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Prepared by: John Paul Collins
Department of Primary Industries and Regional Development

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Meat and Livestock Australia Limited
Locked Bag 1961
NORTH SYDNEY NSW 2059

DPIRD Labour saving and flock management technologies

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Abstract

Access to on-farm labour is a constraint to the growth of sheep enterprises in Western Australia. Investment into labour saving and flock management technology is one way of running more sheep per labour unit. However, many producers need information on how a new tool or system can be integrated into their farm businesses. We worked with a pilot group of producers to test a range of devices and systems and document their practical insights and experiences. Further, we employed an economist to do a benefit – cost analysis. Investment into technology was profitable in the majority of cases. This work will have ongoing benefit to industry as sheep producers seek ongoing practical and impartial information before investing in technology. Future investment into technology should focus on integration of information from multiple sources such as sensors into a single platform which can be used to improve decision making.

Executive summary

On-farm labour has been identified as a key constraint in the expansion of the sheep flock within WA. In particular, many producers in the sheep – cereal zone have expanded their cropping enterprises and sheep tend to have a lower priority in the labour management decisions on the farm. The adoption of labour saving and flock management technology is a practical approach to offsetting the lack of access to good quality labour. Further, using technology is a useful attractant to involving younger sheep producers in a sheep enterprise and stimulating their interest.

We achieved the following:

- We worked with a group of 12 sheep producers (new on-farm technology pilot group) to implement specific new technologies into their sheep enterprise. This created a value proposition for the wider adoption of technology into the sheep enterprise
- We measured and documented the insights gained from the pilot group and what was required for the adaptation of the technologies into their farm system. A benefit-cost analysis was used to determine the value of the investment and payback period
- The learnings from the above were communicated to the wider sheep industry through case studies, field days, via media and the pilot farmers becoming 'farmer champions' promoting labour-saving technology
- We demonstrated key technologies to producers at the Katanning Research Facility. This allowed producers to see first-hand how the devices and systems were integrated, but also allowed for more thorough testing under research conditions where more detailed measurements were routine. Going forward, technology will be used through many of the industry – partnered trials at the Katanning Research Facility, such as the Yardstick sire evaluation trial

Results from the benefit – cost analyses performed as part of the project revealed that investment into labour – saving and flock management technology was mostly profitable. The benefit – cost ratio ranged from 25.8 ($25.80 return for every $1 invested) to <1 (less than $1 returned for every $1 invested and upfront costs weren't recovered in the 10 year analysis period). The most profitable investment into technology was using an electronic identification enabled weight-based product applicator for drenching, vaccinating and backlining. It was found that the two case studies on sheep handlers revealed that on a financial basis, they were not a profitable investment in terms of saving labour. However, there were substantial tangiable benefits that were difficult to place a value on, including reduction in injury and fatigue, creating efficiency through combining husbandry tasks and improved animal welfare. The majority of the case studies showed a positive return. Investment into remote cameras resulted in a benefit – cost ratio of 5.3. The case studies on electronic identification produced a benefit – cost ratio ranging from 6 – 10.

Electronic identification as a technology solution was a key focus for our project. A survey of WA sheep producers showed an adoption rate of 4% from the 2011 and 2014 surveys. Preliminary results from a 2018 survey indicated that the adoption only marginall increased to 5%. We expect this to increase in the next 5 years as many WA producers are currently capitalising on high wool prices to invest in infrastructure renewal such as shearing sheds and sheepyards. Once this capital investment is completed, many producers will be looking to technology solutions including electronic identification and sheep handling equipment. This activity has played a significant role in providing practical and financial information to many sheep producers interested in expanding their sheep enterprise and running more sheep per labour unit on their properties.

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1 Background

1.1 Why the project was undertaken

On-farm labour has been identified as a key constraint in the expansion of the sheep flock within WA. Many farm businesses (particularly in the cereal – sheep zone) have focused on cropping and sheep have a lower priority in the labour management decisions on farm. Many farm businesses focused on cropping have invested in the latest technology in their cropping enterprise, such as autosteer and variable rate control and should be open to the idea of purchasing new technology for their sheep enterprise, providing sufficient data is available to support their decision.

Previous research activities have focused on specific technology solutions that could help improve management within the sheep industry. Some examples include the feasibility of implementing an electronic National Vendor Declaration system. There is already a range of devices and systems on the market which can help with labour management in a sheep enterprise. However, information is required on the integration of these into a sheep enterprise to assist producers to make better decisions on sheep management.

