



Smarter Irrigation for Profit Project

Hunter Optimised Dairy Irrigation Farm (NSW)

‘Glenhaven’ Irrigated Pasture Update

October 2017

[Irrigation Report- Prepared by Peter Smith, Sapphire Irrigation Consulting](#)

Irrigation tips for November

- The weather outlook for November and December is for near normal or average conditions for rainfall, temperature and streamflow. Pastures should be irrigated in accordance with evapotranspiration (ET) measurements or soil moisture readings. Consider not entirely filling the profile to increase the opportunity for rainfall capture.

General comment for commencement of 2017-18 irrigation season

Winter was unusually dry with rainfall of only 27.4 mm in May, 34.2 mm in June, 1.4 mm in July, 19 mm in August and 7.4 mm in September recorded at Scone Airport.

Water allocations from the Hunter River are not limiting for this season with 100% being declared at 1 July 2017.

The soil moisture probes were installed during the dry winter and therefore have probably not fully equilibrated with the soil profile. Readings are considered not fully reliable in this early stage but confidence will increase over the project study period.

Lucerne was over-sown with barley on the Glenhaven site with the intention of cutting and conserving fodder. The barley was irrigated 9 times with a total of 335 mm applied plus about 36 mm of rain and cut for silage on 11-12 October. Refer to the Agronomy Report for further detail on page 6.

The seasonal summary of irrigation, rainfall and soil moisture from the Scheduling Irrigation Diary (SID) on page 2 demonstrates the pasture growing season of the second half of winter/ beginning of spring. The aim of the irrigation was to grow the Barley-Lucerne pasture in readiness for an October hay harvest. As the winter was so dry, the decision was to apply more irrigation than usual. However, an evaluation of the irrigation system revealed that the control panel of the centre pivot indicated about 44% more water was being applied than actual (ie. control panel was set to apply 70mm per pass but in fact 38mm was being applied- refer to Centre Pivot Evaluation Report section on page 5). Hence the soil profile was mined of water.

While manager, Scott Wheatley, was satisfied with the harvest yield achieved, the seasonal summary indicates there was potential to have increased yield if the actual water applied was in accordance with

