WALK-OVER-WEIGHING IN THE BEEF INDUSTRY

PRACTICAL GUIDE

CQUniversity AUSTRALIA | mla MEAT & LIVESTOCK AUSTRALIA

NEW AUTOMATED LIVESTOCK MANAGEMENT TECHNOLOGIES ARE CHANGING THE WAY CATTLE ARE HANDLED IN SOME OF THE TOUGHEST AND MOST REMOTE OPERATIONS IN AUSTRALIA.

While Walk-over-Weighing (WoW) has been researched and tested for a number of years, recent advances are making the technology more suited to real-world operating environments, generating a new wave of interest from producers.

WoW systems have the ability to provide enhanced herd monitoring to:

- Record growth paths of animals without the stress and labour requirements of conventional weighing
- Monitor animal and pasture condition remotely
- Record maternal parentage within seedstock or commercial breeding herds
- Record birth/calving dates within seedstock or commercial breeding herds
- Determine drinking frequency and infer grazing area

A range of WoW systems are available, including out-of-the-box solutions from firms such as Precision Pastoral Pty Ltd, while a number of producers are utilising custom-built systems through research programs with CSIRO, University of Sydney and CQUniversity Australia. With the component parts of WoW readily available, some producers are even following the DIY path.

Whichever option you choose, here's a few tips and tools for getting started.

WHAT IS

WALK-OVER-WEIGHING?

WoW enables cattle producers to record daily weights on their animals without the need for mustering and conventional weighing. Animals are weighed as they walk to water with an animal's identity recorded from the radio frequency identification (RFID) device within the NLIS tag. Weights and identities are captured automatically with all data stored locally. There is also the option to transmit the data to a remote computer server to be stored and further analysed.

WHERE IS THE VALUE?

The value of monitoring cattle as they access water is to provide more regular, more accurate data that can be used to enable better individual animal management. The system can help manage seedstock, breeder and growing cattle. A recent installation for a group of backgrounding steers, at "Berrigurra" near Blackwater in Qld gives an example of how a manager is thinking about the value of the system.

CASE STUDY 1 - BACKGROUNDING AT BERRIGURRA

"Berrigurra" is owned and run as a commercial property by Queensland Agricultural Training College. The unit is tracking the performance of 146 steers of mixed breeds which are being backgrounded to feedlot entry weights. The system has been able to identify mob and individual animal performance, identify sick animals and show the outcomes of rainfall events on weight gains.

Cattle are rotationally grazing 4 paddocks that total approximately 600 hectares of predominately buffel grass pasture. An existing dam square was utilised for the WoW compound. The infrastructure includes a 'force' of 4 portable panels prior to the formation of the race of 3 panels which includes the weigh platform. At the end of the race is an entry spear gate and further around the compound is an exit spear gate. As the animal's weight and identity are recorded it is stored locally as well as being sent via the Next G network to an off-site server.

Figure 1a) The 'force' and race leading into the WoW compound and 1b) the exit spear with steers exiting the compound

> **I WANT TO SEE WHAT CAN BE DONE INTO THE FUTURE - FOR EXAMPLE DRAFTING ON WEIGHT, ASSIGN CATTLE TO A MARKET, ISOLATING POOR PERFORMERS AND MAKE MANAGEMENT DECISIONS ABOUT THE PERFORMANCE OF OUR CATTLE - ROB NEWCOMBE PRODUCTION/LIVESTOCK MANAGER, QUEENSLAND AGRICULTURAL TRAINING COLLEGES**

Using weekly averages it is possible to track the growth paths of whole mobs or sub-groups of cattle (Figure 2). The data can be downloaded locally and processed with standard software such as Microsoft Excel or transmitted across a network and made available automatically though software such as Data Muster the CQUniversity's herd management software.

Figure 2) Weekly average weights for the 146 steers using the WoW system at Berrigurra. There was a total of 115mm of rain in the month of October, which resulted in reduce animal weighings and variable data, however, the growth path returned to normal in November. Image Source: CQUniversity's DataMuster app.

HOW IT WORKS

Walk-over-Weighing relies on training animals to cross a weigh platform when they access water. The weight is recorded as the animal walks across the platform. An RFID panel reader records the animal's identity and this is combined with the weight and the date and time and stored.

