

Impact Assessment: Lifetime Ewe Management

Executive Summary

The Lifetime Ewe Management (LTEM) training program has been delivered to over 4,800 woolgrowers, who are responsible for managing 14.6 million ewes, since 2006¹. Pre and post program completion surveys have been completed since the program commenced and the data collected on these surveys is used for the purpose of continuously improving the course and its adaptability to the ongoing challenges that woolgrowers encounter throughout time. The LTEM training program is designed to educate and empower woolgrowers with essential knowledge and skills to improve the lifetime performance and productivity of their flock. This impact assessment aimed to evaluate the effectiveness and outcomes of the LTEM training program, identify key areas of improvement, and assess its overall impact on the participating woolgrowers and the sheep industry.

Introduction

The Lifetime Ewe Management (LTEM) training program was developed by the AWI-funded LifetimeWool project and Rural Industries Skill Training Inc. (RIST) and commenced in Victoria in 2005/06 (Thompson, 2022). The LTEM training program is based on small groups of woolgrowers that meet 6 times per year with a trained facilitator. During these sessions, each group visits each participating farm and learn skills in condition scoring, pasture assessment and best practice ewe and lamb management to increase reproduction efficiency and wool production, mainly through reducing ewe and lamb mortality. The main objectives of LTEM training program are therefore to:

1. Improve woolgrowers' understanding of the impact of ewe condition and nutrition on ewe and progeny performance.
2. Develop woolgrowers' skills and confidence to adopt LifetimeWool management guidelines.
3. Demonstrate on participating properties with their sheep that the guidelines developed by LifetimeWool for the management of ewes and their progeny are practical and profitable.

The first evaluation of 170 of the 300 woolgrowers that graduated between 2008 and 2010 after participating in LTEM for two years, indicated an average improvement in whole-farm stocking rate of 14% and lamb marking rate of 11 to 13% depending on enterprise type, and a decrease in annual ewe mortality rates by almost 50% (Trompf et al. 2011). It is important to note that whilst these woolgrowers were almost entirely specialist sheep woolgrowers in the high rainfall zone in Victoria, it was proposed that LTEM provided a blueprint for future extension programs striving to achieve widespread practice change in the sheep industry (Thompson, 2022). Since then, AWI funding has increased participation in LTEM throughout southern Australia to almost 5,000 woolgrowers. Subsequently, the evaluation of the results obtained by the participants who graduated between 2008 and 2014 showed that the impact from their participation in LTEM had been consistent. A further analysis conducted in 2019 by Thompson (2019), which evaluated the graduates between 2016 and 2018 suggested that their participation in the LTEM program had a positive overall impact on the participants' attitudes, skills, and adoption of management practices. This assessment is based on the results presented on the project report conducted by Andrew Thompson, published in 2022.

Methodology

The impact assessment employed a mixed-methods approach, combining quantitative data analysis and qualitative feedback from program participants. Data was collected through pre- and post-program surveys, on-farm assessments, interviews, and focus group discussions. The assessment considered the results obtained from the evaluation of different groups of participants and considered the average characteristics of the participants' flocks to estimate the economic impact of the LTEM training program on the average participant.

¹ Thompson, 2022

Program logic

Overall, the LTEM training program focuses on improving the following:

- Nutrition and feeding: LTEM emphasises optimal nutrition throughout different stages of an ewe's life, including pre-lambing, lactation, and maintenance periods. Optimised feeding strategies, balanced rations, and pasture management techniques are employed to ensure adequate nutrition for optimal performance.
- Genetics and breeding: LTEM complements genetics extension and progress and promotes the selection of genetically superior ewes with desirable traits, such as fertility, mothering ability, and resistance to diseases. Strategic breeding programs are implemented to improve the overall genetics of the flock.
- Reproduction and breeding management: LTEM focuses on maximising reproductive efficiency by implementing effective joining programs.
- Health and welfare: LTEM prioritises proactive animal health management, including vaccinations, parasite control, and disease prevention. Regular monitoring and prompt treatment of health issues help maintain the wellbeing of the flock.
- Flock monitoring and recording: LTEM encourages the collection and analysis of comprehensive data on individual ewes and their progeny. This data-driven approach enables informed decision-making, identification of high-performing animals, and continuous improvement of flock management practices.