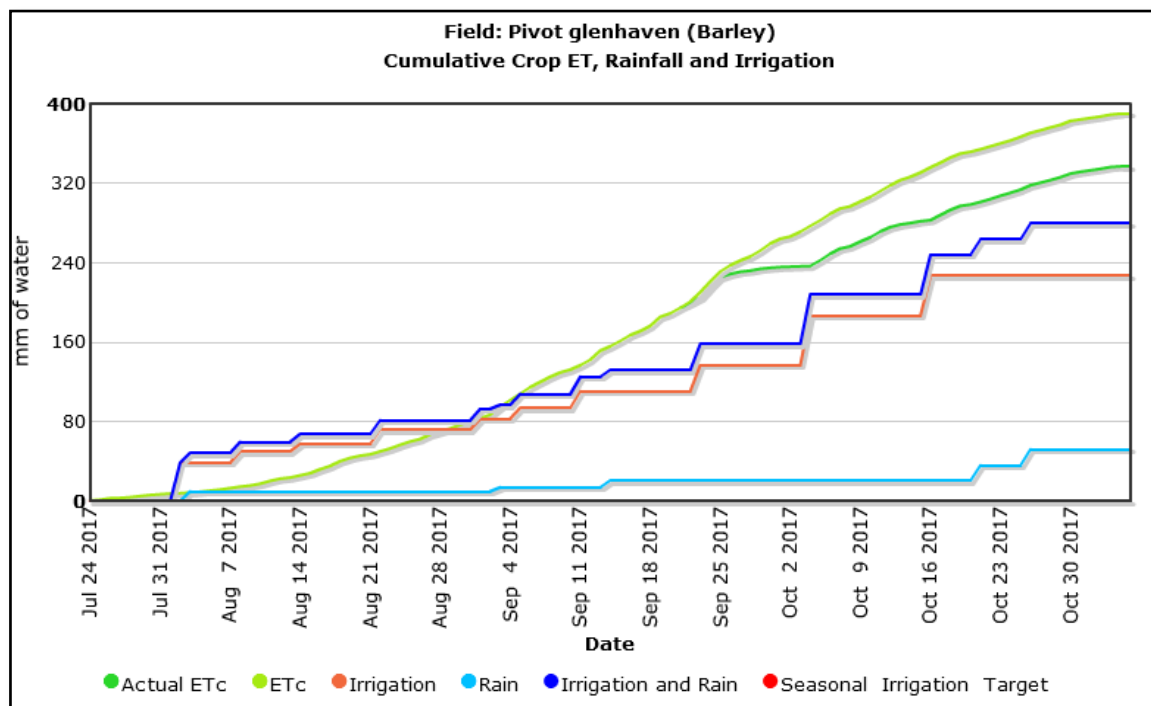
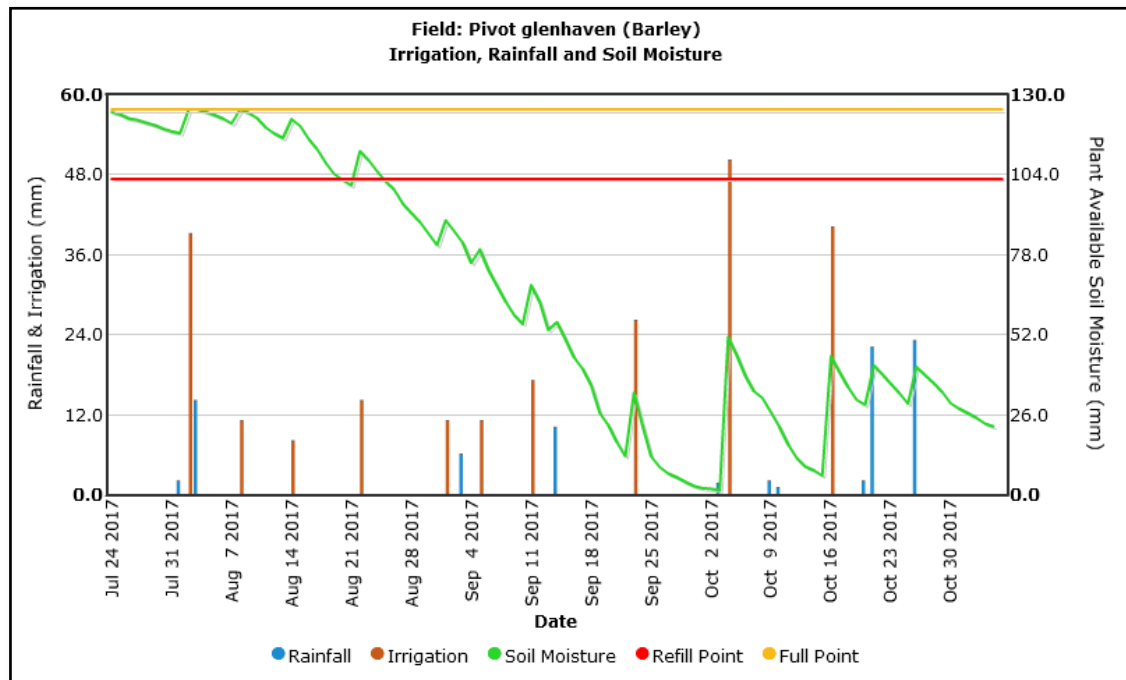
This Project is funded by Dairy Australia and the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit program.

The project is also supported in the Hunter region by the following organisations:

what was programmed into the control panel. Alternatively, the same yield could have been achieved using the same amount of water applied over a shorter duration each day, saving on expensive power usage.

The cumulative crop ET, rainfall and irrigation summary (below) demonstrate the shortfall of applied water of approximately 100 mm when harvest occurred on the 12th of October.

