Australian Government
Department of Agriculture, Water and the Environment

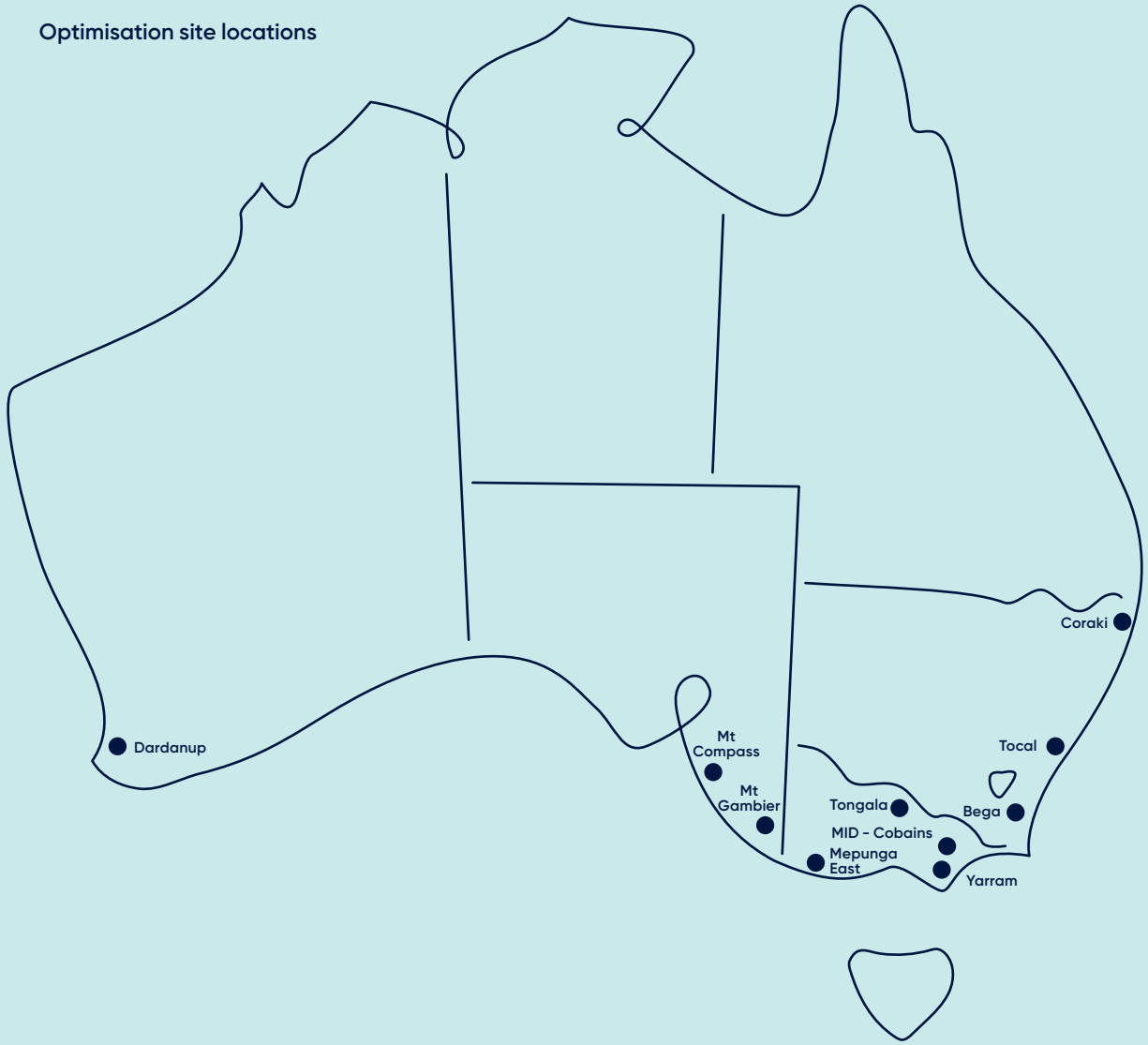
Dairy Australia

This project is supported by funding from the Australian Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit program and Dairy Australia.

SMARTER IRRIGATION FOR PROFIT II

DAIRY OPTIMISATION SITES

Optimisation site locations



DAIRYNSW
BEGA DAIRY OPTIMISATION SITE, NSW

Introducing Will Russell, Jelgowry

Will has recently transitioned from working as an engineer in the Bega Cheese processing plant to taking on the challenge of running the family dairy farm.

The SIP2 project has come at the right time for Will's aspirations to refine practices that will further drive production on the irrigated areas, both pastures and fodder crops.

