SIBI new on-farm technology economic case study: individual application of animal health products

Case study: Scott Newbey of Broomehill

Owner: Scott Newbey, 'Kerang Vale'

Property location: East Broomehill

Property size: 2500 hectares

Stock: 1500 Merino and composite ewes. Suffolk stud

Technology: Electronic identification

Scott and Bec Newbey, Broomehill

Scott and Bec Newbey, together with Scott's brother and his partner (Wayne and Abbey), farm at Broomehill in the Great Southern region of Western Australia. 'Kerang Vale' farm is 2500 hectares, of which 80% is cropped and 20% is used to graze 1500 commercial ewes and a small Suffolk stud. 60% - 70% of the commercial ewe flock is mated to Merinos and composite rams with a focus on wool production and growth rates respectively and the other 30% - 40% are mated to terminal rams for prime lambs. A portion of these are finished at the end of summer in a feedlot and are sold on a weight and grade basis to an abattoir. They shear around 3500 each year.

The best Merino ewe lambs, classed on wool traits at hogget stage, are retained in the wool flock. The wether hoggets are shorn and sold in April as shippers, or sold in the sale yards depending on season and market conditions. The Merino ewes rejected for their wool characteristics are mated to composite rams. Gradually they are building a composite ewe flock. The benefits of the composite flock include faster growth rates, so mating ewe lambs becomes a viable option. A terminal ram is put over the composite ewes for prime lambs. Eventually they want 50% Merino ewes joined to composites and Merinos and 50% composite ewes joined to terminals.

Precision application of medication

Scott successfully trialled a sheep handler to make handling sheep easier and less stressful for everyone, including the sheep (Rowe, P., 2017). He uses the sheep handler for drenching, vaccinating and applying backline for controlling lice. Load bars, as part of his sheep handling system, make the automed® applicator for the application of drenches, injections and backline a viable proposition.

The automed® medication system calculates the optimal dose for each animal based on their individual weight. Prior to this capacity Scott would drench to the heaviest

weight in the mob, or at least near to it, which means that some sheep do not get enough and others too much. The advantage of the automed® system is that it will apply the right dose, anywhere between 0.1 millilitre (mL) or greater, depending on the type of adapter used. It records treatments, manages inventory, integrates with weigh indicators and electronic identification (EID) readers using an app and web portal to capture all the information as applications occur. Individual login means that the application of medication is traceable to the operator.

The animal enters the handler or weighing crate, and the automed® applicator reads the weight via the weigh indicator and adjusts the dose to meet the animal's requirements, which is all recorded.

The cost of the automed® medication system varies depending on operator requirements. The initial cost to purchase the device is $1420 and the ongoing costs for single site compliance and multiple users (one to five) is $52 per month and for multiple sites and unlimited number of users it is $84 per month — this package includes an enterprise app and enterprise web portal.

The investment analysis herein indicates it is a positive investment for the farmer. The benefit for Scott and Bec Newbey depends on the type of products they use, but potentially the net present value (NPV) is $26 390, the benefit – cost ratio (BCR) is 25.8 and it takes one year to pay back the initial investment cost.

Method of evaluation

Net present value 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. The required rate of return is explicitly considered in the net present value calculation.

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.
2. Identify costs and benefits.
3. Identify the impacts and select measurement indicators.
4. Predict impacts over the lifetime of project investment.
5. Monetize (attach dollar values to) impacts.
6. Discount future cost and benefits to obtain present values.
7. Compute NPV for each option.
8. Perform sensitivity analysis.

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

A discount rate of 6% was applied to the future cash flows in this case study, determined by a cash return on capital of 4.3% and change in land value of 2.0% (Planfarm Bankwest Benchmarks, 2017).

The results are reported in NPV terms and a Benefit Cost Ratio (BCR), which is the present value of net cash-flows divided by initial cash outlay. A ratio of 1 or more indicates the investment is worthwhile.

Method

automed® enables the operator to accurately apply the correct dose of animal health products to the sheep according to the weight of the animal.

The initial costs depend on the equipment already on hand. For farmers already invested in a sheep handler with load bars, electronic ear tags and stick readers, the only item needed for the automed® system is the automed® applicator and subscription, otherwise a weighing crate and indicator with the capacity to connect to the device via Bluetooth is required.

The benefit of using the automed® system is the reduction in consumption of animal health products. By applying an accurate dose to every animal, the smaller size animals do not receive more than required, reducing the amount of product used. Generally, the dose given is based on the heavier animals in the mob, or near to it, for example the weights for Scott's weaners ranged from 14kg – 46kg and maiden ewes ranged from 12.8kg to 54.5kg. Only six animals in the maiden mob weighed more than

50kg. Normal farming practices would give the same dose to every animal based on the ‘near’ heaviest weight, in this situation it would be 50kg.