Seasonal summaries from the Scheduling Irrigation Diary (SID) for Glenhaven



Outlook from 'Irrisat'* for November

		Glenhaven		
		ETo	Chance of rain	Forecast
Mon	6	5.1	84%	Light rain starting in the afternoon, continuing until evening.
Tues	7	5.5		Clear throughout the day.
Wed	8	5.6	9%	Partly cloudy in the morning
Thur	9	5.9	5%	Clear throughout the day.
Fri	10	6.2		Clear throughout the day.
Sat	11	5.2	10%	Mostly cloudy throughout the day.
Sun	12	5.5	8%	Partly cloudy until evening.
Mon	13	6.2		Clear throughout the day

*Using data from both Landsat satellites and on-ground weather stations, Irrisat is a web based tool more broadly used in the cotton industry to calculate crop coefficients and forecast crop water use. The *NSW Smarter Irrigation for Profit project* has been trialling its application on dairy pasture systems.

Data records for October

ETo at Scone Airport (mm)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4.4	1.8	4.1	5.2	5.1	5.7	4.4	2	4.4	4.4	5.8	6.3	5.3	3.6	5.4	5.9

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
6.3	6.6	5.6	2.5	4.1	4.7	5.5	5.5	6.8	8.9	6.3	6.6	8.1	11.5	6	168.8

Rainfall received at Scone Airport (mm)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		1.6						4.4	3.4		4.8				

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
			2	22						11.2					49.4

Rainfall at Glenhaven (mm) (manual rain gauge)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
								2	1							

18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
								23						26

Irrigation events (mm) (from Scheduling Irrigation Diary)

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Glenhaven				90												40	

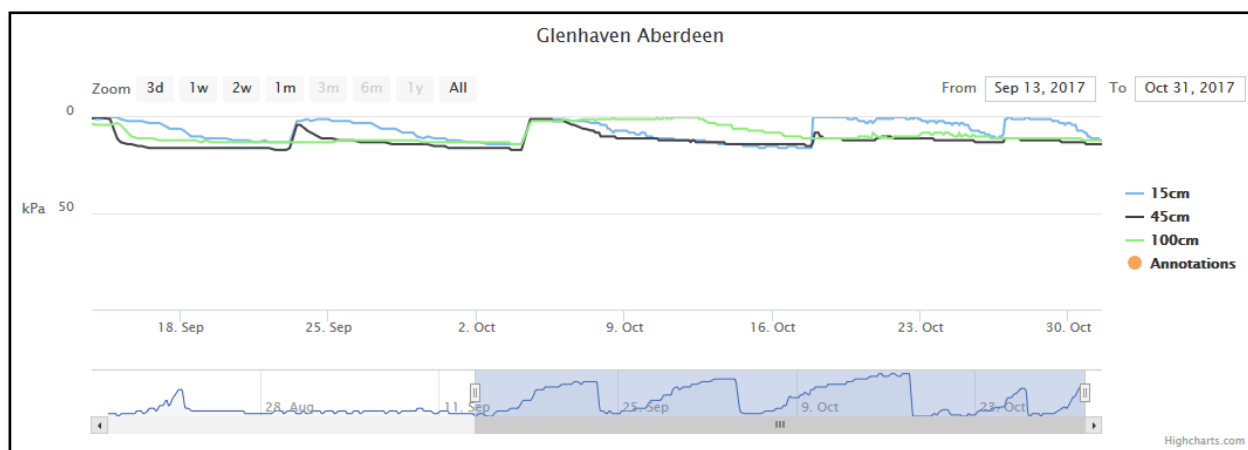
Date	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Glenhaven															130

The Readily Available Water (RAW) at soil probe sites located in the Upper Hunter region:

Soil probe site	Location	Crop	Root depth	Soil texture	RAW
Glenhaven	Aberdeen	Barley pasture mix	40 cm (assumed)	Light Medium to Sandy Clay	23 mm
Garoka	Aberdeen	Mixed pasture	40 cm (assumed)	Sandy Clay	24 mm
Rossett Park	Denman	Mixed pasture	40 cm (assumed)	Light Medium to Medium Clay	22 mm
Dalara	Jerry's Plains	Mixed pasture	40 cm (assumed)	Clayey Sand to Loamy Sand	18 mm

Soil moisture watch

Glenhaven soil probe traces as at 31/10/17



The soil moisture probes under the Glenhaven centre pivot were installed on 14 September. The locations were determined by undertaking EM38 mapping of the site, characterisation of the soils using deep soil coring methods and soil nutrient analysis. The EM38 mapping can be found [Here](#) and results of the soil coring [Here](#).

