorganic fertiliser inputs are carefully managed as a supplement to nutrient inputs from organically derived sources. Nutrient losses are minimised by applying nutrient inputs at monthly intervals, avoiding fertiliser applications prior to forecast rainfall, and minimising leaching through efficient irrigation. Maintaining organic matter in the soil also limits nutrient losses.

Containers laid out in preparation for testing the uniformity distribution performance of newly installed micro-sprinklers.

Monitor and maintain irrigation and fertiliser management systems

The Nelsons have gradually replaced the old irrigation system that came with the property. Corroded electric solenoids installed underground were replaced with low maintenance above-ground hydraulic solenoids. System components are inspected regularly and any problems dealt with immediately.

The Nelsons' ultimate goal is full automation using soil moisture sensors to control irrigation inputs and operate the system remotely. For now, the soil moisture status is reviewed regularly by physically examining the soil profile to make sure that sufficient water is being applied.

Supplementary irrigation of macadamias in dry periods

Benny Creek Farm

Managers	Ned and Patti Sutherland
Enterprise	Macadamias
Location	Clunes
Soil	Red Ferrosol; clay loam
Irrigated area	4.5 ha of 40 ha
Water source	102 ML per year licensed allocation from Bennys Creek, Coopers Creek catchment

It's all in the irrigation drainage and management plan (IDMP)

Before the Sutherlands took over Bennys Creek Farm, the previous owner had ceased irrigating and the irrigation system had become unserviceable, so upgrading the system was the focus of the IDMP. Before moving through the IDMP process Ned Sutherland completed a WaterWise training course and then sought the assistance of a number of irrigation consultants.

The previous owner stopped irrigating after local research between 1979 and 1987 failed to demonstrate yield increases in response to irrigation of macadamias grown on North Coast Red Ferrosol soils. The Sutherlands decided to reinstate the irrigation system to at least part of the orchard to ensure that, if required, irrigation could be applied during the critical stages of flowering, nutset and nutfill.

The Sutherlands received encouragement and support from a local consultant who worked closely with them to establish an independent field trial on the orchard to test the benefits of supplementary irrigation.

The Sutherlands' decision to maintain supplementary irrigation of their macadamia trees was supported in 2006 - 2007. After good rains during the 2006 August / September flowering period (246 variety), rainfall was below average for the next 11 months, coinciding with nutset through to harvest. For most months rainfall during this period was insufficient to replace soil water used by the trees.

By the completion of harvesting in 2007, 1700 irrigated trees yielded an average 20.3 kg NIS per tree compared with an average 11.0 kg NIS for non-irrigated trees. These results will be tested again in the next extended dry period.

MONTHLY RAINFALL (MM)
AUGUST 2006 - JULY 2007

The North Coast's high average annual rainfall means irrigation may not be needed every season, but the results from Bennys Creek Farm indicate that supplementary irrigation of macadamia trees has the potential to buffer against climate variability by maintaining consistent production in dry periods. The Sutherlands' experience demonstrates that supplementary irrigation should be given careful consideration when developing horticultural enterprises on the NSW North Coast.

Choose irrigation system components that best suit the situation

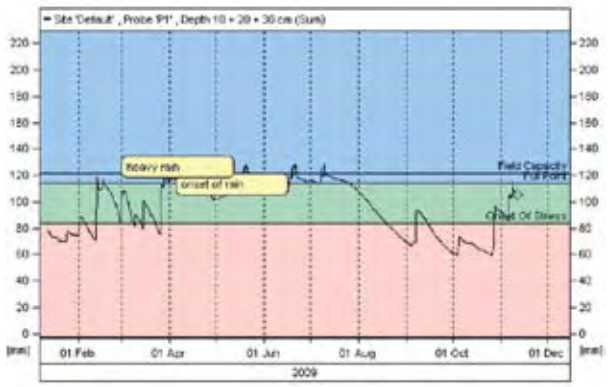
The Sutherlands' irrigation system is relatively simple. An electronic timer controls the operation of an electric pump. Water is drawn from Bennys Creek and pushed through a standard filtration system into irrigation pipes and delivered via micro-sprinklers. Under canopy micro-sprinklers were chosen because they provide uniform distribution and even coverage of tree roots.

