

BUSINESS CASE



Walk-over Weighing

Walk-over weighing (WOW) is a remote weighing system that can provide pastoral producers with an easier and more efficient option to measure and record sheep body weight daily.

In 2008, Jamie McTaggart trialled a WOW system on his sheep station in north eastern South Australia. This business case explores the specific issues and considerations that Jamie faced with WOW in the pastoral zone. It also provides updated information on the technology and systems available since Jamie trialled it.

The business case aims to provide useful information and tools to help you make a decision about WOW for your own business. You can use the method shown here to help prepare your own business case and assess this innovation on your own property.



Figure 1: The portable WOW system developed for the trial at Pernatty Station.



BUSINESS SNAPSHOT

OWNERS

Jamie McTaggart

BUSINESS NAME

Saltbush Livestock Pty Ltd

PROPERTY NAME

Pernatty Station

PROPERTY LOCATION

150 kilometres north of
Port Augusta, SA

SIZE OF PROPERTY

200,000 hectares

BRIEF ENTERPRISE DESCRIPTION

Vertically integrated saltbush lamb
and a white Dorper stud

NUMBER OF PEOPLE WORKING IN THE BUSINESS

1 full time equivalent plus casual
staff at peak times.

AVERAGE ANNUAL RAINFALL

250mm

WHY THIS IS A PASTORAL ZONE INNOVATION

Mustering, weighing stock and
recording data are labour intensive
tasks for pastoral producers. Walk-
over weighing can allow producers
to efficiently weigh sheep, while
recording weights electronically.

Section 1: Weighing sheep on Pernatty Station

BACKGROUND

Measuring the body weight of your sheep provides data for improved management decisions. Information and data generated can be used to improve key management decisions (i.e. selling stock or feed supplementation).

Knowing the weight of your sheep provides producers with the ability to predict when sheep will reach target weights to meet market specifications. They can also reduce variable costs by better targeting feeding and supplementation to those sheep that need it.

MOTIVATION TO CHANGE PRACTICES

Jamie McTaggart runs Pernatty Station, a remote sheep property in north eastern South Australia. Jamie chooses to take a minimalist approach to his livestock production. He runs his rams all year round, has few fences and gates, and only requires 1 labour unit, 1 motorbike and 1 set of portable yards for sheep husbandry.

In 2008 Jamie and the North West Sheep Meat Production Group acquired project funding to trial a walk over weighing (WOW) system at Pernatty. The aim of the trial was to weigh Jamie's sheep remotely and allow the data to be assessed electronically from his off-farm office, 150 kilometres away.

Jamie planned to link the sheep growth data collected from the WOW system with satellite imagery of his pasture biomass. He wanted to have the data to back-up perceptions about sheep growth rates during dry periods, and to ultimately make better management decisions.

WHAT IS WALK-OVER WEIGHING (WOW)?

WOW is a remote weighing system that can reduce labour and increase monitoring efficiency. The innovative system allows pastoral producers to efficiently weigh sheep daily without the need for mustering. Management decisions can also be improved as animal condition and growth rates are easily monitored.

The equipment works by directing sheep to walk in single file over a weighing platform, without the need for external force. This is usually achieved by using spear gates and trap yards around an attractant, such as water, feed or mineral lick access point. Their body weight of each animal is then measured as they enter a race to access the water or feed.

Radio frequency identification (RFID) also referred to as electronic identification (EID) tags are fitted to each sheep's ear. This enables the tag number of each individual sheep to be read by a fixed panel tag reader as they walk over the scales. The tag number and body weight for each sheep is stored in a weighing indicator until it is downloaded to a computer, either manually or via telemetry.

A telemetry system can be incorporated with the WOW system to enable data to be sent back to the office computer remotely. If you choose not to incorporate telemetry then labour will still be required to travel to the WOW system in the paddock and download the data manually. Manual downloading of the data will need to occur as often as updated data is required.

The Bestprac business case 'Options for Water Telemetry' provides more information on the telemetry systems available. Visit www.bestprac.info to read this business case.

WOW technology aims to reduce labour, eliminate human error and provide daily data updates to aid management decisions for sheep production.



Figure 2: : A mob-based WOW system which is being developed by the Sheep CRC.

OUTLINE OF THE OPTIONS

Sheep can be weighed either manually or by using an automatic system such as WOW. The options assessed in this business case include:

1. Maintain the current situation of manually mustering, drafting and weighing sheep, and manual data entry.
2. Invest in a walk-over weighing (WOW) system.