The benefits of implementing LTEM in a sheep enterprise include overall improved reproductive performance, resulting in higher lambing percentages and increased flock size; increased wool cut, due to optimised nutrition for the ewes, improved stocking rate and increased secondary follicle set down in utero for the lambs; enhanced lamb growth rates and weaning weights, leading to improved market outcomes and profitability; increased longevity of ewes, reducing replacement rates and associated costs or enhancing the selection pressure able to be applied the replacement ewes; better flock health and reduced reliance on medical interventions, resulting in improved animal welfare and reduced expenses; and enhanced resilience to environmental and market challenges through improved flock management and adaptation strategies.

Table 1: Program logic

Key Program Activities	Program Outputs	Outcomes	Impacts
Program commences, formation of small group of participants	Peer to peer learning	Analysis of the collected data to gauge the program's impact and improve future courses	Improved course drives higher satisfaction and participation rates
LTEM entry survey	Detailed data collection pre & post program	Gaining skills to improve on-farm performance	Overall increased profits for participants
6 sessions completed on each of the participants' farm	Participants adopting the necessary skills to improve farm productivity	Improved productivity metrics:	
LTEM exit survey	Introduction to other on-farm courses	1. Improved ewe mortality rates	
LTEM post -course review		2. Improved stocking rate	
		3. Improved lamb-marking rate	

Key Findings

Improved knowledge and skills

Participants demonstrated a significant increase in their knowledge and understanding of ewe management practices after completing the LTEM training program. They acquired practical skills in areas such as ewe nutrition, reproduction management, lamb survival, and health management.

Enhanced productivity

Woolgrowers who implemented the knowledge and skills gained from the LTEM program reported improved ewe productivity and performance. This resulted in higher lambing rates, increased lamb survival rates, and improved flock health.

Cost savings

Participants identified cost savings resulting from better management practices learned in the program. These savings were primarily attributed to reduced disease incidence, improved feed efficiency, optimised ewe condition, and reduced reliance on veterinary interventions.

Adoption of best practices

The LTEM training program effectively promoted the adoption of best practices in ewe management. Participants reported implementing recommended strategies, such as targeted feeding programs, condition scoring, strategic drenching, and reproductive management techniques. These practices contributed to enhanced flock performance and long-term profitability.

Increased confidence and decision-making

Program participants expressed a higher level of confidence in making informed decisions regarding ewe management. The training equipped them with the knowledge and tools to assess flock performance, diagnose issues, and implement appropriate interventions.

The LTEM training program recognizes that the productivity and profitability of a sheep enterprise are influenced by various factors throughout an ewe's life, from birth to culling. It emphasises proactive management strategies that enhance ewe health, reproduction, and longevity, ultimately leading to improved flock performance and financial outcomes.

Survey results

Since the program's commencement in 2005, pre and post surveys have been conducted to measure the program's impact on attitudes, skills, and management practices. Across all the 14 years of graduates, 94% of participants indicated they changed their management practices from participating in the LTEM training program. The most notable changes to management were condition scoring and improving ewe nutrition (61%), managing feed on offer (FOO) and improving pastures (41%), supplementary feeding (24%), scanning for multiples and differential management of twins (23%), reducing mob size at lambing (19%) and changes to farming systems such as length of joining, weaning age and time of shearing (16%) (Thompson, 2022).

Throughout all cohorts of graduates, it is noted that LTEM participants made significant changes in their whole farm stocking rates, lamb marking rate and ewe mortality rate, as summarised in Table 2.

