

Cost-effective, fit-for-purpose modernization (infrastructure & management) at the farm level.

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Overview

- Sharing insights and experiences around the uptake of “fit-for-purpose” technology to improve irrigation practice in the Lower Burdekin sugarcane industry

- Determining value from the technology uptake
  - smart irrigation toolkit

- Examine progress over 15 years (since 2010)

Challenges for landowners

- Labour shortage
- Profitability; rising water & energy costs
- Telecommunication
- Internet speed
- Irrigation specialists

2010: 100% of the ~ 70,000 ha of furrow irrigated sugarcane is managed/operated manually.

Irrigation management is the biggest labour investment on farm.
Labour & time availability is the biggest limitation to sustained practice change.
Manual record keeping is a barrier to understanding.
Technology can remove or reduce the problem.

Generalising typical current management

- Scheduling on a fixed cycle
  - 7 – 10 days during peak demand periods
  - Use of scheduling tools is very low (<5% of fields using SMM)
- Volume applied
  - Fixed duration eg 10 h during the day, 14 h at night, 24 h duration
  - Management of available labour is a significant consideration
- 13-month crops are irrigated 15 to 30 times
- Record keeping
  - Very little knowledge of application (ML/ha per irrigation event)
  - Limited understanding of the cost of application (water & energy)
- **All is labour intensive**

Smart Irrigation Toolkit

- The current ‘smart irrigation toolkit’
  - Sugarcane crop model
  - Automation and sensors for monitoring
  - Web Platform to integrate the two technologies (and eventually any others)
  - Measurement of current practice
  - Irrigation specialists providing support

Site A Field results: Productivity, Water, Input Cost

Practice		TCH	CCS	TSH	Water Applied (ML/ha)
Manual	**Fixed cycle**	**134**	**14.9**	**19.9**	**15.42**
Automation	**IrrigWeb**	**133**	**15.2**	**20.2**	**10.01**
Saving		**Water applied**			**5.41 ML per ha**
		Water cost			**$134 per ha**

Industry benefits:

- Productivity & Gross Revenue maintained
- Input costs reduced
- Profitability improved
- Farmer capacity building

~30% reduction

Current practice = manual operation & fixed cycle schedule = 24 irrigation events

Improved practice = automation & crop water use-based scheduling = 15 irrigations

Payback

- Costs vary due to the size of each irrigation management unit
- Typical installation cost range: $500 to $1,500 per ha
  - Using a 7-year useful equipment life; the cost ranges between $100 to $200 /ha per year
  - Site A set up cost = $570 per ha

Cost centre	$/ha per year	Annual benefit $/ha	Simple payback
Water (5.41 ML/ha; variable cost)	$ 134	$ 192	~ 3 years
Energy (includes recycling)	$ 118		
Vehicle running costs	$ 40		
Labour	$ 200	$ 392	~ 1.5 years
Additional maintenance	-$ 100		