'Historically we have had good access to water in the Bega Valley, but the climate has certainly changed and in the 2019-2020 season we were unable to access water for a number of weeks during the peak of summer. This has motivated me to investigate ways to optimise water productivity when the water is available. With the right data and decision support tools I can better plan to drive yield earlier in the season and do this using water and power efficiently.'

Irrigation measurement period

September – February

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- When to start irrigation at the start of season and after rainfall in spring/summer growing season to avoid the green drought?
- What is the optimal irrigation schedule to maintain adequate readily available water (RAW) across soil types of the irrigation area?
- What is the optimal application rate for a centre pivot irrigation system on typical Bega Valley granitic soils and kikuyu/ryegrass pastures?
- What are the potential yield and water/energy efficiency benefits in using variable rate irrigation?

Technologies being trialled

Three 40cm EnviroPro® capacitance probes with Wildeye® logger/telemetry have been installed into three varying soil types across the undulating site. Sensor readings are taken at 10cm increments every hour and this data is transmitted to a platform accessible by a smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using a rising plate meter weekly.

Who is involved?

Far South Coast Dairy Development Group, DairyNSW, Bega Cheese Pty Ltd, South East Local Land Services, Southern Farm Supplies, Bega Agricultural Services, Dave O'Donnell Irrigation Consultant.

Background

- 242ha farm, 125ha milking platform, 110ha mixed irrigation (25ha Centre Pivot, 25ha Bike Shift Sprinklers, 9ha Pod and 51ha hard hose)
- Milking herd: 300
- Optimisation site is an annual ryegrass/kikuyu mixed pasture
- Maize, lucerne, perennial ryegrass and Italian ryegrass also grown on other irrigated areas.

Water Supply

- Surface Water Entitlement: 200ML (high security), 578 (general security)
- Bore: 19ML (rarely used)
- Davey pump (55kW) supplies either bike-shift/k-line irrigation or the centre pivot
- When operating at low river levels this pump is prone to cavitation and reduced pump efficiency
- Power use: 3.8 kw/ML/m (Good), Power costs: $72/ML (High).

Optimisation site infrastructure

- AusRain Centre Pivot: 25ha, 5 span, 360^0, end-guns
- Irrigator commissioned 2002, aged Nelson sprinkler pack
- Site divided into 8 paddocks (2-4.3ha)
- Mainline 1700m from river to pivot with an elevation difference of 33m.

Optimisation site irrigation system

- Capability to segment irrigation via manual wheel speed manipulation. Not currently used.
- System capacity 12mm/day
- System currently delivering 15% less water than control panel setting
- Evaluated Coefficient of Uniformity (CU): 88%.

Pre-project Irrigation scheduling decisions

- Visual inspection of surface moisture/plant
- Weather information considered: recent/forecasted rainfall
- GDot gypsum block tension probe, 10-20cm measurement, no telemetry).

For more information contact **Kym Revington**
E: revington.techservices@gmail.com
M: 0419 388 966

DAIRYNSW
TOCAL DAIRY OPTIMISATION SITE, NSW

Introducing Matt Brett, Tocal Dairy

Matt has managed Tocal Dairy, part of NSW DPI's Tocal Agricultural College, for the past two and a half years. The focus of the farm is on education and training of students to provide them with workforce ready skills but improving practices that drive profitability are no less important than any other dairy business.

'Over the past two years I have been concentrating on profitability rather than production alone. In order to increase business efficiency we need to establish better systems for collecting the right data.

Being a SIP2 Optimised Site is helping to determine what needs to be monitored and will give me greater confidence to adjust irrigation and agronomy practices. At the end we will have evidence of the measured yield benefits under the three centre pivots, especially leading into summer which I think is our opportunity to optimise production.'

Irrigation measurement period

September – February

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Can improved scheduling of irrigation and nitrogen applications allow the Italian ryegrass/clover/chicory pasture to actively persist into early summer?
- Will scheduling irrigation in response to soil moisture and water balance information result in improved growth rates across the September to February period compared to the current set application approach?
- If irrigation is based on determined readily available water (RAW), rather than a fixed frequency (timing) or amount, how will the irrigation decision-making have to adjust? What are the best methods to inform these decisions given the personnel and skills available?
- Are there gains in energy and water use efficiencies from using an irrigation strategy based on depleting and refilling RAW?

Technologies being trialled

Four EnviroPro® capacitance probes with ICT International loggers and telemetry have been installed in the pivot area. The LoRa-WAN® network collects logged data to a central base station on site before it is sent to a cloud based platform, Grafana®, providing real-time data to Matt's smartphone via an App. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using an electronic C-dax meter.

Who is involved?