Table 2: Average characteristics of LTEM participants graduated between 2008 and 2021

	Pre-LTEM	Post-LTEM	Change
Farm characteristics			
- Property size (ha)	2410	2616	206
- Area cropped (%)	23.5	24.3	0.8
Ewe numbers			
- Total ewe	2872	3181	309
- Merino ewes x Merino sire	2396	2462	66
- Merino ewes x other	1301	1344	43
- Non-Merino ewes	2041	2324	283
Productivity settings			
- Stocking rate (DSE/ha)	8.4	9.3	0.9
- Marking % - Whole farm	99.6	105.7	6.1
- Marking % - Merino ewes x Merino sire	88.3	93.5	5.2
- Marking % - Merino ewes x other	95	100.5	5.5
- Marking % - Non-Merino ewes	115.5	123.4	7.9
- Annual ewe mortality (%)	3.80	2.80	-1.0

Source: LTEM project report

Table 2 shows the average farm characteristics pre and post LTEM for participants that graduated between 2008 and 2021. Overall, participants saw a 10% increase in their property size and a 3.40% increase in the area cropped, from 23.5% to 24.3%, whilst improving lamb marking rates by 6.11% on average for whole farm, a 5.88% (88.3% to 93.5%) increase for Merino sheep, and 6.83% (115.5% to 123.4%) increase for non-Merino sheep.

Table 3 summarises the improvements seen in stocking rate and ewe mortality as a result of implementing the LTEM principles on-farm. Ewe mortality rates show an average decrease of 24.96%, post-LTEM, going from 3.8% to 2.8% on average; for stocking rate, results averaged an increase of 9.2%, from 8.4 to 9.3 DSE/ha.

Table 3: Summary of changes in stocking rate and ewe mortality for graduates between 2006 and 2021

Enrolment year	Graduation year	Pre-LTEM stocking rate	Post-LTEM stocking rate	Change in stocking rate	% Change in stocking rate	Pre-LTEM ewe mortality	Post-LTEM ewe mortality	Change in Ewe mortality rate	% Change in Ewe mortality rate
2006/07	2008	10.1	11.4	1.4	13.5%	4.2	2.6	-1.7	-39.39%
2007/08	2009	8.2	9.5	1.4	16.8%	5.6	3.1	-2.6	-45.69%
2008/09	2010	9.8	11.1	1.3	13.2%	4.1	2.8	-1.4	-33.61%
2009/10	2011	9.1	9.6	0.6	6.6%	3.4	2.6	-0.8	-23.56%
2010/11	2012	6.0	6.9	0.9	15.5%	3.9	2.9	-1.0	-26.35%
2011/12	2013	8.1	8.6	0.5	6.5%	3.8	2.6	-1.2	-30.84%
2012/13	2014	6.1	6.2	0.1	1.5%	3.3	2.8	-0.5	-15.96%
2013/14	2015	7.4	7.8	0.4	6.0%	3.1	2.3	-0.8	-26.02%
2014/15	2016	5.5	5.8	0.3	5.6%	3.4	2.8	-0.6	-18.57%
2015/16	2017	7.5	8.2	0.7	9.6%	3.6	2.7	-0.9	-25.77%
2016/17	2018	6.1	6.4	0.2	4.0%	3.3	2.9	-0.3	-10.13%
2017/18	2019	6.8	7.0	0.1	1.6%	3.6	3.2	-0.4	-12.34%
2018/19	2020	7.9	8.6	0.8	9.8%	3.9	3.3	-0.6	-15.92%
2019/20	2021	8.4	9.7	1.3	15.5%	4.5	3.3	-1.1	-25.24%
Average		8.4	9.3	0.9	9.2%	3.8	2.8	-1.0	-24.96%

Figures 1, 2 and 3 (below) show a visual representation of lamb marking percentage, ewe mortality and stocking rate for LTEM participants who graduated between 2008 and 2021.