Automation system pushes irrigation records to IrrigWeb

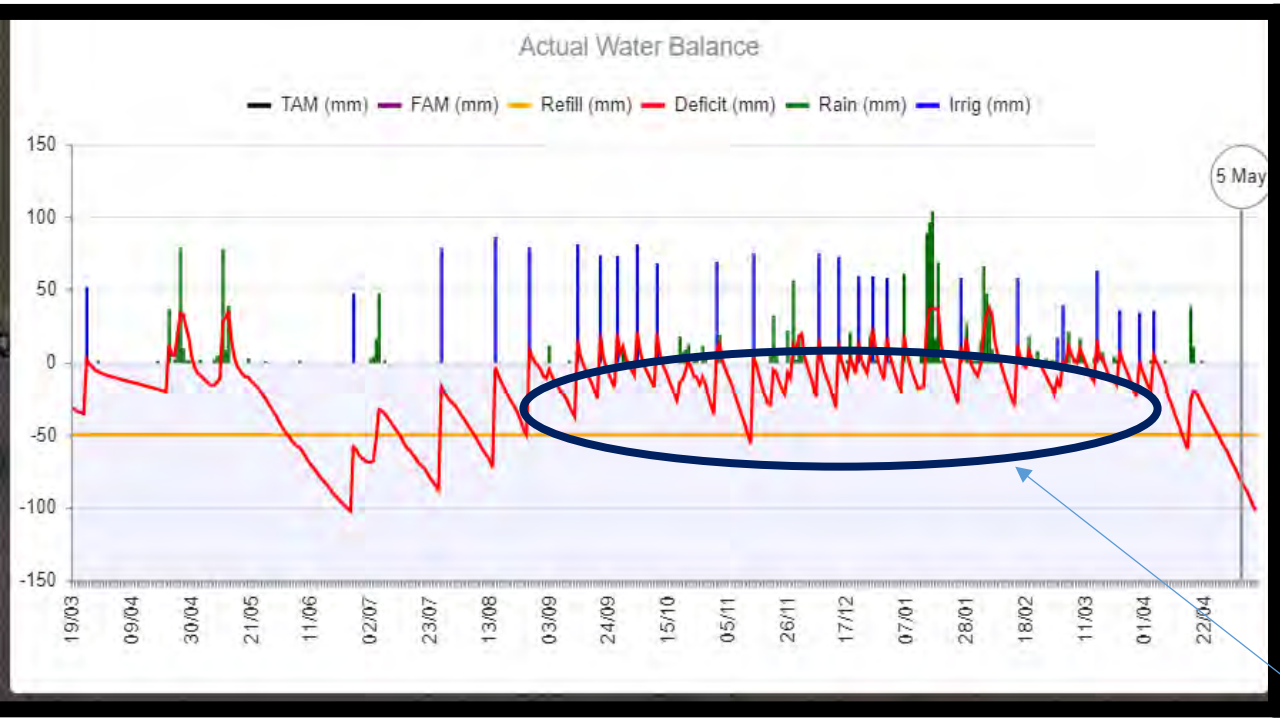
Paddock	Irrigation Date	Date/Times		Flow Rate L/s	Applied Depth (mm)
		Start	Stop		
A	24/03/2022	24/03/2022 8:00:00 AM	24/03/2022 6:00:00 PM	80	51.0
A	26/06/2022	26/06/2022 12:00:00 PM	26/06/2022 9:00:00 PM	82.7	46.7
A	27/07/2022	27/07/2022 11:00:00 AM	28/07/2022 10:00:00 AM	60.4	77.9
A	15/08/2022	15/08/2022 9:22:00 AM	16/08/2022 11:25:00 AM	59.2	85.6
A	27/08/2022	27/08/2022 9:45:00 AM	28/08/2022 7:00:00 AM	63.5	78.5
A	13/09/2022	13/09/2022 9:00:00 AM	14/09/2022 7:00:00 AM	63.1	80.5
A	21/09/2022	21/09/2022 8:45:00 AM	22/09/2022 6:30:00 AM	57.7	72.9
A	27/09/2022	27/09/2022 8:00:00 AM	28/09/2022 6:00:00 AM	56.7	72.4
A	04/10/2022	4/10/2022 7:00:00 PM	5/10/2022 5:00:00 PM	63	80.4
A	11/10/2022	11/10/2022 5:00:00 PM	12/10/2022 2:00:00 PM	55.1	67.4
A	01/11/2022	1/11/2022 3:30:00 PM	2/11/2022 1:00:00 PM	54.6	68.2