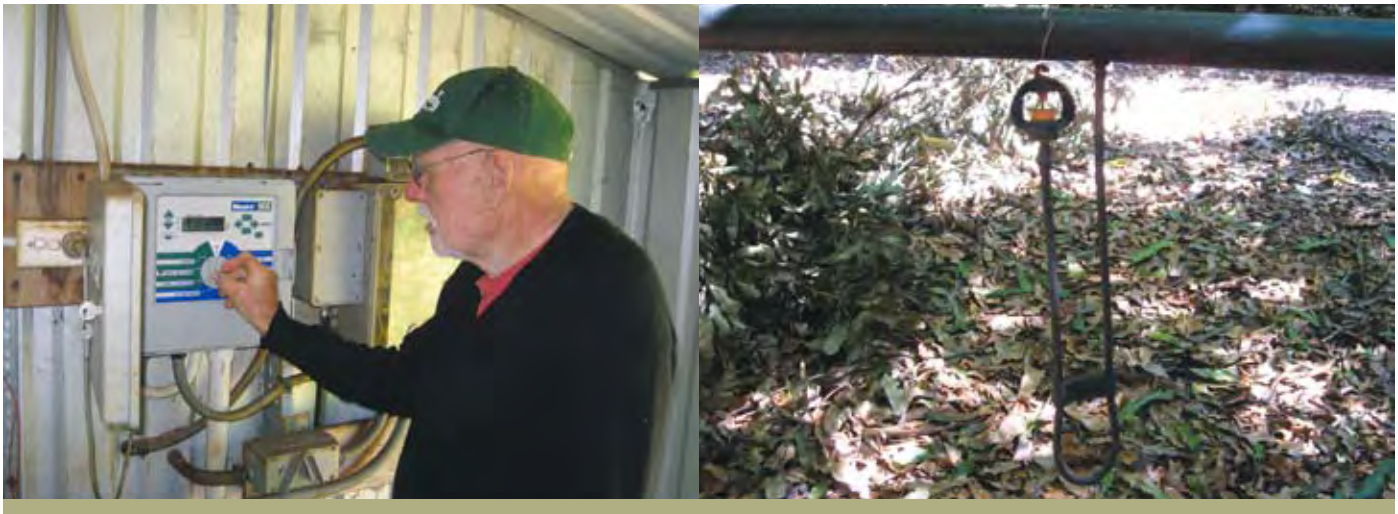
Use water efficiently, know when and how much to irrigate

Irrigation scheduling at Bennys Creek Farm is guided by a sophisticated soil moisture monitoring system. Sentek EnviroSCANs© are installed with sensors positioned at several depths within and just below the effective rootzone in four locations within the irrigated sections of the orchard. Each sensor is connected to a data logger, and telemetry devices emit soil moisture values to a remote internet-based server managed by a local consultant. The Sutherlands receive an email from the server twice each day which provides an update on the soil's moisture status.

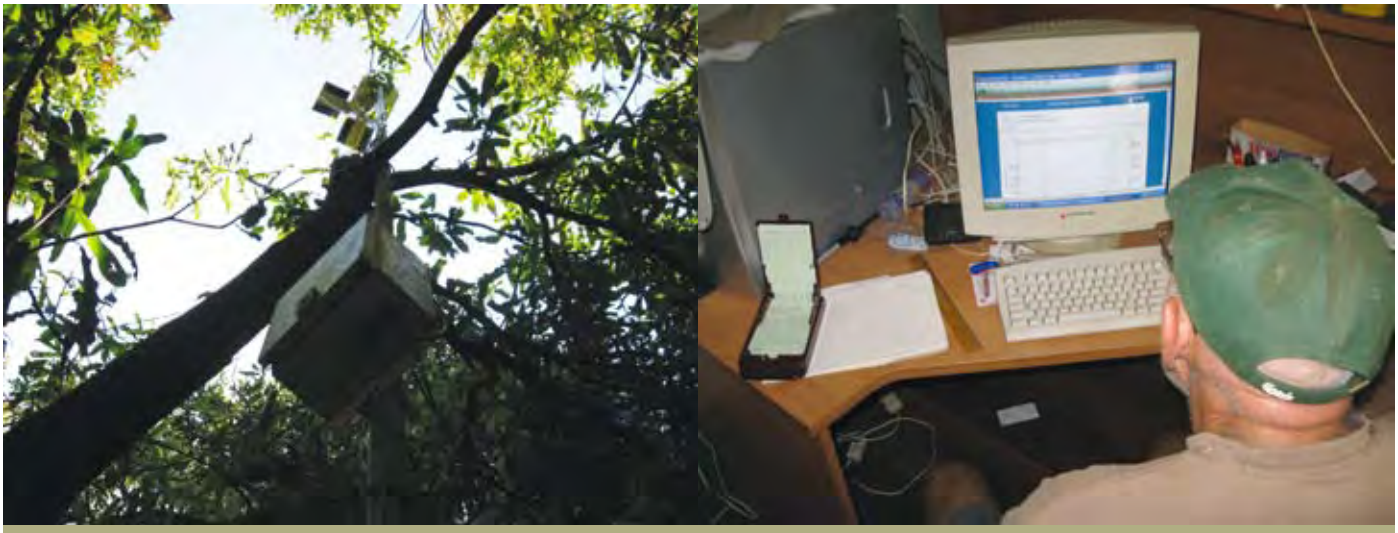
The soil moisture data is presented in graphs that clearly show whether soil water is available or plant stress is pending. By examining the rate of soil moisture depletion, the Sutherlands can plan in advance when irrigation is likely to be required. By knowing the volumetric moisture content of the soil the amount of water required to fill the soil profile can also be calculated. This approach allows for a very precise and water efficient irrigation management system.