The WoW system is powered by a solar panel with a solar regulator distributing power to the RFID reader, the weigh indicator and battery storage. In addition, some systems include a microcomputer that is able to analyse the data and send the data files to an off-site server for backup and reporting.

WHAT'S INVOLVED

The installation of a WoW system takes less than a day for all the hardware components to be connected and to begin recording.

The cattle need to be trained to ensure they are familiar with the system and will cross the WoW platform without human intervention (see Training Protocol below). The size of the WoW compound will depend on the number of animals that will need access the water point (see Yard Design below). Portable panels are used to construct the entry laneway and the race whereas the rest of the compound can be built with barbed wire and steel pickets.

Figure 3) Image showing the enclosure containing the electronic components that make up the WoW system including RFID Panel Reader, Solar Panel and storage case with 2 x 12volt batteries.

EQUIPMENT LIST

For producers seeking to build their own WoW system, the following parts are required:

- WoW Platform, Loadbars and Indicator
- RFID Panel Reader
- Solar panel (150w), panel frame and post
- Solar regulator
- Battery - 130ah deep cycle x 2
- Storage case
- Portable Panels approximately 30
- Spear traps x 2
- Race bows x 2
- Cabling & electronic devices (modem, microcomputer etc)
- Corner stays x 4 & steel pickets x 30 (if there isn't an existing water square/WoW compound)

Figure 4). The storage compartment showing the 2 x 12volt batteries, solar regulator, 12volt to 5volt power regulator and the WoW indicator and RFID reader.

TRAINING ANIMALS

DAY   ACTIVITY

DAY	ACTIVITY
1	Open the last panel in the force just prior to the race so that cattle have easy access to the water compound. Place the top spears in the exit spear so as to discourage cattle from entering through this point. Muster cattle to the WoW compound and allow them free entry to water. Leave panel open for two days to enable stock to sniff around the system without any fear.
3	Reduce the width of the gap in the portable panel that is open but ensure cattle can still enter through the gap. Place the second from the top set of spears in the exit spear. Place an incentive such as a weaner ration on the ground leading through the WoW race. Muster cattle to WoW compound. Gradually allow animals to enter the compound hopefully encouraging some animals to cross the platform.
5	Close the gap in the open portable panel so that only one animal can enter at a time. Place the third from the top set of spears in the exit spear. Place an incentive on the ground leading through the WoW race. Muster cattle to WoW compound. Gradually allow animals to enter the compound hopefully encouraging some animals to cross the platform.
7	Close portable panel so all animals have to enter via WoW platform. Place the final set of spears in the exit spear. Place an incentive on the ground leading through the WoW race. Muster animals to the compound. If animals won't freely enter the race you may need to place some pressure on them by entering their flight zone. This may require 3 or 4 of staff members and is were having a wing or fence extending from the compound is crucial.

TO ACCESS WOW SYSTEM

DAY	ACTIVITY
9	Muster animals to the compound and apply some pressure to the mob if they are reluctant to cross the WoW platform. The use of an incentive may be required if the mob is reluctant to start leading over the WoW platform. If by this stage all animals are walking over the platform and into the compound begin adding spears to the entry spear gate starting from the top set. Whereas, if animals are still baulking at entering the WoW compound leave spears out of entry spear gate.
11	By this time you should be getting a reasonable count (roll call) of RFID tags crossing the platform. Muster animals to the compound and observe whether they will enter the compound without applying any pressure. If so, add the second set of spears from the top down to the entry spear gate.
13	Check roll call information and if all animals have been recorded within the previous 48 hours the third set of spears can be added to the entry spear. If there are some animals still reluctant to enter the compound, muster the mob and apply some pressure to the hesitant animals.
15	Check roll call information to see if all animals are watering between 48 and 72 hours. If all animals are watering and final set of spears haven't yet been added, do so.