A	14/11/2022	14/11/2022 9:51:00 PM	15/11/2022 7:50:00 PM	58	74.0
A	07/12/2022	7/12/2022 4:00:00 PM	8/12/2022 1:59:00 PM	58	74.0
A	14/12/2022	14/12/2022 5:49:00 PM	15/12/2022 3:02:00 PM	58	71.6
A	21/12/2022	21/12/2022 6:24:00 PM	22/12/2022 4:54:00 PM	45	58.6
A	26/12/2022	26/12/2022 3:23:00 AM	27/12/2022 1:23:00 AM	45	57.4
A	31/12/2022	31/12/2022 10:00:00 AM	1/01/2023 8:00:00 AM	45	57.4
A	26/01/2023	26/01/2023 5:41:00 PM	27/01/2023 3:41:00 PM	45	57.4
A	15/02/2023	16/02/2023 12:31:00 AM	16/02/2023 10:31:00 PM	45	57.4
A	01/03/2023	1/03/2023 9:26:00 AM	1/03/2023 2:08:00 PM	45	16.0
A	03/03/2023	3/03/2023 8:24:00 AM	3/03/2023 10:24:00 PM	45	38.3
A	15/03/2023	15/03/2023 8:02:00 PM	16/03/2023 8:01:00 PM	45	62.2
A	23/03/2023	23/03/2023 5:26:00 PM	24/03/2023 6:10:00 AM	45	35.3
A	30/03/2023	30/03/2023 5:17:00 PM	31/03/2023 5:17:00 AM	45	33.5
A	04/04/2023	4/04/2023 10:50:00 PM	5/04/2023 10:51:00 AM	45	33.5