All three sensors have readings in the range of -1 to -17 kPa indicating moist soil. Readings of -8 to -10 kPa indicate Field Capacity, and readings greater than this indicate plant water use, so these readings suggest that the soil was saturated for significant periods. The three kicks on 23 September, 4 October and 17 October are in response to irrigation events of nominally 46 mm, 90 mm and 40 mm respectively. Evaluation of the centre pivot showed that it was supplying 44% less water per pass than the control panel indicates, so these three irrigations actually applied 26 mm, 50 mm and 22 mm respectively. The fourth kick on 27 October is in response to a rain event of 23 mm. The shallow 15 cm sensor (blue line) displayed waterlogging after each watering event, then a steady pattern of water use by the crop. The waterlogging was for periods of three to five days which is longer than would be expected for this soil type (Light Medium Clay) and the usage pattern following the first two irrigations was slower than expected for the crop growth stage and warm conditions experienced for the growing period. The irrigation on 23 September penetrated to the 40 cm sensor (black line) but drained more quickly than the soil at 15 cm, which is to be expected as the second soil layer is lighter than the top layer. This trace then displays a slow water use by the crop. This irrigation did not penetrate to the 100 cm sensor (green line) and there is no indication of water use from this depth. The irrigation on 4 October was double the amount of the previous one and all three soil sensors indicate that water reached them. All three traces are fairly flat for the first three days afterwards so the soil profile was fully saturated. The 40 cm sensor (black line) drained the fastest while the 15 cm trace (blue line) displays waterlogging for another day or so. The 100 cm sensor

(green line) shows waterlogging for about 8 days until 12 October after which drainage commenced. This to be expected as the soil at this depth is heavier than the middle layer. As the trace did not go below -8 kPa, it is not possible to determine if there was crop water use at this depth. The irrigation on 17 October was after the field had been cut. The 40 cm sensor (black line) shows that this irrigation just reached this level, but most of the water was retained in the upper layer which had prolonged waterlogging (blue line) for six or seven days. The water use of the crop was lower following the fodder being cut which would contribute to the extended period of waterlogging. The rainfall event on 27 October appears not to have penetrated beyond the first layer either, but the waterlogging period was much shorter and the pattern after this shows more vigorous crop activity resuming.

Centre pivot evaluation report

During the month of October an irrigator performance evaluation report was undertaken of the study centre pivot.

The key findings were:

- The configuration of this system is substantially different from the specifications so meaningful comparison of the performance is either not possible or questionable. It is recommended that the entire sprinkler package be re-specified.
- This system is applying 44% less water than the control panel indicted per irrigation.
- The Distribution Uniformity (DU) was 61% and the Coefficient of Uniformity (CU) was 73%. There is room for improvement and some steps that would help include repairing leaks, ensuring all sprinklers are straight, half-throw sprinklers are pointing in the right direction, replacing the 15 psi regulators on the overhang with 10 psi regulators to match the rest of the system, and adjusting the end-gun angle of throw.
- The Design System Capacity is 15 mm per day which is ample for the pastures being grown.
- The pump efficiency is 52% where the performance chart indicates it should be about 71%. If the pump was operating at 71% efficiency, the energy usage would decrease by 36%. It is recommended to investigate the cost-benefit of repairing or replacing the pump.
- The pump pressure and the flow rate gradually decreased over the duration of the field test. It would be worthwhile investigating a self-cleaning filter for the suction pipe.
- The height of the pump above normal water level is close to the limits for suction lift. Locating the pump closer to the water source should be investigated.



A catch-can test was undertaken as part of the irrigator performance evaluation (left) & Glenhaven manager, Scott Wheatley, assists irrigation consultant, Peter Smith, with pump efficiency testing.