NSW Department of Primary Industries (NSW DPI), DairyNSW, Hunter Local Land Services, Farmers Warehouse, Doyle Ag and Fabrication.

Background

- 225ha farm, 130ha milking platform, 80ha mixed irrigation
- Milking herd: 280
- Optimisation site is predominantly Italian ryegrass/chicory/clover with peak summer window (January–February) of kikuyu/red and white clover pasture.

Water Supply

- Surface Water Entitlement: 686ML from Paterson River with no usage costs
- Pumping from two locations by submersible Grundfos pumps.
- Flow-meter fitted
- Remote control capability using the AgSense® platform on a smartphone or PC
- Second pond effluent is shandied through the irrigation system via poly-lined piping.

Optimisation site infrastructure

- Bike shift irrigation was replaced on the Optimisation Site with centre pivots in 2018
- Valley® Irrigation centre pivots:
  - Pivot 1: 19 ha, 4 span, 360°, end gun
  - Pivot 2: 14 ha, 3 span, 360°, end gun
  - Pivot 3: 4 ha, 2 span, 229°, end gun.

Optimisation site irrigation system

- Capability to segment irrigation via wheel speed manipulation. Not currently used
- Variable rate application along the line not possible (no solenoids on nozzles)
- Panels can be controlled remotely using AgSense® (timing (on/off), rate, speed)
- Evaluated Coefficient of Uniformity (CU): Pivot 1-77%, Pivot 2-84.5% and Pivot 3-80%
- Pump performance testing indicates improvement could reduce energy use by 23%.

Pre-project Irrigation scheduling decisions

- Visual inspection of surface moisture/plant
- Soil strength when pushing in strip grazing posts
- Weather information considered: rainfall and evapotranspiration
- Standard rate of 12mm applied per application during summer in 2019/20 season.

For more information contact **Peter Smith**
E: sapphireirrig@gmail.com
M: 0455 973 780

SUBTROPICAL DAIRY
CORAKI DAIRY OPTIMISATION SITE, NSW

Introducing Brian Chappelle, Fairdale Farm

When Brian needed to take over the family farm in 2018, the young farmer was enthusiastic to learn from those more experienced in the region but he also knew he and wife Lizzy wanted to explore new strategies.

'Our new fixed irrigation system has given us the capacity to apply irrigation to meet plant requirements. What we now need to know is how energy efficient our system is to make sure that we are getting a good return for our investment. We feel that we can maximise efficiency and growth potential of our pastures by knowing where our soil moisture is at.

The SIP2 project is providing an opportunity for us to learn more about what data is critical to schedule irrigation more effectively and how to maximise our yield during the winter ryegrass period into early summer. This is the window of growth opportunity for us'.

Irrigation measurement period

July - December

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Will scheduling irrigation in response to soil moisture and water balance information:
  - improve water and power efficiency compared to the current standard application approach?
  - enable annual ryegrass to reach its yield potential?
- In comparison with a travelling irrigator system, does the solid set system out perform on improved production and input efficiency performance? If so, what is the potential payback period for transitioning across to a solid-set system?
- Will the practices and outcomes communicated from the optimisation site be monitored and adopted by Northern Rivers irrigators, especially the strategy of determining and irrigating to maintain readily available water (RAW)?

Technologies being trialled

Three 40cm EnviroPro® capacitance probes with Wildeye® logger/telemetry have been installed at the foot, middle and tail of the rectangular site. Whilst there is little soil variation across the alluvial site, multi soil moisture monitors will provide improved insight into the true uniformity and rate of application of a solid set system over time. Probe sensor readings are taken at 10cm increments every hour and this data can be accessed via a smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using a rising plate meter before and after grazing.

Who is involved?

Far North Coast Dairy Industry Group Inc., Subtropical Dairy Programme Ltd – Far North Coast NSW Regional Group and Norco Co-operative Ltd.

Background
- 150ha farm, 110ha milking platform, 55ha mixed irrigation
- Milking herd: 400-470 Jersey cows (year-round calving)
- Annual ryegrass/kikuyu mixed pasture system.

Water Supply
- Surface Water Entitlement: 565 ML pumped from Richmond River
- Caprari pump (66 kW, 90 HP, 50Hz)
- Flow-meter fitted at the mainline near the pump house.

Optimisation site infrastructure
- Adjacent paddocks: 19 (1.42ha) and 20 (1.41ha).

Optimisation site irrigation system
- Solid set sprinkler, triangular layout, grid of 21.5m x 25m
- Naan Dan Jain Sprinklers , 233 Black Sleeve - front nozzle 6mm, rear nozzle 2.5L
- Commissioned by Think Water Australia in 2017.