YARD DESIGN

The design of the WoW compound will be dependent on the number of animals within the mob and whether there is an existing water/dam square that can be utilised. The structure needs to include a compound to house the electronic components (unless they are stored on top of the Wow unit) and a barrier to inhibit animals from entering the RFID reader's range and having their ear tag read when not actually crossing the WoW platform.
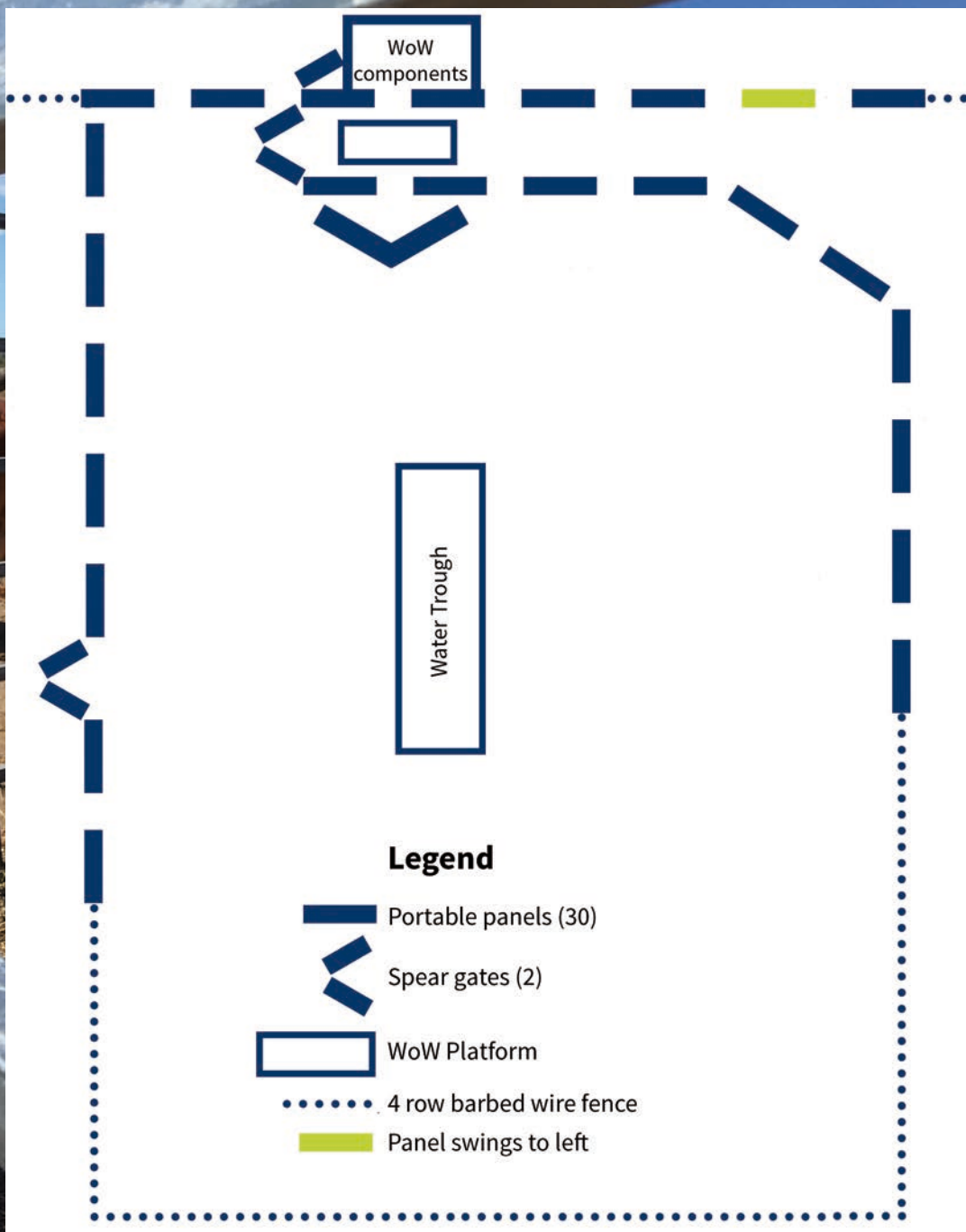

WoW components

Water Trough

Legend

▬▬	Portable panels (30)
▸	Spear gates (2)
▭	WoW Platform
• • • • •	4 row barbed wire fence
▬	Panel swings to left