Agronomy Report- Dan Clydesdale (Clydesdale Rural Pty Ltd)

Agronomy tips for November

- Grazing rotation length is important in Lucerne pastures to maximise yield and quality. Many producers are mowing Lucerne paddocks in front of cows to help increase utilisation.
- Maintain a grazing round to ensure ryegrass pastures are grazed at 2.5-3leaf to maintain quality. Using Italian ryegrass over annuals is a great way to extend feed quality later into the season.
- Monitor feed on offer and conserve excess feed through hay or silage.
- Closely monitor insect damage and weed invasion in summer crops such as sorghum, millet and maize. Wireworm and cutworm have caused significant damage locally and if pest numbers are at threshold levels consider action.
- Take the opportunity to grow quality home grown feed during this time of year. Ensuring soil fertility is addressed is essential during this time.

Lucerne pasture for direct grazing

To increase late winter and early spring growth under the centre pivot the Wheatley's decided to direct drill Forage Barley into the existing Lucerne Stand. On the 16th July an application of Spray-seed to control annual weeds and check the Lucerne plants was undertaken. Following this Barley was direct drilled into the Lucerne stand for the purpose of making hay and silage for use during next autumn and winter.

Since the Barley was cut on the 12th October, the Lucerne has recovered and is due to be grazed on Monday, the 7th November. The aging Lucerne stand has thinned in patches due to competition from couch and paspalum. The Wheatley's plan to utilise the Lucerne for grazing through Summer and assess plant numbers moving into autumn.

October conserved fodder barley harvest results

Pivot Area (ha)	Hay/Silage Produced	Average Bale weight	Date Baled
10.29	166 Silage Round Bales	464kg	14 th October
3.07	25 8X3X3 Hay Bales	333kg	19 th October



Barley crop under the 13.5ha irrigator was harvested in October. Whilst Scott was pleased with the results, there was perhaps potential to have increased yield if the water applied had not been 44% less than what was indicated on the control panel- lost opportunity?

Established study monitoring plots

To monitor both the pasture growth and the utilisation of the pasture, measurements will be taken before grazing then again after grazing to determine the pasture consumed.

The pasture is measured using an electronic pasture metre with GPS reference points to determine pasture dry matter. To calibrate and ensure an accurate reading is obtained quadrant cuts are taken across the paddock.



Photo: Pasture readings taken across the pivot area.

Legend Pasture Cover 6th November 2017

Dot Colour	Dry Matter (kg/ha)
Blue	3000+
Green	2000-3000
Yellow	1500-2000
Orange	0-1500

The dry matter under the pivot was measured before grazing commenced on the 7th November with the electronic pasture meter. An average dry matter of 2185kg/ha was measured with a range across the paddock. A minimum of 700kg/DM/ha was measured with a maximum of 3330kg/DM/ha. This reflects the age of the Lucerne stand, recovery from the hay/silage operation and the lower depressions in the paddocks causing the Lucerne to die out.



Photo: The Project Pivot with herd strip grazing on the 7th November 2017.



Photo: Herd strip grazing on the 9th November 2017.

To find out more about the Smarter Irrigation for Profit- Hunter Optimised Dairy Irrigation Farm Project, please contact:

Marguerite White
Project Manager, ICD Project Services

Phone: 0447 500 415 or Email: mwhite@icdprojectservices.com.au

Make sure you keep up to date on the project by following:

www.facebook.com/SmarterIrrigation

or by regularly visiting the project website page at:

www.dairyingfortomorrow.com.au/tackling-specific-issues/water/smarter-irrigation-for-profit

Dairy farmers are encouraged to access the Tain soil moisture data for the four locations across the Upper Hunter by clicking on the following link:

<https://panorama.taindata.com/>

The login name: wheatley@brooknet.com.au

The password: abcabcab

This login will show you all four sites:

'Glenhaven, Aberdeen' - Scott Wheatley

'Garoka, Aberdeen' - Brad Smith

'Dalara, Jerrys Plains' - Shane Gee

'Rossett, Denman' - Andrew Farr

Note: Whilst the sites may not be of the same soil type and climatic conditions for your local area, the graphed trends in soil moisture versus Eto & rainfall are highly translatable to any dairy farming system at from time to time will provide some good insight into how your own soil moisture levels may be trending over the same period.