Weights from the weaners, maiden ewes and blue tag ewes on ‘Kerang Vale’ were used to compare vaccinating the weaners with Cydectin® 6 in 1, applying a backline at shearing, a backline for flies, and a drench to the ewes ‘with’ and ‘without’ the automed® device.

Assumptions

- discount rate at 6%
- ten-year project
- 2% per annum inflation for costs and benefits
- price of wool at $8.35 greasy, net “sweep-the-board” ($13.05 clip average at 67% yield).

The number of sheep, maximum and average weights, the dose rate per head for backline, injection and pour-on, and the cost per head ‘with’ and ‘without’ the automed® in Table 2 and Table 3 were used to determine the potential savings between using the automed® device and normal farming practices.

The cost per head ‘with’ the automed® is equivalent to the total weight of all the animals in the mob, divided by the number of sheep in the mob to determine an average weight. Even though every animal is dosed individually with its own dosage the overall cost per head ‘with’ automed® is equivalent to dosing to the average weight.

Table 2 Cost for animal health products with and without automed® for weaners and maiden ewes

Cyromazine Virbac Cydectin® Imidacloprid

	Backline[1]	Injection[2]	Pour-on[3]
Number of sheep (head)	1317	1317	1317
Dose for 50kg sheep (mL per head)	60	4	66
Cost for 50kg sheep ($/head)	1.14	0.84	0.56
Maximum weight in mob (kg per head)	50	50	50
Average weight in mob (kg per head)	29.7	29.7	29.7
Dose for maximum weight (mL per head)	60	4	66
Dose for average weight (mL per head)	36	2	39.2
Cost per head without automed® ($/head)	1.14	0.84	0.56
Cost per head with automed® ($/head)	0.68	0.42	0.33

[1] Imidacloprid
[2] Virbac Cydectin®
[3] Cyromazine

Table 3 Cost for animal health products with and without automed® for ewes

	Drench[4]	Backline[1]	Injection[5]	Pour-on[3]
Number of sheep (head)	1500	1500	1500	1500
Dose for 50kg sheep (mL per head)	10	60	2	66
Cost for 50kg sheep ($/head)	0.35	1.14	0.74	0.56
Maximum weight in mob (kg per head)	88	88	88	88
Average weight in mob (kg per head)	73.2	73.2	73.2	73.2
Dose for maximum weight (mL per head)	18	106	4	116
Dose for average weight (mL per head)	15	88	3	97
Cost per head without automed® ($/head)	0.62	2.01	1.30	0.99
Cost per head with automed® ($/head)	0.51	1.67	1.08	0.82

A comparison between different priced products identified the potential savings when more expensive labelled items are used. The savings when using products in

[4] Abamectin, Oxfendazole & Levamisole
[5] Cydectin® Eweguard®

Table 4 (higher priced products) were compared to the products (lower priced products) in Table 2 and Table 3.

Table 4 Dose for a 50kg sheep and price of products at a higher price

	Drench[6]	Backline[7]	Injection[8]	Pour-on[9]
Dose for 50kg sheep (mL per head)	5 ml	25 ml	2 ml	20 ml
Cost for 50kg sheep ($/head)	0.83	1.46	0.28	1.10
Cost per head without automed® weaners & maiden ewes ($/head)	0.83	1.46	1.12	1.10
Cost per head with automed® weaners & maiden ewes ($/head)	0.49	0.87	0.56	0.65
Cost per head without automed® ewes ($/head)	1.46	2.57	1.72	1.94
Cost per head with automed® ewes ($/head)	1.22	2.14	1.43	1.61

The initial analysis assumes the automed® device is an addition to someone who has already invested in a sheep handler and weighing equipment, so no additional capital outlay is required. This was compared to the need to invest in a basic weighing crate to work with the automed® device. Lastly, the results were extrapolated to larger flock sizes: 2000, 3500 and 5000 mated ewes.

Results

The difference, or the savings, between 'with' and 'without' automed® system for the flock (

[6] Monopantel
[7] Spinosad
[8] Weanerguard Se B12
[9] Dicyclanil

Table 5) were used to calculate the net present values in Table 6.