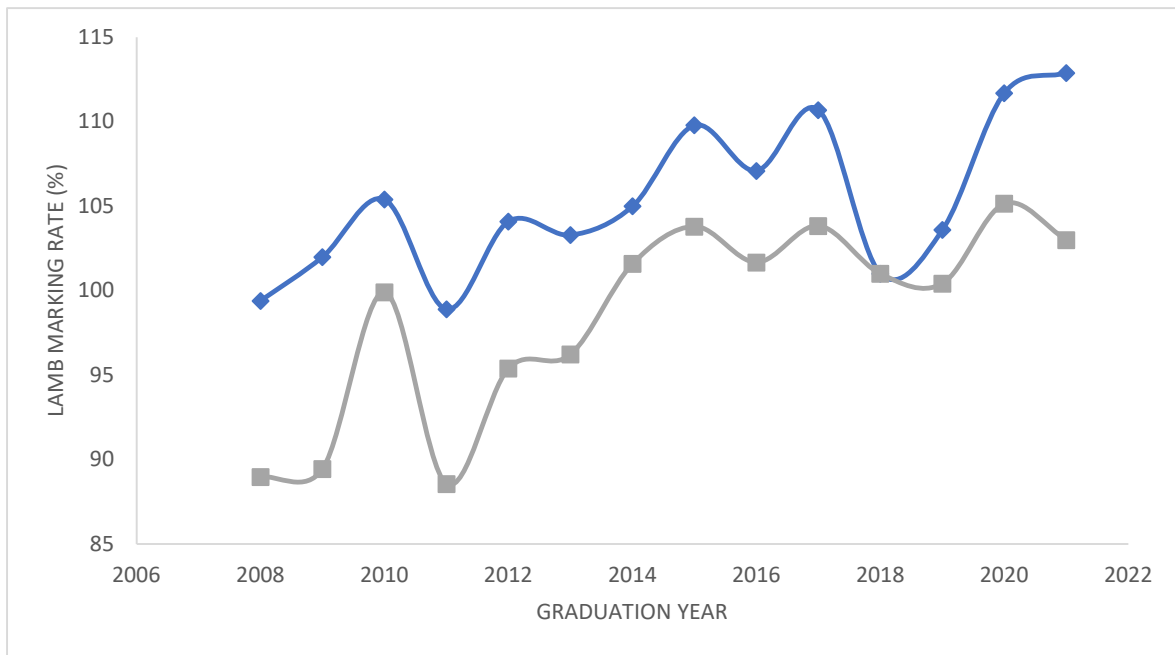


Figure 1: Whole farm lamb marking rates pre-LTEM (grey) and post-LTEM (blue) for participants of LTEM that graduated between 2008 and 2021.