SOIL WATER CONTENT (MM)





Simple but effective; an automated timer controls an electric pump to deliver irrigation water via raised micro-sprinklers installed in the tree row.



Sentek EnviroSCANs© track soil moisture and relay data via wireless technology to the Sutherland's computer so they can decide when to irrigate and how much water to apply. Graph (previous page) supplied by Col Peak, Peak Environmental Monitoring.

Manage fertiliser inputs and nutrient losses

The Sutherlands employ a consultant to manage their fertiliser program. Soil and leaf samples are collected and analysed annually and the fertiliser management program is adjusted as required. Fertilisers are currently applied as a top dressing twice a year but the Sutherlands are working toward improving the efficiency of their fertiliser management system by installing fertigation equipment.

Soil erosion can result in significant losses of nutrients from macadamia orchards on the NSW North Coast. Harvester blowers and sweepers and rainwater runoff from tree trunks move soil from under the tree to the middle of the row between trees. The Sutherlands have employed a contractor to move the inter-row soil into mounds under the trees where it covers the tree roots and retains soil nutrients where they are needed. The inter-rows are shaped into wide dish-shaped drainage lines that direct and control water so that its erosive energy is reduced.

In between harvesting periods leaf litter is retained on the soil surface. Some of the leaf litter will break down and return nutrients and organic carbon to the soil but the mulching effect of the leaf litter also slows erosion. Soil and nutrient losses could be improved by cultivating groundcovers such as smother-grass across the orchard floor, a future project for the Sutherlands.

Monitor and maintain irrigation and fertiliser management systems

Irrigation inputs are monitored by the Sentek EnviroSCAN© system. Soil moisture readings guide when and how much water to apply and also indicate whether too little or too much water is applied. The volume of water drawn from Bennys Creek is monitored using a water meter.

A water meter keeps track of water volumes pumped from Bennys Creek into the orchard.

As irrigation in the Sutherlands' orchard is only applied during dry spells, there can be lengthy periods when irrigation is not required. Without regular use, system components can corrode and irrigation emitters can become blocked by insect nests or algal growth. To ensure that the system will operate when needed, the Sutherlands run the irrigation system a few times each year and components are checked regularly and repaired if faulty.

"If we can maintain consistent production of macadamias in dry years by irrigating, and we have reliable access to water, then we'd be crazy to not take advantage of the resource"

Resources

Industry & Investment NSW

Industry & Investment NSW provides an online irrigation information service.

Start here:

http://www.dpi.nsw.gov.au/agriculture/resources/water

All you need to know about irrigation drainage management plans:

http://www.dpi.nsw.gov.au/agriculture/resources/water/irrigation/idmp

Help with designing and selecting components for your irrigation system:

http://www.dpi.nsw.gov.au/agriculture/resources/water/irrigation/systems

How to achieve water use efficiency on your farm:

http://www.dpi.nsw.gov.au/agriculture/resources/water/irrigation/efficiency

Can't find what you are looking for?

Try calling one of our Irrigation Officers. You might also want to ask them about WaterWise irrigation training courses:

Richmond 02 4588 2107

Tamworth 02 6763 1262

Irrigation Australia Limited

Irrigation Australia can put you in contact with accredited irrigation consultants who will be able to work with you to design and manage your irrigation system.

http://www.irrigation.org.au

NSW GOVERNMENT Industry & Investment

Australian Government
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