Table 5 Difference in cost with and without automed® for animal health products

		Without automed®. Total cost on max weight ($)	With automed®. Total cost on average weight ($)	Difference (savings) ($)
Lower priced products				
Weaners & maiden ewes	Backline[1]	1501	892	609
	Injection[2]	1106	553	553
	Pour-on[3]	737	438	300
Ewes	Drench[4]	924	768	155
	Backline[1]	3000	2503	506
	Injection[5]	1953	1625	329
	Pour-on[3]	1478	1230	249
Higher priced products				
Weaners & maiden ewes	Backline[7]	1923	1142	780
	Injection[8]	1475	737	738
	Pour-on[9]	1093	649	444
Ewes	Drench[6]	2190	1822	369
	Backline[7]	3854	3206	648
	Injection[8]	2587	2152	435
	Pour-on[9]	2904	2416	488

The NPV for the lower priced products using the automed® is $17 474 and BCR is 17.2, whereas the NPV for the higher priced products is $26 390 and BCR is 25.8. The automed® system is clearly more advantageous when using higher priced products.

However, this assumes the weighing equipment is already purchased and the automed® device is the only capital item required. The additional capital cost for a weighing device reduces the NPV and the BCR is 1.6 and 2.8 for lower and higher priced products respectively. The automed® creates savings when using the higher priced products, Table 6.

Table 6 Results of NPV analyses

	NPV	BCR	Pay-back period (years)
Lower priced products	$17 474	17.2	1
Higher priced products	$26 390	25.8	1
With purchasing a weighing crate			
Lower priced products	$8 974	1.6	5
Higher priced products	$17 891	2.8	1

The details for the initial investment cost, annual cost and annual benefits are in Appendix 1.

When the analysis is extrapolated to larger sized flocks economies of scale are evident; as the flock size increases the NPV and BCR increase,

Table 7.

Table 7. NPV and BCR at different flock sizes

		Without a weighing crate		With a weighing crate	
Number of mated ewes		Lower priced products	Higher priced products	Lower priced products	Higher priced products
2000	NPV	$22 314	$23 736	$13 814	$25 155
	BCR	22	32.8	2.3	3.8
	Pay-back (yrs.)	1	1	4	1
3500	NPV	$40 560	$60 290	$32 000	$51 950
	BCR	39	58	4.8	7.5
	Pay-back (yrs.)	1	1	2	1
5000	NPV	$58 952	$89 290	$50 450	$78 943
	BCR	57	84	7.3	11.3
	Pay-back (yrs.)	1	1	2	1

Conclusion and discussion

The benefits of the automed® appear simple, including a correct and precise dosage of animal health product related to bodyweight and improvement in effectiveness of the animal health treatment. Given these benefits it is a technology many sheep producers will be interested in testing on their own properties.

This analysis assumes that the automed® system is an add-on to a system already using several technologies, namely electronic ear tags, an EID reader and sheep handling equipment with capacity to weigh the animals. Therefore, the additional cost for the applicator and subscription is a small investment to achieve financial gains from savings in consumption of animal health products. The additional advantages of recording the data and using it for decision making for productivity and animal welfare benefits were not valued.

For farmers without these technologies, the minimum piece of equipment required to use the automed® system is a weighing crate and indicator with the capacity to talk to the automed® device. The minimum cost for this equipment is estimated to be $8500. This capital investment reduces the NPV and BCR, although it remains a positive investment, especially when using higher value products and with larger flock sizes.

Correct application of drench, vaccine and backline has the potential to improve productivity and reduce the risks associated with resistance to animal health products.

The value of these additional benefits is very difficult to assess, but it adds to the already attractive proposition of the automed® system. Further, there is a benefit in having a complete record of animal health treatments for on-farm inventory audits, or if selling to an abattoir or feedlot.

There were difficulties experienced with the introduction of the new equipment. These included hardware problems as well as connectivity problems. Access to parts in a timely manner and after sales technical support is vital with the introduction of any new electronic equipment.

In summary, even though the NPV, BCR and payback period on the automed® look very favourable, it needs to be considered in the context that purchasing an automed® is 'value adding' a previous purchase of sheep handling equipment. Therefore, purchasing the automed® system can't be considered as a standalone investment within the sheep enterprise. This technology has financial benefits for most situations, larger flock sizes have more to gain, especially if the infrastructure for weighing animals is already available.

References

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Appendix 1: Details for NPV calculations

Table 8 Details for NPV calculations

	Initial investment		Annual Cost	Annual Benefit[10]
1. Lower priced products	Automed® device	$1420	$624	$2420
2. Higher priced products	Automed® device	$1420	$624	$3537
3. Lower priced products with weighing crate	Automed® device Weighing crate	$1420 $8500	$624	$2420
4. Higher priced products with weighing crate	Automed® device Weighing crate	$1420 $8500	$624	$3537

[10] Annual benefit for the first year, which is adjusted for inflation at 2% thereafter for the lifetime of the project.