Pre-project Irrigation scheduling decisions
- Evaluated Coefficient of Uniformity (CU): Range 48-63%
- Pump performance testing indicates improvement could reduce energy costs by an average of 9%.
- Visual inspection of surface moisture/pasture with a management policy of keeping soil wetter than perhaps needed. The new fixed irrigation system has enabled Brian to be able to do this.
- Weather information also loosely considered with a strategy of: *If no rainfall in recent period, and no rainfall forecast, then irrigation is started until visually wet at the surface.*

For more information contact **Peter Hutton**
E: huttop02@gmail.com
M: 0400 047 572

GIPPSDAIRY
MID-COBAINS DAIRY OPTIMISATION SITE, VIC

Introducing Oakdale Park, Cobains

Oakdale Park is an equity partnership dairy operation managed by Garry Cook and Colleen Laws. The business is continually investigating new and emerging practice options for different aspects of the dairy business. Now, driven by less reliable allocations of irrigation water gravity fed by a district channel from Lake Glenmaggie, Oakdale Park is keen to explore whether drying off the milking area over summer may be a valid response. This thinking has come from having both irrigated and dryland dairy businesses and understanding the potential benefits in having increased seasonal control.

'In this region the SIP2 project will provide data to help inform this decision. It is about using reduced water allocations most profitably and evaluating whether we will benefit from using our water most effectively in spring and autumn, rather than over summer. The data is needed not only within season, but also to consider any carry-over implications in autumn.'

Irrigation measurement period

August - May

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Are there overall dry-matter yield impacts or benefits in using a dry-off strategy?
- Does over-sowing in autumn assist pasture yield to bounce-back after dry off?
- What is the best interval to dry pasture off? Two or three months?
- What are the yield differences between a March dry-off (to simulate a water shortage) and a planned, controlled dry-off in Jan and Feb?
- Is irrigation scheduling improved with the use of soil moisture monitoring to inform decisions, and if there is improvement, does this translate into increased dry-matter production?

Technologies being trialled

Three 40cm EnviroPro® capacitance probes with Wildeye® logger/telemetry have been located in each of the 3 bays of the optimised site. Sensor readings are taken at 10cm increments every hour and transmitted to a platform accessible by a smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using a rising plate meter before and after grazing.

Who is involved?

Agriculture Victoria, GippsDairy, Browns Fertilisers, Graham Seeds and the Macalister Demonstration Farm.

Background

- 134ha farm, 112ha milking platform, 112ha surface (flood) irrigation
- Milking herd: 445 in peak of 20/21
- Optimisation site is a perennial ryegrass
- 15% of milking area cropped with summer crops.

Water Supply

- Water Entitlement: 543ML high reliability water share, 216ML low reliability water share
- 10ML/day flowrate at paddock 39 (study site)
- 16ML flows but restricted by delivery
- Gravity fed from district channel
- Water can also be pumped from an adjacent reuse dam to supply the paddock.

Optimisation site infrastructure

- 2.5ha paddock divided into 3 equal bays
- Reuse dam located next to optimisation site paddock.

Optimisation site irrigation system

- Automated Padman outlets with Padman timers (size E4s)
- 2 hours in total to water optimisation site paddock.

Pre-project Irrigation scheduling decisions

- Irrigation scheduling is carried out by Garry, scheduled using analogy tensiometer (Gdot gypsum block probe measures soil tension in moist, but not dry or saturated soils) and the traditional 'tread-in' test (pigtail method).

For more information contact **Alexis Killoran**
E: alexis.c.killoran@agriculture.vic.gov.au
M: 0428 387 869

GIPPSDAIRY
YARRAM DAIRY OPTIMISATION SITE, VIC

Introducing Shelley Field, Yarram

Shelley has been involved in the dairy industry in Yarram for over 25 years, both share-farming and on the family farm. In that time she has witnessed climatic conditions change to longer, dryer summers and less reliable spring and autumn rainfall.

'The region's dairy industry has had to respond and now we are seeing more irrigators commissioned locally, but we are all learning about how to best optimise our production as dairy irrigators. SIP2 in this region will allow us to investigate new forage and fodder options that can work with effective irrigation and using water more wisely to grow more feed when and where we have the water.'

Irrigation measurement period

October - March

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Is irrigation scheduling improved with the use of soil moisture monitoring to inform decisions, and if there is improvement, does this translate to increased dry-matter production?
- Is water and power use efficiency improved if irrigation scheduling (frequency and rate) is based upon a fixed depletion level determined by the readily available water (RAW)?
- Can the pasture/millet yield gap be decreased under a pivot using best practice irrigation scheduling?
- Can summer crops, such as millet, provide increased water use efficiency and comparable dry-matter production to perennial ryegrass over the irrigation period?

