SIBI new on-farm technology economic case study: handling sheep with ease

# Case study: Emily Stretch of Kojonup

**Owner:** Digby, Nikki and Emily Stretch
**Property location:** South-west of Kojonup
**Property size:** 3500 hectares
**Stock:** 10 000 – 12 000 Merino sheep

**Technology:** Sheep handler

## Using sheep handlers

Any new technology that makes farming 12 000 sheep easier is welcomed, isn’t it? But, it seems a sheep handler does not save time in the yards for the Stretch family. In fact, it takes longer to drench, vaccinate, or backline using the sheep handler; and two people are, at this point, still required in the yards. So why do the Stretch family now consider a sheep handler a valuable tool in their farming operation?

## ‘Wandoora’, Kojonup, Western Australia

Emily is a sixth-generation farmer working with her parents on their family farm, ‘Wandoora’, 53 kilometres (km) south-west of Kojonup. The family property comprises of the home farm, ‘Wandoora’; a second property ‘Wade Gully’, 10km east of the home farm; and a third leased property 10km to the west. Of the total 3500 hectares (ha), 2400ha are effective for grazing, and 1600ha are croppable. Generally, 800ha of canola, wheat, oats and barley are sown in a five-year rotation of three years of crop and two of pasture.

Emily works with her parents Digby and Nikki. They have always been progressive with technology, but only choose to be at the lead if they are certain the technology is a winner. “Emily is presenting us with a lot of new technology ideas at an exciting stage in farming” says Digby (Smith, A., 2017).

Emily is involved with the Sheep Industry Business Innovation ‘new on-farm technology’ pilot group. She is looking for ways to improve efficiencies and at the same time learn from like-minded and passionate individuals. She is very mindful of the physical demands around sheep work and sees the new technology as an opportunity to improve working conditions for the family and their employees.

The Stretch family have between 10 000 and 12 000 Merino sheep on their properties. They are aiming to produce fine white wool which will handle a high rainfall environment. They stopped mulesing ten years ago which has subsequently driven many of their management decisions. Reducing worm and fly issues is essential for non-mulesed sheep, and therefore Emily manages an aggressive worm control program, where monitoring worm egg counts (WEC) is vital. Emily does the analysis on-farm. They select animals with less wrinkle and cull anything that looks at risk of being prone to flystrike. Cull tags are used in the cradle at lamb marking and whilst classing over their lifespan to identify any culls.

The flock structure is based around 3800 breeding ewes mated to Merinos, and a further 1400 Merino ewes are mated to Dorset or White Suffolk rams. Lambing starts in June with the ewes mated to crossbreds followed by the Merinos in July. They also shear 4000 to 5000 wethers, which they keep until two to three years old; some of which are purchased, depending on seasonal conditions and the available pasture.

## Sheep handler

Emily and Digby were keen to try a sheep handling system. They were looking for something reasonably simple to use, with minimal electronics and noise. They chose a system where the animal is held in a clamp by using the body weight of the operator to squeeze the sides together. They are trying this as part of the Sheep Industry Business Innovation ‘new on-farm technology’ pilot group. Their system includes a three-way draft, the ability to dag, and load bars for weighing the sheep once clamped.

They concur with most people who’ve purchased a sheep handler, in that it reduces the physical impact of working with sheep. It may not be quicker than using a double drenching race, but it makes the work less physically demanding and they are convinced they do a better job because there is more precision in what they do. Rarely do animals miss a treatment, and applications of animal health products are much more precise as they have much more control. An additional benefit is the increased capability to complete multiple applications in one pass.

The main activities they use the sheep handler for are:

* administering Glanvac vaccinations
* tagging purchased wethers
* backlining after shearing with a lousicide
* weighing crossbred lambs
* dagging crossbred lambs before sale
* drenching (but not always)
* classing sheep to identify issues such as
	+ wool problems
	+ udder problems
	+ mouthing.

Some of the benefits of a sheep handler were unexpected. For example, they now have a better understanding of the range of weights within their mobs. They have also found it a really good tool for classing their sheep, and teaching Emily how to class, because they get a good look at them while they are stationary. They are convinced their management has improved and their animal health product application is easier and more accurate, resulting in less wastage. They have more flexibility in their business around who does the sheep work; it means that inexperienced workers can competently administer animal health products after initial training. This allows Digby, and Emily if required, to work on higher valued operations elsewhere on the farm.