Each of these options could provide potential benefits to a pastoral business. Table 1 lists the likely benefits identified for each option.

Table 1: The benefits of each weighing option.

Option 1: Manual weighing	Option 2: Walk-over weighing system
<ul style="list-style-type: none"> • Does not require additional cost or investment. • Manual weigh crates are lightweight and are easy to use. • No need to change the yard layout or water and feed access points. • No need to turn off any water or feed access points. • No retraining of staff or animals is required. • Can use a simple computer program to analyse data, such as Microsoft Excel. • Can be coordinated with other animal husbandry activities such as lamb marking or crutching. • Manual weigh crates can be moved to other yards. • Weights are precisely measured and the data is reliable 	<ul style="list-style-type: none"> • May reduce fuel and labour costs associated with mustering and weighing livestock depending on the use of trap yards. • Minimises sheep handling and associated stress. • Existing trap yards can be used to direct stock over the weighing platform. • May increase the ease and efficiency of data recording facilitates daily or weekly monitoring of body weight and growth rates. • Provides the ability to monitor ewe and lamb condition in breeding programs. • Can provide information which can be used to increase the rate of genetic gain in the mob • A summary of livestock performance can be quickly generated. • Additional equipment such as an auto-drafter can provide the ability to draft sheep into smaller groups selected on single or multiple characteristics. This also allows producers to focus on manipulating top performing and improving underperforming sheep. • Incorporating electronic ear tags can allow feral animals to be drafted as they do not have a tag.

RESULTS OF THE CHANGE

Jamie McTaggart implemented a WOW system as part of a trial at Pernatty Station in 2008. He installed the following equipment to set-up his WOW system:

- A weighing platform with load bars underneath.
- A weighing indicator (WOW enabled) to collect and store data.
- WeighMatrix software to analyse and interpret the data.
- Fencing/yard materials to direct animals over the weighing platform.
- Solar panels and deep-cycle batteries to power the system.
- RFID tags for each sheep and a panel reader.

The WOW system was housed on a trailer with the intention that it could be easily transported to the next water point (see figure 1). The flow of animals was slowed down by making them step up onto a trailer, make a 90 degree turn and navigate over 'hock bars'. The sheep then exited the trailer just to the left of an old fridge which stored all the electronic equipment, including the weighing indicator.

Integrated digital cameras and telemetry equipment were also trialled at Pernatty as part of the pilot program. The cameras took photos of the system working and the telemetry equipment enabled remote controlling and transmission of data to Jamie's office computer.

Jamie's sheep required virtually no training to get used to the WOW system each time it was set up. However, issues with the WOW technology were discovered during the pilot program and most of Jamie's energy was focused on overcoming these impediments. This prevented him from getting the most out of the data and using it for practical applications.

Issues Jamie identified with the WOW system when it was trialled on his property in 2008 include:

- Lack of consistent body weights, due to more than one animal standing on the scales at a time and the weighing indicator not collecting weights quick enough. The sheep could not be slowed down enough so that weights could be accurately collected.
- Rain events or thunderstorms prevented sheep coming in to water and entering the WOW system.
- Lack of suitable software available to analyse and interpret the data collected.

After the trial Jamie decided not to permanently implement WOW at Pernatty station as the system did not accurately record weight and was unreliable.

KEY LEARNINGS

Jamie recommends only incorporating telemetry equipment into a WOW system if you have already invested in it for other purposes, such as water or gate infrastructure.

"There was a poor return on investment in the telemetry equipment which was used with walk-over weighing" said Jamie.

He also says it is important to invest time in analysing the collected data or consider outsourcing the data analysis to increase the practical application.

OPPORTUNITIES FOR THE FUTURE

Data applications

The data collected through WOW has many applications for a sheep business once it has been processed through a program called WeighMatrix, the only software currently available for sheep. Producers can then make key management decisions with substantiated information and more confidence.

Key management decisions aided with WOW data can include:

- When to sell stock if the target body weight has been met.
- If feed supplementation is needed to increase growth weight or maintain stock condition.
- When to start feed supplementation in drier seasons.
- Administering the correct dose of animal health products based on animal body weight.
- Culling of animals if performance is not adequate.
- Selection of best animals for breeding.
- Growth rates can indicate when a mob needs to move into a different paddock with better feed available.
- Growth rates can be used in drier seasons to predict how long available feed will last and how much additional feed needs to be brought in.