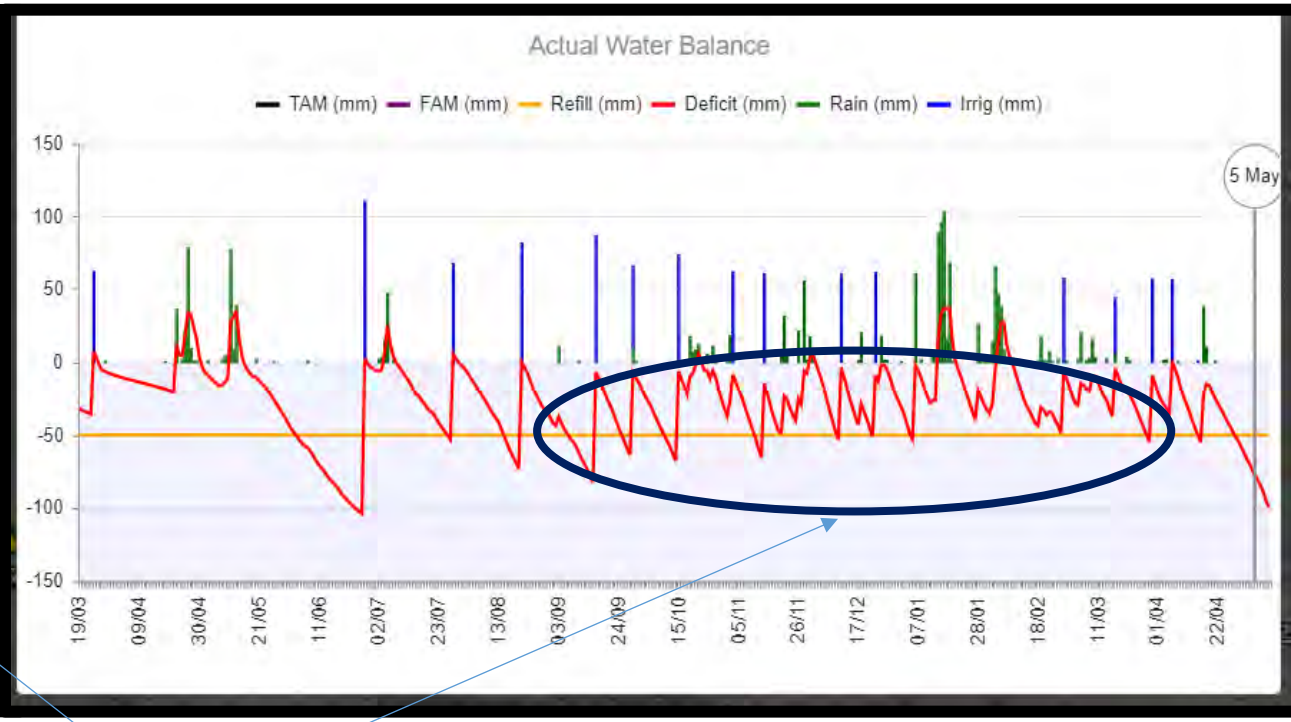
24 irrigation events

Paddock	Irrigation Date	Date/Times		Flow Rate L/s	Applied Depth (mm)
		Start	Stop		
B	26/03/2022	26/03/2022 8:00:00 AM	26/03/2022 6:00:00 PM	98.8	61.0
B	29/06/2022	29/06/2022 9:15:00 AM	30/06/2022 11:00:00 AM	97.5	139.9
B	26/07/2022	26/07/2022 9:00:00 PM	27/07/2022 9:00:00 AM	96.0	69.0
B	20/08/2022	20/08/2022 11:30:00 PM	21/08/2022 3:00:00 PM	98.8	88.9
B	17/09/2022	17/09/2022 6:30:00 PM	18/09/2022 8:15:00 AM	106.4	86.2
B	29/09/2022	29/09/2022 7:15:00 AM	29/09/2022 6:00:00 PM	82.2	53.9
B	16/10/2022	16/10/2022 2:00:00 PM	17/10/2022 5:45:00 AM	82.2	75.0
B	02/11/2022	2/11/2022 8:15:00 PM	3/11/2022 7:15:00 AM	82.1	54.9
B	14/11/2022	14/11/2022 8:54:00 AM	14/11/2022 6:54:00 PM	98.0	60.5
B	10/12/2022	10/12/2022 6:50:00 PM	11/12/2022 4:49:00 AM	98.0	60.4
B	22/12/2022	22/12/2022 6:54:00 PM	23/12/2022 5:55:00 AM	90.0	60.2
B	28/02/2023	28/02/2023 10:30:00 AM	28/02/2023 8:30:00 PM	90.0	55.5
B	16/03/2023	16/03/2023 4:30:00 PM	16/03/2023 10:31:00 PM	90.0	37.1
B	29/03/2023	29/03/2023 11:15:00 AM	29/03/2023 9:17:00 PM	90.0	55.7
B	05/04/2023	6/04/2023 1:47:00 AM	6/04/2023 11:49:00 AM	90.0	55.7

15 irrigations

Technology supporting farmer decision making & capacity building
IrrigWeb – sugarcane crop model
Records rainfall and irrigation
Irrigation scheduling based on soil type, weather, irrigation, and crop.