Digby said “more people with less skills or strength can be productive on the sheep farm with a handler”. Emily emphasizes that the ability for her to front-up the following day feeling less physically drained improves her labour productivity.

## The economic value

The cost of the handler with a three-way draft, lead up race, half curve, wheels for towing and load bars/indicator was $14 500 (ex GST). Emily and Digby know the qualitative value the sheep handler has brought to their business, but they are interested to know if there is any economic benefit from using a sheep handling device.

There are only small economic benefits for using the handler. Overall labour costs decrease with the handler, but it returns a negative net present value (NPV). However, this does not include the value from an occupational health and safety angle associated with managing sheep in a more controlled environment.

## Method of evaluation

NPV is a method for determining the current value of all future cash flows generated by a project after accounting for the initial investment. It is widely used in capital budgeting to establish which projects are likely to turn the greatest profit (Boyte-White, 2017). Often referred to as a cost-benefit analysis (CBA) or benefit cost analysis (BCA) it provides an objective framework for weighing up different impacts and impacts that occur in different periods. This objectivity is supported by converting all impacts into present value dollar terms. Sometimes, full quantification of some impacts is not possible (Office of Best Practice Regulation, 2016).

The need to discount future cash flows can be viewed from two perspectives, both of which focus on the opportunity cost of the cash flows. The first is that individuals prefer a dollar today to a dollar in the future, and is most obvious in the fact that banks need to pay interest on deposits to entice individuals to forgo current spending. This preference for current consumption is known as the ‘rate of time preference’ and relates to all economic benefit (and costs), not just those that are financial in nature (Office of Best Practice Regulation, 2016).

Society’s preferences place greater weight on consumption occurring closer to the present and since individuals are not indifferent between cash flows from different periods, those flows cannot be directly compared unless they are discounted back to current dollar terms.

The second perspective is that there is an opportunity cost for investment. The costs need to be funded in some way either through the interest paid for borrowing the money, or the returns forgone when the funds are not used for other purposes. Therefore, the project will only be beneficial when it provides an excess of the cost for deferring consumption, or the return that could have been earned on the best alternative use of funds. Applying a discount rate to future cash flows, the required rate of return is explicitly considered in the NPV calculation. A 6% discount rate was applied to the future cash flows in this analysis; a cash return on capital of 4.3% and change in land value of 2.0% (Planfarm Bankwest Benchmarks, 2017).

The steps for conducting a NPV analysis are outlined in Table 1, and is a guide to the process used for the analysis presented in this case study.

**Table 1 Steps in preparing a cost – benefit analysis**

| **Steps in preparing a cost-benefit analysis** |
| --- |
| 1. Specify the set of options.
 |
| 1. Identify costs and benefits.
 |
| 1. Identify the impacts and select measurement indicators.
 |
| 1. Predict impacts over the lifetime of project investment.
 |
| 1. Monetize (attach dollar values to) impacts.
 |
| 1. Discount future cost and benefits to obtain present values.
 |
| 1. Compute NPV of each option & BCA[[1]](#footnote-1).
 |
| 1. Perform sensitivity analysis.
 |

Source: Adapted from Boardman *et al.* (2010)

## Method

The two options considered were: working ‘with’ a sheep handler and ‘without’ to provide a comparison for before and after.

Digby and Emily identified the main benefits of using the sheep handler as:

1. the ability to use different sources of labour and combining more than one activity when handling the sheep
2. gains in labour productivity
3. a reduction in waste of animal health products.

The different sources for labour and combinations are outlined in Table 2a. As owner/manager, Digby’s hourly rate was $78 per hour. Emily’s hourly rate as assistant manager was $45.50 per hour and unskilled labour at $26.50 per hour. All except Digby’s include on-costs such as tax and superannuation (Fair Work Ombudsman, 2017). The total cost of labour for one hour of work is given in Table 2a, for example it costs $124 per hour for Digby and Emily to work together.