The system can also be used to observe animal behavior, such as how often the mob is coming in to access water or feed. Some WOW systems allow an alert to be set if a particular animal has not been recorded for the past few days.

RFID equipment can also be used to mother up ewes and lambs as they walk through the walk-over weighing system. Lambs are tagged with RFID tags and walk past the RFID reader together with their mother. The tag number data is collected and uploaded into a computer program, such as Pedigree Matchmaker, which can accurately pair the ewes and lambs.

Automatic drafting is another technology that can be incorporated into a WOW system. Auto drafters allow sheep to be drafted by the information stored on their RFID tag. Different values can be set on the auto-drafter software to ensure sheep are drafted for specific characteristics, such as body weight, tag number, sire groups or age.

Mob-based walk-over weighing

Since Jamie trialled walk-over weighing in 2008, there has been continuous development on the technology and its applications. Recently, the Sheep CRC have been working on a mob-based WOW system which monitors mob body weight rather than individual animals. This system does not require RFID tags or readers which will lower the financial investment required.

Management decisions can be made on a whole of mob basis. A recent study (Brown et al. 2012), has shown there is a strong relationship between mob-based WOW body weights and static weights collected manually ($r^2 = 0.8$). This has been achieved by improving the data analysis by applying a 25% filter and grouping the data into 5-day groups.

As Jamie McTaggart observed with his trial, a persistent barrier to WOW and mob-based WOW is still being able to get sufficient data entries on consecutive days. Brown et al. (2012) recommended more research into improved data collection techniques is required to increase the adoption of WOW and mob-based WOW. Further development of WeighMatrix software is also needed for practical application of the data.

Section 2: How to use a business case to assess 'Walk-over Weighing'

AIM OF THE BUSINESS CASE

A business case is a practical process to assess investment options; whether it is a new practice or a piece of machinery. This business case aims to assess options for weighing sheep in the pastoral zone.

Section 1 details Jamie McTaggart's experiences with trialing a WOW system and the improved systems available today. The following section will show how a business case can be used to formally assess the costs, risks and other considerations involved when making an important business decision.

WHAT ARE THE COSTS?

A WOW system requires initial capital investment; however, once established it will significantly reduce labour costs. The costs of a WOW system can range from \$11,000 to \$26,400, depending on the system design. Additional equipment can be added to a basic WOW system to increase data collection whilst improving labour efficiency.

A basic system for measuring your mobs average body weight will require:

- A weighing platform with load bars underneath,
- A weighing indicator (WOW enabled) to collect and store data,
- Computer software to analyse and interpret the data. The only software currently available is WeighMatrix which is available from the Sheep CRC for free. However, you have to undergo training and pass data analysis tests to be able to process data. An alternative is to outsource the data analysis and engage a service provider.
- Fencing/yard materials to direct animals over the weighing platform, and
- Solar panels and deep-cycle batteries to power the system.
- Radio-frequency identification (RFID) tags and panel readers to assign body weights to individual animals. One tag can record several pieces of information on an individual sheep and increases animal traceability. RFID tags can also be recycled through the manufacturer, which reduces the cost of the tags overtime.
- Telemetry equipment such as a repeaters, camera, software and antennas.

Table 2 shows the approximate capital costs of setting up a walk-over weigh system with telemetry. In comparison, the total cost of Jamie's WOW system was \$22,500 in 2008.



Figure 3: A camera took photos of sheep walking through the WOW system and they were transmitted to the office computer via telemetry.

Table 2: The approximate capital cost of setting up a walk-over weigh system.

Basic WOW system requirements:	Approximate cost:
Weighing indicator (must be WOW enabled)	\$4,000
Weighing load bars and platform	\$1,200
RFID tags	\$1.65 per head
RFID tag reader	\$2,600
Solar panels and batteries	\$3,200
Yards and fencing	\$500 - \$1,000
Data processing costs	\$150 - \$2,000
Telemetry system, camera and installation - optional	\$12,400
TOTAL COST	\$11,650 - \$26,400

Partial Budget

When assessing a WOW system for your own business, it is important to calculate the costs you will save from manual weighing and the new costs you will incur. Table 3 is a partial budget which describes how to calculate the overall benefit/loss per head from implementing a WOW system. A partial budget only includes items which alter as a result of the change in practice.