24 irrigations

15 irrigations

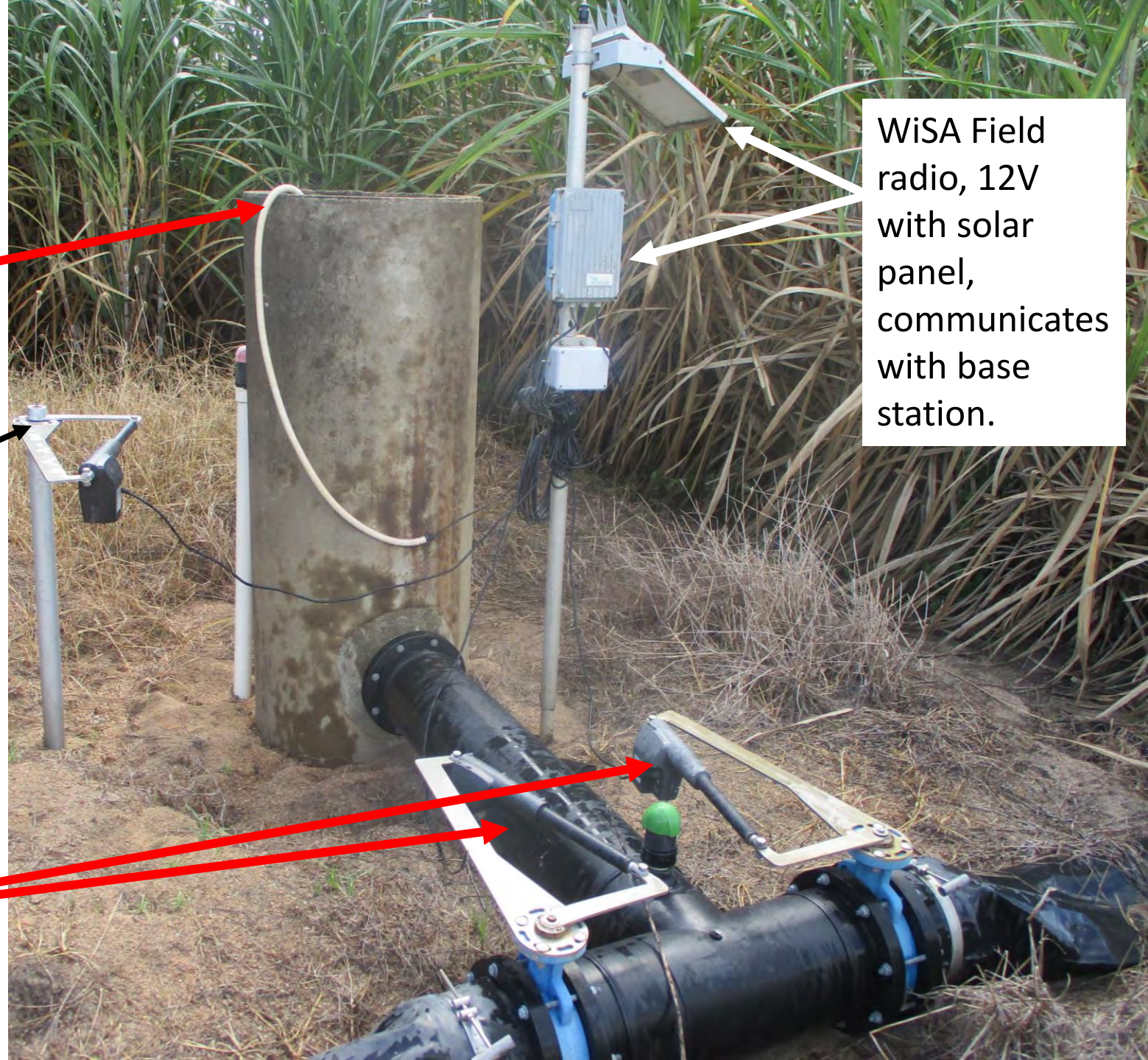
IrrigWeb tells us Field 1 is much wetter than Field 2 during this period.

Fully Automated actuator Operated T-piece and Isolation valve

Submersible pressure sensor monitoring height of water in the cylinder.

Isolation valve (butterfly valve) in main pipeline (underground)

T-piece with 2 x butterfly valves. Each valve is open/closed by a 300mm stroke actuator (12V)



Pump set up

Diesel or electric pumps including centrifugal, submersible or turbine

Monitoring flow and pressure in pipelines

In-line Flow Meter

Flow Switch

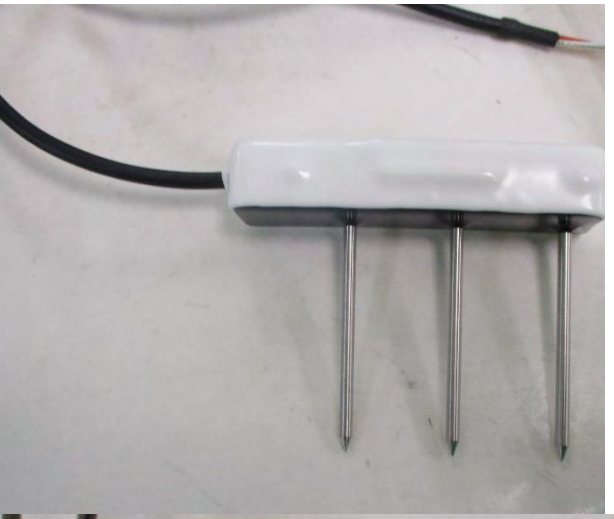
In-Line Pressure Sensor

Water height in dams, recycle pits or channels

Water height is monitored by the submersible sensor.
Pump can be turned on or off depending on the height.
Alerts can also be sent.