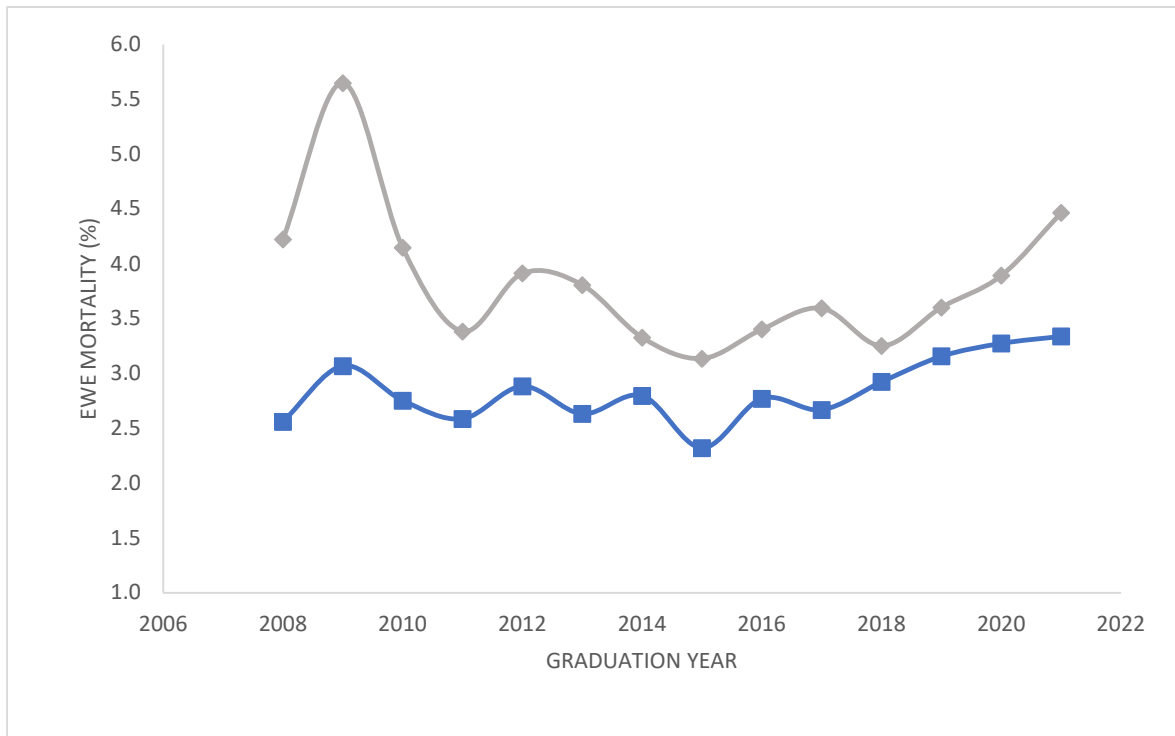


Figure 2: Whole farm ewe mortality rates pre-LTEM (grey) and post-LTEM (blue) for participants of LTEM that graduated between 2008 and 2021.

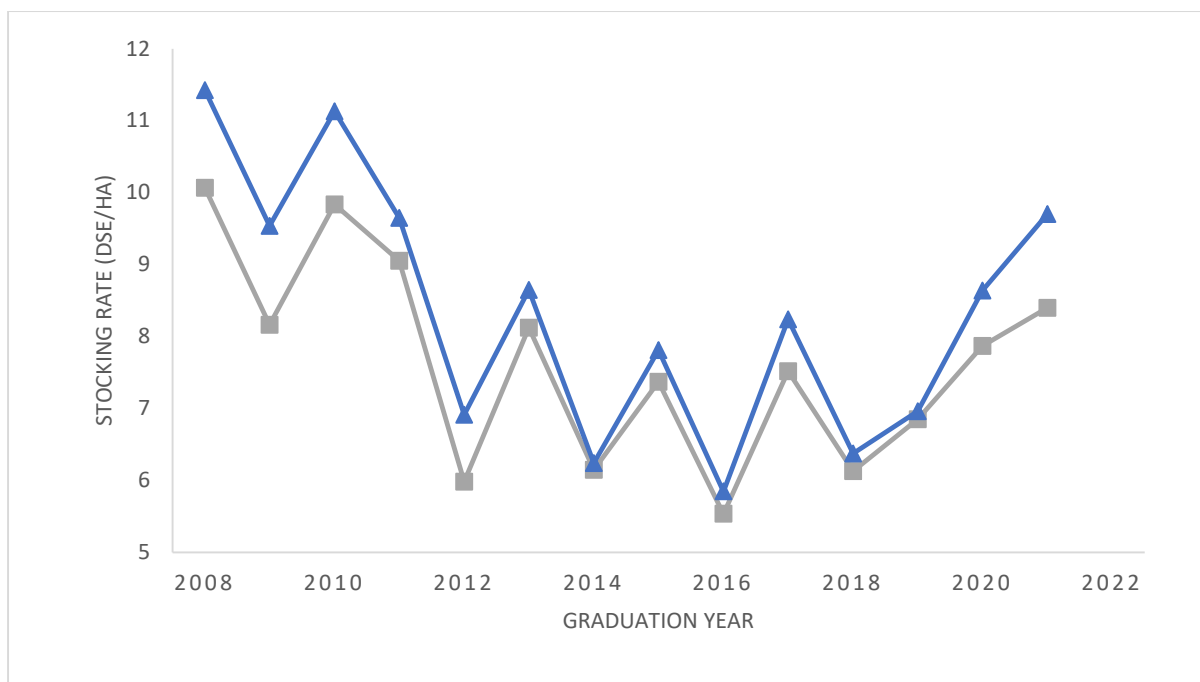


Figure 3: Whole farm stocking rate pre-LTEM (grey) and post-LTEM (blue) for participants of LTEM that graduated between 2008 and 2021.

Whole farm stocking rates have shown different results throughout different groups of LTEM graduates. Over the initial three years LTEM was delivered almost exclusively to specialist woolgrowers in the high rainfall zone and the increases in stocking rate due to participation in LTEM were around 15%. Since then, about 55% of groups have been delivered within the ABARE wheat-sheep zone where stocking rates are lower and there is generally less scope to increase stocking rates (Thompson, 2022).