Table 3: A partial budget** describing the benefits and costs associated with implementing a walk-over weighing system compared to manual weighing.

	Average \$/head per year
BENEFITS OF WOW	
<i>Variable Costs Saved from Manual Weighing</i>	
Fuel*	Fuel usage from mustering livestock.
Vehicle R&M*	Vehicle repairs and maintenance costs associated with mustering livestock for weighing.
Labour in the paddock	Labour associated with mustering, yarding, drafting and weighing sheep manually. Sheep can be manually weighed once a week at Pernatty station when growth rate data is required.
Labour in the office	Labour associated with manually recording body weights and entering data into a computer.
Total Benefits of Implementing WOW	\$
COSTS OF WOW	
<i>New Variable Costs Associated with WOW</i>	
RFID tags	Each sheep will require a RFID tag, costing approximately \$1.20 – \$2.30 each. Tags are designed to last for the sheep's lifetime and can be recycled to reduce costs.
Labour	Labour associated with analysing the data via computer.
<i>New Overhead Costs Associated with WOW</i>	
WOW depreciation	Annual depreciation on the WOW equipment. Can be calculated as approximately 10% of the estimated value and divided by the average number of head.
Total Cost of Implementing WOW	\$
BENEFIT/COST PER HEAD (excluding capital costs)	\$ (= Total benefits less total costs)

*Fuel and vehicle R&M costs can be estimated using the rate of 75c per kilometre. This is based on the Australian Tax Office's method of calculating vehicle costs and is based on a vehicle with over 2.6L of engine capacity.

**Please note the partial budget does not include any financing costs associated with investing in a walk-over weighing system.

A blank partial budget template has been provided in section 3 for you to assess the impact of implementing a WOW system in your own business. The overall benefit/cost per head can be multiplied over your average mob size to calculate the expected change in gross margin for your business.

It is also possible to calculate the effect that investing in a WOW system will have on your businesses cash flow, by creating a development budget. This budgeting tool evaluates how long it will take for the WOW system to break-even on the initial capital investment (as opposed to cash flow break-even).

For more information on development budgets and a simple template, download the "How to create a development budget" factsheet from the Bestprac website www.bestprac.info.



Figure 4: Hock bars and a 90 degree turn were used to slow down the flow of sheep over the weighing platform.

WHAT ARE THE LIKELY RISKS?

Risks are the possibility of something happening that impacts on the projects objectives. It is necessary to consider all the risks, such as strategic, environmental, financial, operational or technical related.

The following table summarises the business risks associated with WOW systems and how they can be managed.

Table 4: The risks associated with implementing a walk over weighing system.

What are the associated risks with a walk-over weighing system?	How can this risk be managed?
Disruption of drinking or eating – shy animals not coming in as much for water or feed.	<ul style="list-style-type: none"> Gradually set-up the system over a few days or weeks to get the sheep used to it. Train sheep to walk through the system by offering an incentive such as supplementary feed. A quiet set-up with a clear view through the system will reduce disruption. Some systems can monitor which animals are not moving through the system, and therefore identify any issues.
Animals do not come to water troughs regularly due to rainfall events.	<ul style="list-style-type: none"> Maximise the number of daily data entries by using a WOW system during periods of dry weather. Use a successful feed attractant to encourage sheep to walk through the WOW system.
Inconsistent data variability and the implications this could have on the potential for individual sheep management.	<ul style="list-style-type: none"> Ensure the walk-over weighing platform is not too long so that only one animal is weighed at a time (for individual animal weights). The flow of sheep moving over the weighing platform may need to be slowed using fencing or spear gates. Install WeighMatrix to statistically filter and analyse the data, or engage a consultant to undertake the analysis. Ensure the scales and weighing platform is free of built-up manure. Fence-off the RFID tag panel reader to prevent sheep getting their tag read again once they are in the trap yard. Hock bars can be used in the race to slow animals down before they walk over the weigh platform.

WHAT ELSE IS THERE TO CONSIDER?

When making a decision the cost of implementation isn't the only thing to consider. The other areas on top of costs and risks are the implications to Workplace Health and Safety (WHS), labor, time requirements, and how easy the innovation will be to implement.

Table 5: Implications to Workplace Health and Safety, labour, ease and time requirements which may result from implementing a walk-over weighing system.