EoR Sensors

- Providing real time data on irrigation progress



Farm in One

Unit A EOR Sensors - Mon Dec 05 2022 to Wed Dec 14 2022

LF irrigation (Set 2)
2 sets with gravity

Started 7/12 @ 4:00 pm

Stopped 8/12 @ 2:00pm

Duration = 22 h

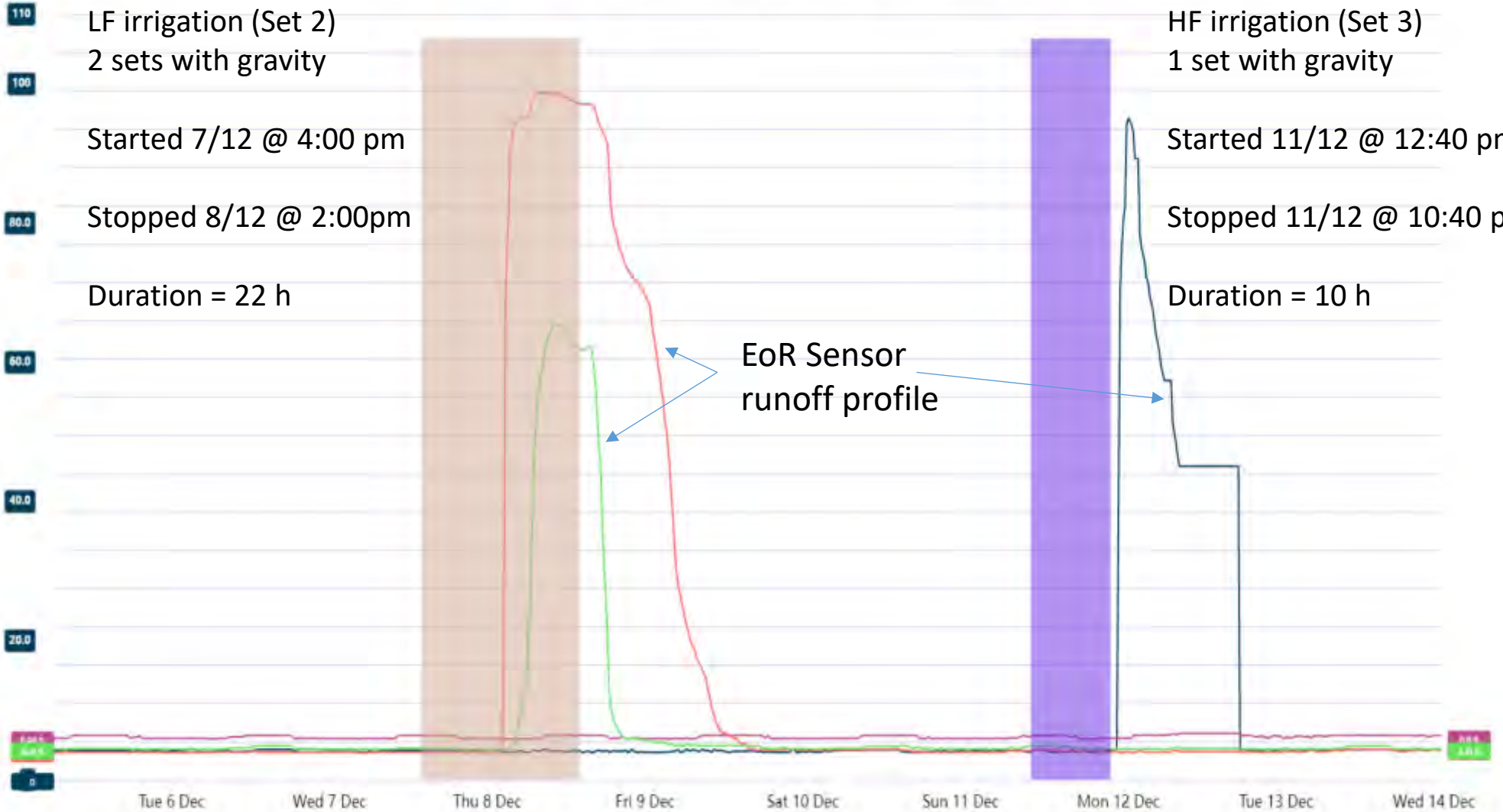
HF irrigation (Set 3)
1 set with gravity