This combined analysis confirms that LTEM provided the skills and confidence to enable participants to simultaneously increase stocking rates and lamb marking percentage. On average, a 1 DSE/ha increase in stocking rate between pre- and post-LTEM from 8.4 to 9.3 (DSE/ha) was associated with an increase in whole farm lamb marking rate of 6.1% from 99.6 to 105.7 (Thompson, 2022). This association is consistent with the recommendation from Young *et al.* (2011) promoted in LTEM that improving ewe condition score should occur without compromising stocking rate. These results are reflected in Figure 1, 2 & 3.

Economic Analysis

Conducting a Benefit-Cost Ratio (BCR) analysis for the LTEM project is an essential step in evaluating its economic viability and potential impact. The calculations carried out in this evaluation have utilised the average results for participants that graduated between 2008-2021 to estimate the annual benefit that LTEM participants could expect to receive after participating in the program. Results showed that for each \$1 invested by AWI, there has been a \$8.19 return to the woolgrower (Table 4, 5 & 6 show the BCR calculations).

Survey results show that on average, participants expect to present a 0.9 (DSE/ha) increase in their stocking rate, which represents a percentage increase of 10.71%. Increased stocking rates have proven to increase the potential for greater production output, such as more lambs or wool (Thompson 2022). For greater accuracy, this evaluation has considered the costs associated with the increased productivity caused by participating in the LTEM training program. The analysis also suggested that participation in LTEM resulted in participants simultaneously increasing stocking rates and decreasing ewe mortality. On average, a 1 DSE/ha increase in stocking rate between pre- and post-LTEM was associated with a 24.96% decrease in ewe mortality rate, from 3.8% to 2.8% (Thompson, 2022).

To calculate the BCR of the program, this evaluation considered an average participant who enrolled in the LTEM program with the following flock composition: 1,437 Merino ewes, 235 non-Merino ewes, and 1,282 other sheep/lambs, for a total flock size of 2,954.

Counterfactual Approach

The calculations carried out in this evaluation considered the changes in the lamb marking rates, ewe mortality rates and the additional extra wool produced by the flock. For conservativeness, the counterfactual approach applied on this evaluation was:

How many participants will continue to implement the practices learnt on the LTEM training program?

It was estimated that at least 60% of the participants would continue to implement the practices learned during LTEM; by considering this adoption percentage it is possible to estimate the annual net benefit generated by the LTEM training program.

The counterfactual approach may be considered overly conservative as it considers the annual economic impact for 60% of the participants, however, the risk of overstating the actual annual adoption rate on a year-by-year basis is high and potentially misleading as there is a considerable number of factors that are likely to influence the economic impact of the LTEM training program, from climate change: floods and droughts, changes in the Eastern Market Indicator (EMI), sheep per head prices, to the number of participants that will continue to implement the practices learned as a result of their participation in LTEM.

The calculations on Table 4 were made according to the average characteristics for LTEM participants who graduated between 2008 and 2021 (summarised on Table 2).

Table 4: Scenario post-LTEM participation

Scenario post-LTEM		
Improved marking %		
Description		Value
Number of additional Merino lambs		85
Number of additional non-Merino lambs		16
	Total	101
Assumption: 50% are ewe lambs and 50% are wether lambs		
Number of additional Merino ewe lambs		42
Number of additional non-Merino ewe lambs		8
Number of wether lambs (Merino and non-Merino)		50
	Total	101
Extra wool production and sale lambs due to improved lamb marking (1 year)		
Additional wool from Merino ewe lambs (kg)		148
Additional wool from non-Merino ewe lambs (kg)		28
Additional wool from wether lambs (Merino and non-Merino) (kg)		176
Total additional wool produced due to improved marking rate (kg)		352
Value of additional wool produced by lambs due to improved marking rate (\$)		\$4,765.06
Value of additional lambs available for sale due to improved marking rate (\$)		\$6,112.41
Value of additional ewe lambs for replacement breeding stock (\$)		\$6,112.41
Value of extra wool and lambs produced due to improved lamb marking rate		\$16,989.89
Reduced ewe mortality		
Number of additional Merino ewes due to reduced ewe mortality		14
Number of additional non-Merino ewes due to reduced ewe mortality		2
Additional wool produced by ewes due to reduced ewe mortality (kg)		58.52
Value of additional wool produced due to reduced ewe mortality (\$)		\$791.19
Additional benefits due to reduced ewe mortality (1 year period)		\$791.19
Improved wool production		
Assumption: At least 60% of the flock to produce 0.2 extra kilograms of wool per year due to improved practices		