Figure 5) A schematic of a yard design that incorporates the WoW compound and all components

OPTIONS FOR THE TRANSFER OF DATA

The most basic option is for the WoW data to be stored locally and manually downloaded from the WoW indicator to a laptop and sent to a service provided for analysis. There are many advantages to having the telemetry components built into the system so that the data is automatically transferred to an off-site computer for backup and reporting. Within locations that have mobile phone coverage this can easily be achieved using a Next G modem where data packets are sent at regular intervals. Where there isn't mobile phone coverage data can be sent via a satellite modem but due to the cost of communications the regularity and size of the transmissions may need to be reduced.

Figure 6) Components of a Next G telemetry system including the Next G modem, Raspberry Pi computer and cables that connect to the WoW indicator and power source.

PITFALLS OF DIY - DATA MANAGEMENT AND REPORTING

A DIY WoW system, in which the user downloads the data to a laptop, does not incorporate any software to consolidate, interpret and analysis the data. A third-party software solution is recommended to transform the data to show herd or single animal measurements over time.

The first step in consolidating the data is the removal of erroneous weights and rows of data without an animal identity. Erroneous weights can be caused by two animals being weighed at once or an animal baulking and only half of its weight being recorded.

Once the data has been 'cleaned' algorithms can be run to determine growth paths, animal associations, drinking frequency etc. Across the different systems in use reporting can be done to present growth rates, determine maternal parentage, derive calving dates, calculate frequency of watering events and infer oestrus events.

WOW SYSTEM MAINTENANCE

TOP TIPS:

- Be sure to regularly remove dirt and faeces from underneath the WoW platform
- Keep solar panels clean
- Maintain batteries
- Use fail-safe alerts such as roll call, and
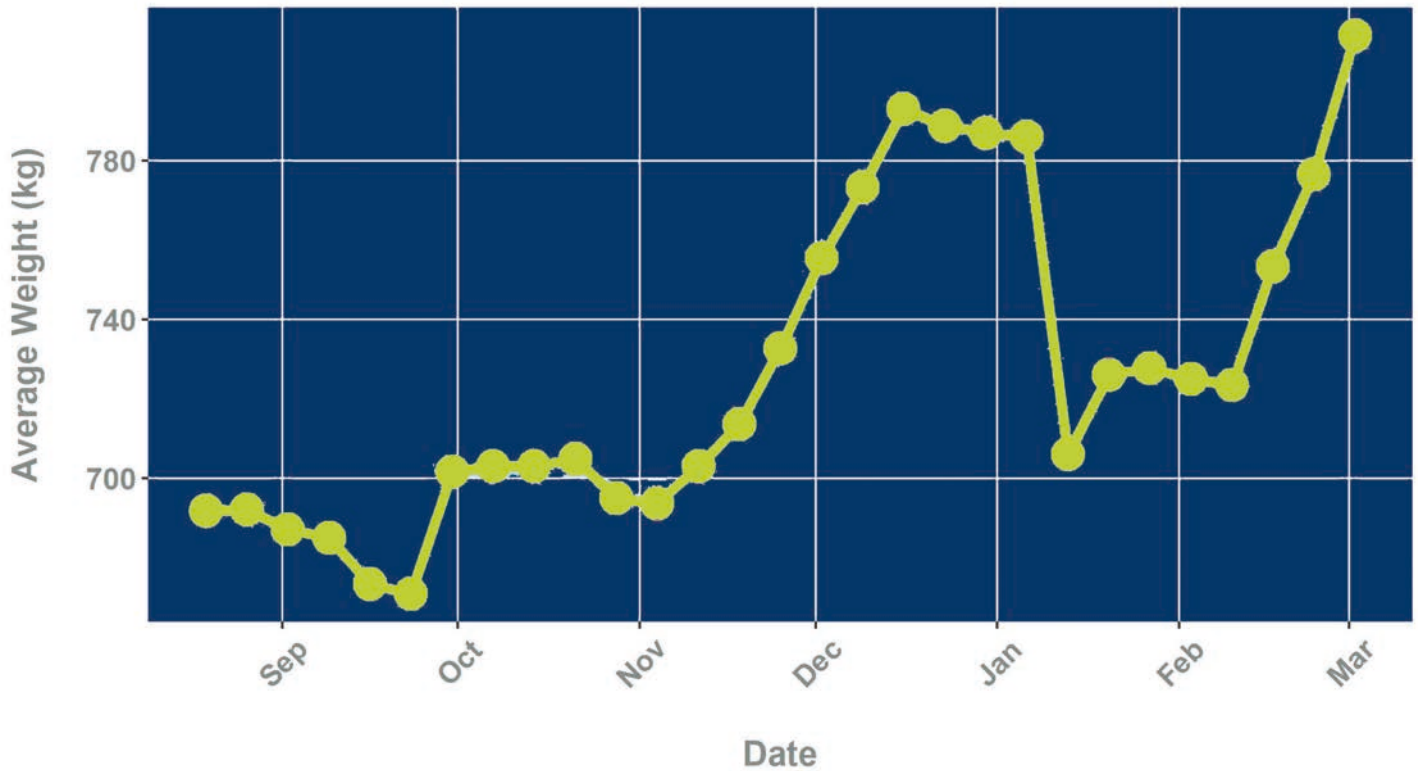- Routinely check your telemetry system is operational.