Technologies being trialled

Three 40cm EnviroPro® capacitance probes with Wildeye® logger/telemetry have been installed into three varying soil types across the site. Sensor readings are taken at 10cm increments every hour and this data is accessed by Shelley from her Smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using a rising plate meter before and after grazing.

Who is involved?

Agriculture Victoria, GippsDairy, MG Trading.

Background

- 277ha farm, 175ha milking platform (entirely irrigated) plus 78ha irrigated for young stock /fodder production and 24.3ha of dryland agistment
- Milking herd: 415
- Optimisation site is perennial ryegrass. An area will be sown to millet over summer for grazing/silage.

Water Supply

- Ground Water Entitlement: 1284ML
- Surface Water Entitlement: Maximum 240ML, dependent upon seasonal river flow allocation.

Optimisation site infrastructure

- Zimmatic by Lindsay centre pivot: 39ha, 5 span, 1800, end-guns
- 40HP, 56psi variable drive pump
- Commissioned in 2015.

Optimisation site irrigation system

- Panel and solenoid capability for variable rate application, though not currently utilised.
- System capacity 20mm/day

Pre-project Irrigation scheduling decisions

- Visual inspection of surface moisture/plant.
- Hole dug in the paddock to determine moisture in soil profile
- Fixed frequency/rate scheduled around off-peak power windows.

For more information contact **Alexis Killoran**
E: alexis.c.killoran@agriculture.vic.gov.au
M: 0428 387 869

WESTVIC DAIRY
MEPUNGA EAST DAIRY OPTIMISATION SITE, VIC

Introducing Stephen Smith, Mepunga East

Stephen has historically relied upon the farm's irrigation during south-west Victoria's hot, dry summers. More recently, climate variability has seen the irrigation season starting earlier and reduced confidence that the autumn break can be relied upon.

'Traditionally the south-west dairy region is not known for its reliance on irrigation. The landscape is changing and there is increasing interest in how dairy farmers with irrigation can get the best returns from limited water access and how to better manage the seasonal shoulder periods. The SIP2 project will provide me with better information about how I can grow more feed reliably on my irrigated pastures over the summer and the optimum times to commence and finish irrigation for the season. The plan is also to investigate whether some simple VRI may help to manage the different soil types across the pivot areas.'

Irrigation measurement period

October/November–April

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Develop region/district specific metrics on the optimum system performance and productivity of perennial ryegrass based dairy pastures irrigated with centre pivot irrigators in south west Victoria.
- Investigate the feasibility and potential economic benefits and water saving potential of fitting centre pivot irrigators with variable rate irrigation (VRI) technology.
- Field test and evaluate the benefits/ease of use of online irrigation scheduling tools, such IrriPasture, and emerging in-situ soil moisture and weather monitoring technologies for irrigating dairy pastures in south west Victoria.

Technologies being trialled

Four EnviroPro® capacitance probes with Wildeye® loggers/ telemetry have been installed, two under each irrigator of the site. Sensor readings are taken at 10cm increments every hour and this data can be accessed via smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken weekly using a rising plate meter.

Who is involved?

WestVic Dairy, Headlands Consultancy, HEC Consulting, Windmill and Irrigation, Meridian Agriculture, Warrnambool Veterinary and South-west Agronomy.

Background
- 292ha farm, 260ha milking platform, 88ha (3 centre pivots)
- Milking herd: 600
- Optimisation site is perennial ryegrass.

Water Supply
- Water Entitlement: 600ML
- 20 year old pump (75kW, 50 Hz) used to service both irrigators separately
- Flow-meter fitted.

Optimisation site infrastructure
- Valley® Irrigation centre pivots
  - Pivot 1: 18 ha, 4 span, end-guns, 360^0
  - Pivot 2: 48 ha, 7 span, 360^0.

Optimisation site irrigation system
- Pivot 1 and half of Pivot 2 are 20 years old, Pivot 2 was doubled in length 3 years ago
- Ageing Nelson sprinkler packs
- System capacity Pivot 1- 26mm/day and Pivot 2- 9.2mm/day
- Capability to segment irrigation via wheel speed manipulation, not currently used
- Panels can be controlled remotely using AgSense® (timing (on/off), rate, speed)
- Pivot 1 currently delivering 38% and Pivot 2- 2.5% less water than control panel setting
- Evaluated Coefficient of Uniformity (CU): Pivot 1- 81% and Pivot 2- 84%
- Pump performance testing indicates improvement could reduce energy use by 20%.