Table 2a Labour options and cost

| **One skilled person** | **Two skilled people** | **One skilled person with one unskilled** | **Two skilled people with one unskilled** |
| --- | --- | --- | --- |
| Emily | DigbyEmily | EmilyOne unskilled labour unit | DigbyEmilyOne unskilled labour unit |
| $45.50/hour | $124/hour | $72/hour | $150/hour |

A labour option from Table 2a was allocated to the sheep activities listed in Table 2b, ‘with’ and ‘without’ the sheep handler. For example, the sheep handler is used for multiple operations after shearing when the sheep are treated with a lousicide (backlining), drenched if required, and classed all in the one pass. Without the sheep handler this is not possible and although the backlining and drenching might be done in the race at the same time, classing becomes a separate operation and requires additional handling of the sheep; either re-drafting or bringing them back into the yards later.

Table 2b Labour options used for activities with and without sheep handling system

| **Activity** | **Labour ‘without’ the sheep handler** | **Labour ‘with’ the sheep handler** |
| --- | --- | --- |
| Backlining | One skilled person | Two skilled people |
| Classing sheep | Two skilled people |
| Drenching | One skilled person with one unskilled |
| Vaccinating hoggets | Two skilled people | One skilled person with one unskilled |
| Tagging wethers | Two skilled people | One skilled person with one unskilled |
| Weighing crossbred lambs & removing dags | Two skilled people | One skilled person with one unskilled |
| Drenching | Two skilled people | One skilled person with one unskilled |
| Vaccinating and Clik-ing | Two skilled people | One skilled person with one unskilled |

The total cost of labour for each activity was calculated using the hourly rate in Table 2a for the relevant labour option in Table 2b and the assumptions in Appendix 1, which specify the time it takes to process the sheep for each activity, ‘with’ and ‘without’ the handler.

The gain in labour productivity identified by Emily and Digby is improved ability of the operator to work with sheep on consecutive days. It reduces the level of physicality compared to working in a race wrestling with sheep, which becomes wearying and results in a decrease in the number of sheep processed over time. The sheep handler prevents this from occurring and to represent the physical tiredness associated with working on consecutive days, a 10% increase in time was applied to the ‘without’ scenario which equates to an additional 17 hours per year.

Table 3 displays the total cost of labour for each activity ‘with’ and ‘without’ the sheep handler. For example, backlining, classing sheep and drenching after shearing are three separate operations ‘without’ the sheep handler. The total cost is $4323 for 65 hours of work (Appendix 1), but when the three operations are combined ‘with’ the sheep handler, the total hours of labour decreases to 37 hours and the cost increases to $4574. This difference in cost is because the hourly rate is higher for Digby backlining, classing and drenching. In contrast, all the other activities have lower labour costs ‘with’ the sheep handler than ‘without’. This also means that when Emily is competent enough to class without Digby, there will be a decrease in the labour cost of this task.

Table 3 Total cost of labour for activities with and without using the sheep handler

| **Activity** | **Total cost ($) of labour ‘without’ the sheep handler** | **Total cost ($) of labour ‘with’ the sheep handler** |
| --- | --- | --- |
| Backlining | 1411 | 4574 |
| Classing sheep | 1113 |
| Drenching | 1800 |
| Vaccinating hoggets | 865 | 576 |
| Tagging wethers | 247 | 216 |
| Weighing crossbred lambs & removing dags | 495 | 144 |
| Drenching | 1484 | 1080 |
| Vaccinating and Clik-ing | 1360 | 1000 |

The other benefit Emily and Digby identified is a saving in animal health costs due to more accurate applications. The sheep handler offers two main advantages for improving management. Firstly, it allows the operator to weigh and accurately dose the animals with an oral drench; secondly, it keeps the animals in a stationary position for more accurate placement of animal health products. In economic terms these small improvements translate into a reduced cost of chemicals through less wastage and increased chemical sustainability which allows the Stretch family to rotate back to less expensive chemicals. At 5% this saves $1600 and at 10% $3136 per year.

There is also an improved knowledge of weight ranges which contributes to a deeper understanding of flock management.

## Results

The NPV is -$70 000 ‘without’ a sheep handler; this is the discounted cost of labour assuming a 10% increase in time to process sheep due to operator fatigue. The NPV for a sheep handler is -$46 800 which includes the initial cost of purchase, 10% saving in animal health products and a $6000 value for the handler in year 10 (Table 4). The benefits improve the NPV, but they are not enough to make it positive. In practice, this means that the cost of handling sheep reduces with a sheep handler, but the additional benefits are not high enough to cover the cost of the investment.

