Mountjoy William Hannah & family

PROJECT:
LoRaWAN inline water flowmeter to detect water leakage

LOCATION:
Haverfordwest

FARM:
Sector: Dairy
Stock numbers & breed: 390 Friesian Cross Breds and 200 followers
Farm size (ha): 242ha
Woodland (ha): 7ha
Crops & ha grown: Kale – 9ha
Land management schemes: None
Calving pattern: Late spring block calving (20 March – 6 June)
Grazing system: Rotational grazing

FARM OBJECTIVES

1. Identify water leaks early to reduce impact on loss of milk yield and welfare of stock through lack of water in summer/drought conditions

Key take home messages:

- Preventing animal welfare distress from lack of water supply.
- Mitigating a potential daily milk yield reduction of 15-20% equivalent to a loss of 2,200litres daily output for the herd (circa value of £1,000 on spring 2022 prices).
- Initial purchase cost £250.
- Water leak alert via mobile phone enabling quicker response to the problem.

The problem:

Water usage and water conservation are very important. Using mains water over bore hole supply is expensive and, if there is not enough stored water, farm operations, especially milk cooling, can be significantly impaired.

Mountjoy unexpectedly lost 40,000 litres of stored water in a 6-hour period, emptying both storage tanks. It was caused by the failure of a ball cock valve in a remote field. This resulted in milk cooling operations being delayed and extended compressor was used to cool the milk due to poor (or no cooling) provided by the plate coolers, which rely on water flow.

There was no way of knowing that the water was leaking out into the field at some 100 litres per minute. A solution was sought to provide an early warning system of significant leaks to prevent the situation from occurring again.

Purpose of work:

The site already uses a sensor system called LoRaWAN for a number of different applications around the farm.

The LoRaWAN system allows sensors to remotely record information e.g. soil temperature and animal shed humidity and to send this information via the internet over long distances. It was this that prompted the idea of placing an inline flow meter in the water feed pipe to the water troughs in the remote fields.

The sensor was configured to send a 'pulse' for each 10 litres of water that flowed through and these pulses are then used to calculate the volume of water every 20 minutes or so and dis-played on an easy-to-use dashboard.

What we did:

A field site survey confirmed suitable LoRaWAN coverage, therefore a suitable flow meter was sourced with enough capacity to handle the significant amount of water that would flow through it, without causing any restrictions to the flow. A LoRaWAN flow sensor was added and the complete system was installed by the farmer about 3/4 mile from the farm into the alkathene feed pipe.

The real-time flow of water can be used to detect continual and significant water flows, which may indicate a leak from which an alert can be generated directly to the farmer's phone.

Additionally, there was a LoRaWAN distance sensor placed in the water storage tanks, which measured the amount of water remaining in the tanks. This was configured to send out an alert when the level of water was getting low, therefore that the farmer can take any appropriate action to prevent a completely empty water system.

Outcomes:

Using the LoRaWAN sensor system and internet dashboard/alerting system, the farmer can reli-ably be alerted to unexpected loss of water and take immediate action to prevent further loss enabling farm operations to continue.

Research into practice /10 how to steps for your farm:

1. Early warning of potential water leakage issue.
2. Alert system via app on phone.
3. LoRaWAN sensor technology is simple and relatively easy to set up at a cost of around £75 for the sensor and flowmeter for £250.

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"The benefits of the LoRaWAN water sensor are great in times of drought, allowing quick observation of a problem and on which part of the farm the problem is using the flowmeter leak notification via the dashboard app on the phone. Additionally, the water tank depth sensor provides a useful notification of the variation in water usage and lets you know of a potential water leak."

Figure 1. Inline water sensor

Figure 2. Site position installation

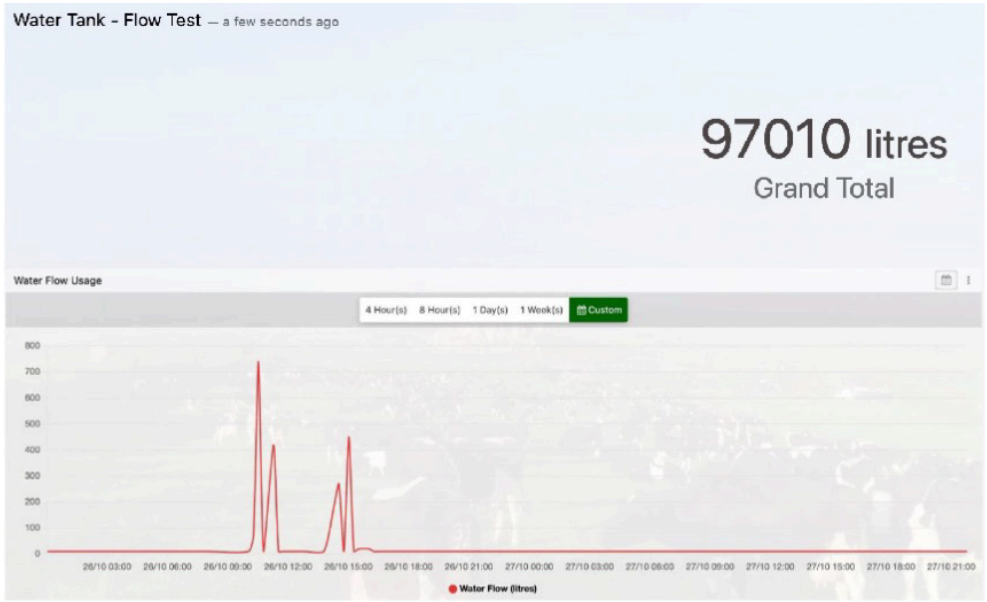

Figure 3. Water tank flow rate and water usage through the flowmeter. The spikes in usage are all around milking times when volumes jump dramatically as a consequence of washing down and cleansing in the parlour twice daily.

Other projects taking place on this site:

1. Selecting for efficient genomics in a spring calving herd
2. Reducing nitrogen and incorporating more clover in the swards