What to consider?	Option 1: Manual weighing	Option 2: Walk-over weighing system
Workplace Health and Safety	<ul style="list-style-type: none"> Can involve manual handling and moving sheep through confined spaces such as a race or weighing crate. 	<ul style="list-style-type: none"> A WOW system reduces the manual handling associated with opening and closing manual weigh crates.
Labour	<ul style="list-style-type: none"> Requires a couple of labour units to muster, yard, and manually weigh sheep every 3-4 weeks. Requires further administrative labour for recording and entering data. 	<ul style="list-style-type: none"> Labour efficient, once set-up it does not require any labour to weigh sheep or record data. Installing an auto-drafter with the WOW system further leverages labour as sheep can be drafted ready for other husbandry activities or loading into a truck.
Ease of implementation	<ul style="list-style-type: none"> Easy to implement. Analysing data may require computer and data analysis skills. 	<ul style="list-style-type: none"> May require some initial resources to adapt yards to include WOW system. Require computer software training to analyse the data in WeighMatrix. Other water or feed access points need to be switched off so that sheep enter the WOW system. This can be difficult if creeks or waterways can be accessed by stock.
Time taken to implement	<ul style="list-style-type: none"> Takes time to manually weigh sheep and therefore may only be conducted monthly, quarterly or yearly. 	<ul style="list-style-type: none"> Requires time to initially monitor and train the sheep and ensure they are freely accessing water or feed. It is recommended to collect initial base weights via manual crate weighing, before using a WOW system. A base weight will allow you to calculate growth rates from day 1 and provides a check if there are any major data issues. If you don't collect a base weight then the first set of WOW data forms your base weight to compare and calculate growth rates from, over the next period. Can take time to get consistent data for growth rate analysis.

FURTHER INFORMATION

For more information on walk-over weighing or radio frequency identification (RFID) please visit the following websites:

- Sheep CRC website. There is also a series of webinars on precision sheep management available on their website www.sheepcrc.org.au
- Victorian Department of Primary Industries website <http://www.dpi.vic.gov.au/agriculture/farming-management/nlis/sheep-and-goats/on-farm-benefits-of-sheep-electronic-identification>
- Remote Individual Animal Management Final Report is available on the Meat and Livestock Australia website <http://www.mla.com.au/News-and-resources/Publication-details?pubid=5237> This report is the output of the trial Jamie McTaggart was involved in during 2008.
- Tru-Test is a supplier of WOW and RFID equipment, visit their website www.tru-test.com

Further references for mob-based walk-over weighing:

- Brown, D., Savage, D.B., Hinch, G.N., and Semple, S.J. (2012) Mob-based walk-over weights: similar to the average of individual static weights? *Animal Production Science* 52, pg 613-618.

Section 3: How can you make the change?

Section 3 provides all of the tools necessary to work through a business case process to assess an innovation. You can assess the option of walk over weighing on your own property by completing the templates below.

WHAT ARE THE BENEFITS?

Benefits can be measurable, such as income and wool yield; or non-measurable, such as safety and achievement of business goals. List all the benefits associated with each option in the table below.

Option 1:	Option 2:

WHAT ARE LIKELY COSTS?

Using the information provided in section 2, complete the partial budget template below to assess the cost of implementing a walk-over weighing system in your business.

	Average \$/head per year
BENEFITS OF WOW	
<i>Variable Costs Saved from Manual Weighing</i>	
Fuel	
Vehicle R&M	
Labour in the paddock	
Labour in the office	
Total Benefits of Implementing WOW	\$
COSTS OF WOW	
<i>New Variable Costs Associated with WOW</i>	
RFID tags	
Labour	
Other	
<i>New Overhead Costs Associated with WOW</i>	
WOW depreciation	
Total Cost of Implementing WOW	\$
BENEFIT/COST PER HEAD (excluding capital costs)	\$ (= Total benefits less total costs)

WHAT ARE THE LIKELY RISKS?

List the risks involved with walk over weighing and identify how they can be managed in your business.

What are the risks with walk over weighing?	How is this risk managed?

WHAT ELSE IS THERE TO CONSIDER?

Address any other factors to consider for each option in the following table.

What to consider?	Option 1:	Option 2:
Workplace Health and Safety		
Labour		
Ease of implementation		
Time taken to implement		
Other		

CONTRIBUTORS

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To view more innovation profiles, business cases and videos of innovations in the pastoral zone, visit the Bestprac website www.bestprac.info