Pre-project Irrigation scheduling decisions
- Visual inspection of surface moisture/plant
- Single Watermark tension probe (40cm) located under Pivot 2
- Weather information considered: rainfall & evapotranspiration.

For more information contact **Graeme Ward**
E: graeme.ward57@bigpond.com
M: 0428 573 280

MURRAY DAIRY
TONGALA DAIRY OPTIMSIATION SITE, VIC

Introducing Andrew Tyler, Tongala

Andrew, along with son James, have thought long and hard about how best to adapt their farming system to better manage the risk associated with inconsistent water allocation and the increasing cost of water in northern Victoria.

'We need to extract maximum yield from every megalitre applied. Persisting with ryegrass through long, hot summers is no longer economical and we need to grow alternative fodder crops that maximise our water efficiency and profit.'

The SIP 2 project is providing opportunity to investigate improved irrigation strategies for higher yielding fodder crops and develop northern Victoria specific information. Drawing upon the expertise and experience of the broader SIP2 cropping partners is seen as a windfall of being part of a large national program.

Irrigation measurement period

Maize crop growing period (October – April)

Site yield potential

The Tasmanian Institute of Agriculture is using APSIM, a model widely used by copping industries, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- How can management of flood irrigation be improved to optimise summer maize crop yield?
- Is there an impact on the yield of each crop in a double cropping scenario of maize/cereal over three years?
- What is the measured benefit to yield and quality in being able to apply irrigation until the end of the crop? Is there a compromise to yield and quality if the final irrigation is unable to be applied?
- Is there a correlation between maize growth rate/quality and total irrigation applied?
- What are the benefits of using IrriSAT to forecast crop water requirements, together with real-time soil moisture monitoring, to determine irrigation scheduling compared to a basic water budget approached (ET° – rainfall)?

Technologies being trialled

Three 80cm EnviroPro® capacitance probes with Wildeye® logger/telemetry have been installed on site in representative areas of the paddock. Sensor readings are taken at 10cm increments every hour and this data can be accessed via a smartphone. IrriSAT has been adopted as an additional decision support tool to monitor the crop coefficient (Kc) using NDVI mapping from satellite imagery. This online platform provides a seven day water use forecast for the maize crop.

Who is involved?

Murray Dairy and Advanced Ag.

Background
- 450ha farm (plus 200 ha dryland lease), 450ha milking platform, 400ha surface (flood) irrigation
- Milking herd: 900
- Optimisation site is a summer maize crop followed by a winter cereal crop.

Water Supply
- Water Entitlement: 1200ML (owned and leased)
- Gravity fed from district channel
- Pumping also from reuse dam.

Optimisation site infrastructure
- 14.5ha flood irrigated laser graded site divided into 8 bays.

Optimisation site irrigation system
- Automated Padman stops with radio controlled Aquator automation controlled from the farm office
- 100% watertight rubber flap precast irrigation gates set in a concrete structure to simplify automatic gravity flow watering systems.

Pre-project Irrigation scheduling decisions
- Visual stress inspection of the crop
- Weather information considered using a 7 day rainfall forecast
- Soil moisture checked using a shovel.

For more information contact **Lisa Menhenett**
E: lisam@murraydairy.com.au
M: 0438 115 730

DAIRYSA
MT GAMBIER DAIRY OPTIMISATION SITE, SA

Introducing James Mann and Cornelis Zonneveld, Donavan's Dairy

James and Cornelis are looking forward to continuing their involvement in the SIP2 project as phase one was certainly beneficial when it comes to better managing the large scale operation at Donovan's Dairy. They believe you need good information to make decisions, especially when scheduling 18 centre pivots, so having readily available water (RAW), evapotranspiration (ET°), weather forecast and soil moisture monitoring data at their fingertips is critical for driving production.

'There is no doubt that we need to operate the systems effectively as we are on shallow soils overlying limestone. We currently use technology and our own experience on how the pasture responds to irrigation under certain areas of Pivot 6 to determine when we water, though 6 mm per application during off-peak power is primarily the standard strategy. We have only a 19-hour window to get the pivot around. We think that the SIP2 project will provide better insight into when to start-up the irrigator and how much to apply to better balance dry and wet periods.'

Irrigation measurement period

September – March/April

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Investigate the option of using a weather-based water balance calculation method to better schedule irrigation (timing and rate) and understand the rainfall, ET° and soil data inputs needed.
- Understanding soil moisture monitoring reports and how to interpret these to inform timing and rate of irrigation using determined readily available water (RAW) refill and field capacity limits.
- Determine and understand yield improvements to be made by scheduling irrigation start-up on time by monitoring pasture production over the three seasons.
- Understand the cost and value of irrigated pasture to the farm business (water, yield, labour and energy costs). Determine baseline input costs versus yield and evaluate the impact upon business profit in making changes to irrigation practices/systems. What is the payback period?