Increase in wool production total flock (kg)		354.48
Value of extra wool whole flock (\$)		\$4,792.57
Total additional benefits for an LTEM participant (1 year period)		\$22,573.65

Changes to flock composition

With a flock composition of 1,437 Merino ewes, 235 non-Merino ewes and 1,282 other sheep/lambs, the flock composition of the woolgrower considered in this evaluation would expect to have 85 additional Merino lambs and 16 non-Merino lambs as a result of the improved marking rate; 14 extra Merino ewes and 2 extra non-Merino ewes due to the reduced ewe mortality rate. It was assumed that half of the additional lambs would be ewe lambs and the other half would be wether lambs.

Extra wool production

For the sake of the calculations, it was assumed that the wether lambs would be shorn once and then sold. The amount of wool produced by a sheep in a year can vary depending on factors such as breed, genetics, nutrition, management practices, and environmental conditions. For conservativeness, this evaluation considered that the wool cut per head was approximately 3.5 kilos of wool per year². Taking this into consideration, it was estimated that extra wool produced due the improved lamb marking rate was 352 kilograms, and the extra wool produced due to the reduced ewe mortality rate was 58.52 kilograms, for a total of 410.97 additional kilograms of wool produced by the flock per year. The value of this additional wool was estimated to be \$5,526.25, which was calculated using the average EMI for the 2012-2023 period, \$13.52.³

Value of additional ewes and lambs

It was estimated that the value of the additional 50 wether lambs available for sale was \$6,112.41 (\$121.40 per head⁴). The additional ewe lambs available for replacement breeding stock were assigned a conservative per head value equal to that of Merino lambs, \$121.40 per head⁵, for a total of \$6,112.41.⁶

Improved wool production for the whole flock

It is estimated that LTEM participants will note an increase of 0.2 kilograms in the wool cut per head due to the improved practices implemented by the woolgrower. For conservativeness and inconsideration of the external factors that might influence the flock's performance, it was estimated that at least 60% of the total flock would produce at least 0.2 additional kilograms of wool per year which means, that the average woolgrower with a flock composition similar to the one considered on this evaluation, would expect an extra 354.48 kilograms of wool produced by their flock per year, with an estimated value of \$4,792.57.⁷

Additional costs for the woolgrower

For increased accuracy, this evaluation included the additional costs that a woolgrower would incur due to their increased farm profitability caused by their participation in the LTEM program, it was estimated that the average LTEM participant would incur additional shearing and crutching costs (\$1,392.59), health costs (\$1,693.64) and wool and livestock selling costs (\$618.54), as shown in Table 5. The total additional costs for the example carried

² <https://www.wool.com/market-intelligence/wool-production-forecasts/australian-wool-production-forecast-report-sep-2022>

³ AWEX Eastern Market Indicator & Micron Price Guide. <http://harvest.woolinnovation.com.au/harvest/prices/report>

⁴ MLA national Merino lamb trade report. <https://www.mla.com.au/prices-markets/sheep/merinolamb/>

⁵ MLA national Merino lamb trade report. <https://www.mla.com.au/prices-markets/sheep/merinolamb/>

⁶ Merino lamb prices were considered due to the lack of historic data related to ewes per head prices.

⁷ AWEX Eastern Market Indicator & Micron Price Guide. <http://harvest.woolinnovation.com.au/harvest/prices/report>

out in this evaluation total \$3,304.76 and were calculated using the *Farm Enterprises Budget series – 2022*, published by NSW Department of Primary Industries.⁸

Additional feeding and infrastructure costs have not been included in this calculation as a focus of LTEM is to assist the participants in better utilising the resources they already have, however this does not apply to extra per head costs, which have been accounted in this calculation, as seen in Table 5.