Figure 7: The growth path of a cow from late gestation to post calving showing how WoW can be used to determine the calving date. The observed calving date was on the 12th January, which corresponded with a weight loss of approximately 65 Kg. In addition, in mid-November there were two rainfall events that totalled 131 mm, which were followed by 46 mm of rainfall in December, 20 mm in January and 77 mm in February. The growth path of the cow reflects the pasture growth following the rainfall events Image source: CQUniversity

The major issues that can arise with WoW systems relate to either a lack of power to the system or a fault that causes data errors.

Power optimisation is dependent on the energy input (solar panel wattage), energy storage (number of batteries and condition) and energy output (power requirements of the RFID panel reader, WoW indicator and accessories such as telemetry system). In overcast weather the system could be powered for approximately 3 to 5 days using 2 x 12volt 130ah deep cycle batteries. Power input and output can be checked using a voltmeter or by using a solar regulator that has a digital display.

As with any weighing system, if dirt and faeces builds up underneath the platform weights may not be accurately recorded and the WoW indicator may not tare back to zero. These issues can be moderated by placing the platform on a surface that will allow water to run off such as hard ridge or simply checking the platform especially after rainfall events when mud can build up.

If the system includes a telemetry system for extracting and storing the data, fail-safes can be built into the software so that periodic (hourly or daily) messages are sent to ensure the system is still online. Similarly, graphical presentations of the number of RFID reads per day show the usage of the system and the impact of events such as rainfall, temperature extremes etc.

THE PROBLEM OF RAINFALL

Water is usually the simplest and most effect attractant to use to encourage animals to use the WoW system. After rainfall events animals will reduce water consumption and hence usage of the WoW system simply due to the increased water content within the plant material. In addition, if surface water is present following large rainfall events cattle may use this alternate water source.

Preliminary research is showing that surface water is not nearly as big a problem as non-permanent creeks or lagoons as cattle tend to avoid drinking from stagnant surface water. A possible solution may be to surround non-permanent water sources in an electric fence to ensure cattle continue to access the WoW system. Other areas yet to be validated are the use of supplements or water medication to encourage cattle to preferentially drink from the water supply within the WoW compound when non-permanent water is an issue.

SERVICE PROVIDERS

There are a number of research organisations who have built systems for research projects as well as one commercial supply of WoW systems. Research organisations who are utilising WoW include CSIRO, the University of Sydney and CQUniversity Australia all of which have used off-the-shelf equipment and built the systems in house. Precision Pastoral Pty Ltd supply a complete system which is being marketed by Tru-Test.

This guide has been compiled by CQUniversity researchers and is based on experience working with the technology and both formal and informal interactions with producers and developers of the technology.

The ideas represented in this document are guidelines only and CQUniversity does accept any liability for the advice given in this document.

As noted in the guidelines, it is recommended that producers seek further advice from a service provider when installing a system.

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