Technologies being trialled

Three Terros-10 capacitance probes, with sensors located at 10cm increments to 30cm, and Wildeye® logger/telemetry have been installed. Data is logged every hour and can be accessed from a Smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using a C-dax meter and pasture cuts as part of Agriculture Victoria's Pasture Smarts project. The field data is being used to cross calibrate satellite and UAV captured spectral imagery and determine its validity for measuring and forecasting pasture yield.

Who is involved?

DairySA, Integrated Irrigation, Water Dynamics, Agriculture Victoria.

Background
- 1700ha farm, 800ha milking platform (465 ha irrigated by 9 centre pivots). A further 335 ha irrigated by 9 centre pivots for fodder conservation
- Milking herd: 1800
- Optimisation site is perennial ryegrass/white clover pasture
- Other areas of the farm produce lucerne, tall fescue and corn silage.

Water Supply
- Water Entitlement: 6000ML
- CMG Pump- 90kW, 415V, 104Amps
- Flow-meters fitted.

Optimisation site infrastructure
- T-L Centre Pivot: 80 ha, 10-span, 360°
- Nelson sprinkler pack
- Site divided into 7 paddocks
- Remote control capability using the AgSense® platform on a smartphone or PC.

Optimisation site irrigation system
- Has the capability to use variable rate application
- A prescription map has been prepared for the site varying rates from 6.1mm/ha to 9.46 mm/ha using segmentation (change in wheel speed)
- Evaluated Coefficient of Uniformity (CU): 79%
- Pump efficiency is in accordance with specification.

Pre-project Irrigation scheduling decisions
- Knowledge of the site and soil moisture data from existing single Wildeye probe with refill and field capacity set using determined RAW of location
- Segments of the 360° are irrigated at different times and rates
- ET° and recent/forecasted rainfall from local NRM weather station.

For more information contact **Kylie Boston**
E: kylie@dairysa.com.au
M: 0407 231 547

DAIRYSA
MT COMPASS DAIRY OPTIMISATION SITE, SA

Introducing Ben McHugh, Mt Compass

Local irrigators in the Mt Compass region have been collaborating in recent years on ways to optimise the use of irrigation to supplement rainfall across the site in the autumn/spring shoulder periods and more effectively target the potentially higher yielding areas with limited water over summer.

Ben McHugh believes that SIP2 will provide more of the hard data the group needs to make the leap to changing practices.

'Under my pivot I have some variability in soil type with generally shallow root zones with acidity issues at depth. My current standard approach to applying 12mm per application may not necessarily be needed right across the site. For example, more may be needed in the elevated sections of the pivot where deeper root zones are present. Overall I may not reduce water usage but I may use it more wisely when and where it is needed. Soil moisture monitoring to better inform start-up to supplement rainfall will also make sure I am not drying the profile too far.'

Irrigation measurement period

September – March/April

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Investigate the option of using a weather-based water balance calculation method to better schedule irrigation (timing and rate) and understand the rainfall, ET° and soil data inputs needed.
- Understanding soil moisture monitoring reports and how to interpret these to inform timing and rate of irrigation using determined readily available water (RAW) refill and field capacity limits.
- Determine and understand yield improvements to be made by scheduling irrigation start-up on time by monitoring pasture production over the three seasons.
- Understand the cost and value of irrigated pasture to the farm business (water, yield, labour and energy costs). Determine baseline input costs versus yield and evaluate the impact upon business profit in making changes to irrigation practices/systems. What is the payback period?

Technologies being trialled

Three Terros-10 capacitance probes, with sensors located at 10cm increments to 30cm, and Wildeye® logger/telemetry have been installed. Data is logged every hour and can be accessed from a Smartphone. IrriPasture and Pasture.io are being adopted as decision support tools. Yield measurements are taken by a rising plate meter.

Who is involved?

DairySA and Natural Resources SA Murray-Darling Basin.

Background
- 260ha farm, 180ha milking platform, 22.5ha irrigation
- Milking herd: 330
- Optimsiation site is biannual Italian ryegrass/white clover
- Lucerne and tall fescue also grown on other paddocks under the same pivot.

Water Supply
- Water Entitlement: 185.7ML
- Variable speed Lowara Pump - 50kW
- Flow-meter fitted.

Optimisation site infrastructure
- Rain Master Centre Pivot: 12.5ha, 360°
- Nelson sprinkler pack
- Site divided into 4 paddocks.