Table 4 NPV Results

|  | NPV for ten-year project‘without’ the sheep handler  | NPV for ten-year project‘with’ the sheep handler |
| --- | --- | --- |
| 0% saving in animal health products | -$70 000 |  |
| 5% saving in animal health products  |  | -$59 300 |
| 10% saving in animal health products |  | -$46 800 |

To help understand the difference between the two scenarios a cost per head was calculated. This is the present value of costs divided by the total flock (11 200 head). It costs $0.42 and $0.63 per sheep per year ‘with’ and ‘without’ a sheep handler respectively, Table 5.

Table 5 Cost per head ($/head per year)

|  | ‘without’ the sheep handler | ‘with’ the sheep handler |
| --- | --- | --- |
|  | $/head per year | $/head per year |
| 0% saving in animal health products | 0.63 |  |
| 5% saving in animal health products  |  | 0.53 |
| 10% saving in animal health products |  | 0.42 |

For some farmers, the sheep handler might have additional benefits such as introducing objective measurement and increased observation of sheep health issues. This has the potential to improve sheep survivability and may increase the rate of genetic gain due to improved classing and selection of sheep to breed. When these benefits are considered the NPV with the additional benefit for a 2% improvement in survivability is -$16 600 and the cost reduces to $0.15 per head per year.

## Discussion and conclusion

Efficiencies or productivity gains are hoped for with most investments in new technology, but most purchases are not based purely on economic criteria. Any significant purchase must be evaluated and made on its merits, and some benefits and costs are not always easy to express in money terms.

Sheep handlers have some benefits which are difficult to express in economic terms. There is an occupational health and safety advantage associated with managing sheep in a more controlled environment. There is a reduced likelihood of knee injuries, back strain and operator self-injections. The sheep handler improves operator comfort significantly and reduces operator fatigue.

It can enable older farmers to continue working with sheep, and may encourage more people with less experience to enter or remain in the industry. While difficult to quantify, sheep work appears to be calmer and less stressful for both the sheep and the operators when using the sheep handler. In Digby and Emily’s situation, the sheep handler provides them with more flexibility for allocating the work load and they have fleetingly achieved the ‘holy grail’ of the ‘one man and a dog’ operation to run sheep through the clamp. When this occurs, there are enormous cost savings, but they are still working on making this an everyday reality instead of a once off. It is a great device for training Emily how to class sheep and it helps makes them more attractive to employees, because they are managing and offering better working conditions.

## References

Boardman, E.A., Greenberg, G.H., Vining, A.R. and Weimer, D.L. (2010). *Cost-benefit analysis: concepts and practice*, 4th edition, Pearson Prentice Hall, New Jersey.

Boyte-White, C. (2017) What is the formula for calculating net present value (NPV)? <https://www.investopedia.com/ask/answers/032615/what-formula-calculating-net-present-value-npv.asp>.

Office of Best Practice Regulation (2016). Cost-Benefit Analysis Guidance Note. https://www.pmc.gov.au/sites/default/files/publications/006-Cost-benefit-analysis.pdfFair work ombudsman (2017)

Planfarm Bankwest Benchmarks, 2017

Smith, A. (2017). Gravel roads mean home for Emily, Farm Weekly, September 2017

## Appendix 1

|  |  |  | Without | With | Without[[2]](#footnote-2) | With |
| --- | --- | --- | --- | --- | --- | --- |
| Activity | **Month** | **Number (head)** | **Number per hour (head)** | **Number per hour (head)** | **Total hours** | **Total hours** |
| Backlining | February | 11 200 | 400 |  | 31 |  |
| Classing sheep | February | 11 200 | 400 |  | 9 |
| Drenching | February | 3 128 | 500 |  | 25 |
| Backline/Drench/Classing | February | 11 200 |  | 300 |  | 37 |
| Vaccinating hoggets | April | 2 427 | 400 | 300 | 7 | 8 |
| Tagging wethers | July | 800 | 400 | 300 | 2 | 3 |
| Weighing crossbred lambs & removing dags | October to February | 484 | 150 | 250 | 4 | 2 |
| Drenching | May & October | 5 375 | 500 | 400 | 12 | 15 |
| Vaccinating and Clik-ing | Oct-Nov | 4 138 | 400 | 300 | 11 | 14 |

Note: The one to two hours of labour required to assemble and disassemble handler is not included in the analysis.

1. BCA = present value of net cash-flows/initial cash outlay [↑](#footnote-ref-1)
2. 10% increase in time included [↑](#footnote-ref-2)