Started 11/12 @ 12:40 pm

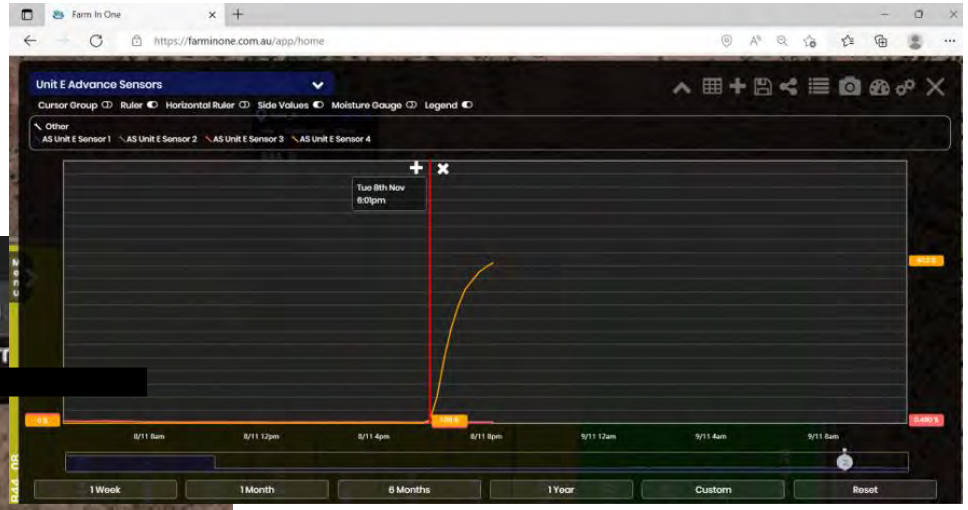
Stopped 11/12 @ 10:40 pm

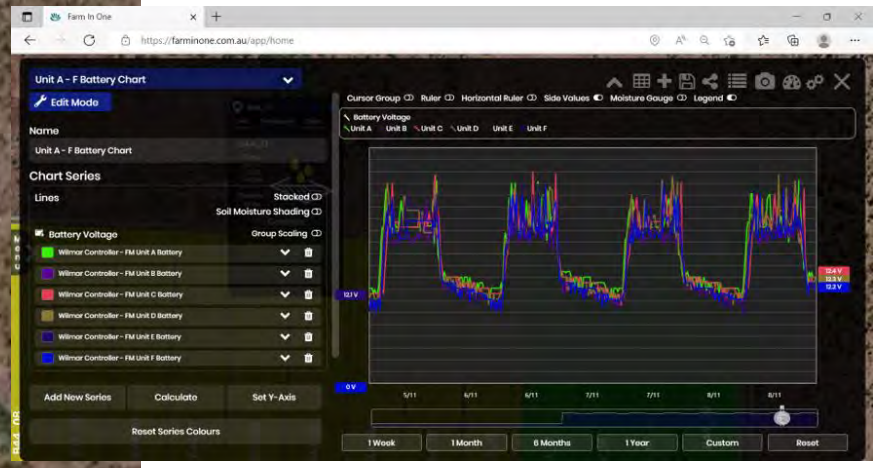
Duration = 10 h

EoR Sensor
runoff profile

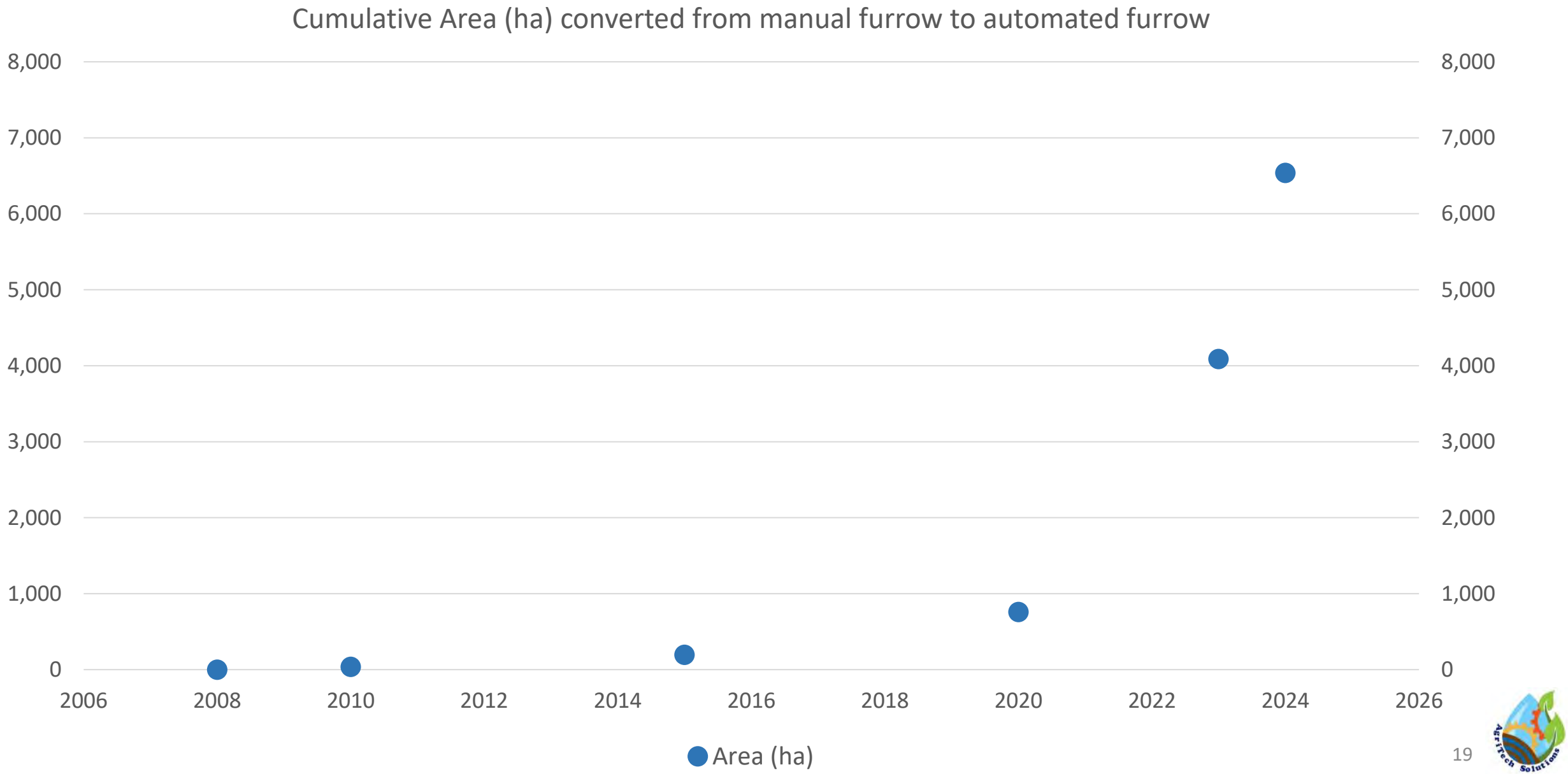


Integrating platform: Farm in ONE





Irrigation technology transforming farmer management & thinking



Smart Irrigation Toolkit

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  - Baseline: measurement of current practice
  - Irrigation specialists providing support

- Technology is the “enabler” to make irrigation lower cost, more water efficient, more productive, more time efficient, more labour efficient, etc.



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