Optimisation site irrigation system
- System currently delivering 16% less water than control panel setting
- Evaluated Coefficient of Uniformity (CU): 92%.

Pre-project Irrigation scheduling decisions
- Weather information considered: recent/forecasted rainfall from local NRM weather station
- Visual inspection to start-up irrigator with 12mm/application applied to all soil types.

For more information contact **Kylie Boston**
E: kylie@dairysa.com.au
M: 0407 231 547

WESTERN DAIRY
DARDANUP DAIRY OPTIMISATION SITE, WA

Introducing Michael Twomey, Peninsula Downs

The Twomey farm is one of several within the Peninsula downs dairy operations, managed by Michael. The farm uses irrigation strategically on two areas of the farm:

- 55ha managed as an early germination grazed ryegrass (April – mid-December); and
- 45ha millet/chicory/clover managed for summer grazing.

Michael believes his summer pasture production can be improved by considering the variable factors that may be impacting upon maximising yield including soil type, selection of plant species, getting the right start-up time for irrigation and ongoing irrigation scheduling.

'I am really keen to schedule irrigation events based on soil moisture monitoring and then measuring dry matter responses. I think that SIP2 has a lot of potential benefits for my farming system.'

Irrigation measurement period

September – autumn break (approximately April)

Site yield potential

The Tasmanian Institute of Agriculture is using the industry specific model, *DairyMod*, to determine the theoretical yield potential of the optimisation site based upon soil, weather and fertility parameters. Measured yield data across three seasons will evaluate progress towards optimising yield potential.

Addressing the yield gap

- Can a green drought scenario be avoided by commencing irrigation earlier in the season (mid-spring) to extend the biannual ryegrass?
- Will the adoption of using an irrigation strategy based on depleting and refilling readily available water (RAW) throughout the dry season increase dry matter production in year two and three of the project?
- Is the current pivot irrigation system operating efficiently according to specification and therefore is there potential to maximise production uniformly across the site?
- If the system takes advantage of off-peak power rates by increasing the application volume but decreasing irrigation frequency can soil moisture be maintained within RAW?

Technologies being trialled

Two 40cm Aquacheck ® and one 40 cm Enviro-pro (R) capacitance probes with Wildeye® logger/telemetry have been installed into three varying soil types across the pivot site. Sensor readings are taken at 10cm increments every hour and this data is accessed by Michael from his Smartphone. IrriPasture and Pasture.io have been adopted as decision support tools. Yield measurements are taken using an electronic C-dax meter before and after grazing.

Who is involved?

Western Dairy, KR Farming Solutions and ProAg Services.

Background

- 220ha farm, 220ha milking platform, 100ha irrigation (4 Valley® pivots, 1 traveller)
- Milking herd: 430 Friesian/Jersey cross
- Optimisation site 5ha: early germination biannual ryegrass/oats/white and sub clover/chicory.

Water Supply

- Water Entitlement: 0.5GL pumped by bore from the Leaderville Aquifer into a farm dam that also receives surface run-off
- Pumps: X 3 75kW pumps, pontoon mounted on the dam
- Combined pumps supply 200L/sec allowing three centre pivots to operate simultaneously.

Optimisation site infrastructure

- Valley® Centre Pivot: 12ha, 4-span, 360°.

Optimisation site irrigation system

- Capability to segment irrigation via wheel speed manipulation. Not currently used
- System capacity 12mm/day
- System currently delivering 10.4% less water than the AgSense® report
- Distribution Uniformity (DU): 76%.

Pre-project Irrigation scheduling decisions

- The pivot at the optimisation site currently set to deliver 30L/second. 8mm is applied every second day over a 10hr off-peak power window.

For more information contact **Peter Hutton**
E: huttop02@gmail.com
M: 0400 047 572

10

Disclaimer

The content of this publication including any statements regarding future matters (such as the performance of the dairy industry or initiatives of Dairy Australia) is based on information available to Dairy Australia at the time of preparation. Dairy Australia does not guarantee that the content is free from inadvertent errors or omissions and accepts no liability for your use of or reliance on this document. You should always make your own inquiries and obtain professional advice before using or relying on the information provided in this publication, as that information has not been prepared with your specific circumstances in mind and may not be current after the date of publication.

© Dairy Australia Limited 2020. All rights reserved.

ISBN 978-1-925347-85-2 (Digital/PDF)

Dairy Australia Limited ABN 60 105 227 987
Level 3, HWT Tower
40 City Road, Southbank Vic 3006 Australia
T +61 3 9694 3777 F +61 3 9694 3733
E enquiries@dairyaustralia.com.au
dairyaustralia.com.au

2605.1 | Jun 2020