Table 5: Additional costs for the woolgrower

Costs associated to increased productivity		
Shearing costs	Per head	Total
Number of extra sheep		117
Shearing costs for extra sheep (\$)	\$9.10	\$1,068.51
Crutching (\$)	\$1.75	\$206.66
Total		\$1,392.59
Health costs		
Description	Per head	Total
Vaccinations (\$)	\$6.32	\$742.09
Drenching (\$)	\$3.51	\$412.14
Fly control/disease prevention (2 applications) (\$)	\$2.84	\$333.47
Pregnancy scanning (ewes) (\$)	\$0.80	\$13.38
Lice control (\$)	\$1.64	\$192.57
Total		\$1,693.64
Wool and livestock selling costs		Total
AWI levy (% of gross income)	1.50%	\$83.34
Wool commission, warehouse, testing, cartage and packs (per bale x 2 extra bales) (\$)	\$67.13	\$134.26
Livestock transportation & cartage (per head) (\$)	\$2.50	\$125.87
Commission on sheep sales (% of gross income) (\$)	4.50%	\$275.06
Total		\$618.54
Total extra costs per participant		\$3,704.76
Net benefit		\$18,868.89

The cost of conducting the LTEM training program is estimated to be \$411,513 per year⁹ (300 participants) and it was considered when calculating the benefit cost ratio, as shown in Table 6.

Total net benefit for all participants

To calculate the benefit cost ratio, the net benefits received by the average LTEM participant (\$18,868.89) were multiplied by the number of participants per year who were estimated to implement the practices learned during LTEM. Considering that at least 60% of the participants would continue to implement the practices learned during the program and continue to see the benefits, it was estimated that the net annual benefit generated by the LTEM training program is \$3,396,400.27. Considering that the average cost of running the LTEM program per year (300 participants) is approximately \$414,847.00, it was estimated that the average BCR generated by the program per year is 8.19 which means that for every \$1 invested there was a \$8.19 return of investment to the woolgrowers.

⁸ Farm Enterprise Budget Series, 2022. https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0008/1297682/Merino-Ewes-1000-Ha-18-micron.pdf

⁹ LTEM 8 budget breakdown taken for reference.

Table 6: Benefit-Cost Ratio calculations

BCR calculations		
Average benefit per participant post LTEM		\$22,573.7
Average extra costs incurred per participant post LTEM		\$3,704.76
Net benefit per participant post LTEM		\$18,868.89
Average number of participants per year		300
Counterfactual: How many participants will implement the practices learned during LTEM?	At least 60% =	180
Net benefit generated by LTEM for participants per year	60% of the participants	\$3,396,400.27
Program cost (per 900 participants, 3 years)		\$1,244,541.00
Average cost of LTEM program (per year)		\$414,847.00
	BCR	\$8.19

Sensitivity Analysis

The purpose of sensitivity analysis is to understand how changes in certain variables or parameters in an evaluation affect the estimated results. The number of participants who will continue to implement the practices learned during their participation in LTEM is a variable that will influence the project’s BCR – by changing the percentage of participants that are likely to continue to implement the practices learned, the BCR varies from 4.09 to \$12.28.

Sensitivity analysis		
% of participants who will continue to implement practices learned during LTEM		
	Net annual benefit generated by LTEM	BCR
Lower bound = 30%	\$2,830,333.56	\$4.09
60%	\$3,396,400.27	\$8.19
Upper bound = 90%	\$3,962,466.98	\$12.28

Conclusion

The impact assessment of the Lifetime Ewe Management Training Program demonstrates its positive influence on woolgrowers’ knowledge, skills, and practices. The program has resulted in improved ewe productivity, cost savings, adoption of best practices, and increased confidence among participants. The LTEM program should undergo periodic evaluation and refinement to align with emerging industry trends and challenges. Regular updates and incorporation of the latest research findings will ensure the program's ongoing relevance and effectiveness.

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Websites

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Australian Wool Innovation – wool.com/market-intelligence

NSW Department of Primary Industries

MLA Statistics – Meat & Livestock Australia