1.2 Significance to industry

We formed a pilot group of stud and commercial sheep producers who run a mixed-enterprise business and are passionate about the expansion of the WA sheep industry. Their role was to provide feedback on the various technologies available to improve efficiency of sheep management and to participate in an objective assessment of the costs and benefits of various technologies to sheep production. The pilot group want to see the WA sheep industry grow because they have made a big investment in their own genetics, infrastructure and management tools and want to grow their own businesses and see their client's businesses grow. The 12 producers in the pilot group have already made some investment into technology in their own sheep enterprises and are also interested in testing additional systems and devices to improve labour efficiency. The pilot group held 8 meetings starting from their first meeting in February 2016 and ending with their final meeting in June 2018 (Fig. 1).

Fig. 1 New on-farm technology pilot group at their first meeting in February 2016.

1.3 Overarching aims

The overarching aim of this activity was to work with the new on-farm technology pilot group on the evaluation and adoption of technology that could improve labour efficiency, traceability and breeding in the WA sheep industry. The integration of the technology is an important aspect to provide commercial relevance to any producer considering investing in technology. Further, an important component of growing value in the WA sheep industry is using technology to provide an attraction to younger producers to join and remain in the sheep industry. Younger producers are excited about the technology they have been exposed to in school, university and in the cropping industry and it is a good opportunity to show how technology can be applied to the sheep industry.

2 Project objectives

2.1 Key performance indicators and outcomes

- Develop a value proposition, including a cost-benefit analysis, for the integration of at least five existing and emerging technologies into a sheep enterprise to improve labour efficiency
- Measurement of the change in work practices for each member of the pilot group of producers over the period of the project as an indicator of the level of adoption
- Incorporate specific questions on the adoption of new technologies into a survey of sheep producers scheduled as part of the overall SIBI project.

2.2 Specific objectives

- To work with a group of at least 6 farmers (initial Pilot Group) implementing specific new technologies within their sheep enterprise. The devices and systems being implemented and integrated into the sheep enterprises will allow the farmers to be better informed about the value to their business.
- Measures and documents the insights gained, and processes used during the on-farm trial and adaptation of the technologies into the system. A benefit-cost analysis will be used to determine the value of the investment and payback period.
- The learnings from the above will then be communicated to the wider sheep industry through case studies, field days, via media and the pilot farmers becoming ‘farmer champions’ promoting labour-saving technology
- Demonstrate key technologies to producers at the Katanning Research Facility. This will allow producers to see first-hand how the devices and systems have been integrated, but will also allow for more thorough testing under research conditions where more detailed measurements are routine. Survey’s of producers attending field days at the Katanning Research Facility will be conducted at the end of each event to gauge their interest and intention to adopt one or more bits of new technology.

3 Methodology

3.1 Pilot group

In 2015, we sent out an expression of interest via a media release inviting tech-savvy sheep producers to contact us who were passionate about the sheep industry and had ideas on making improvements to labour efficiency in running a sheep enterprise. We also approached several young sheep producers who had a passion for the sheep industry and invited them to be involved based on the skills they could bring to the group.

We sought to demonstrate how a specific technology infusion into a sheep enterprise could be made attractive to other sheep producers. To achieve this we used a cost – benefit analysis approach that was incorporated into case studies. We contracted two economists to visit the producer testing a product, interview the producer, put together an analysis of the costs, benefits and then determine key metrics including the benefit-cost ratio and payback period over a 10 year investment term. This data was written up into a 5 – page technical report and made available on our webpage (www.agric.wa.gov.au/sheeptech).

3.2 Communication of outcomes of case studies

We contracted freelance journalists to interview the producer and use the information in the technical report to write an article that would be suitable for inclusion in the rural press and be used as the basis for a radio interview. These articles were offered to rural media outlets to run as stories.

A filmmaker that specializes in short Youtube films (3 – 4 minutes) was contracted to film the sheep producer and the economist and put together a short video suitable for Youtube on each of the labour – saving technologies analysed in the case studies.

We participated in numerous field days across WA where we incorporated technology into a static display for producers to come and view. Additionally, we ran the short Youtube films on a TV at the field day for interested people to view.

We selected 5 of the most interesting technology solutions that would have the biggest impact on the WA sheep industry in terms of labour efficiency, breeding and traceability. These were presented at the Lambex 2018 conference (Appendix 1).

3.3 Extension and adoption strategy

We developed a plan for the broader extension and adoption of technology in the sheep industry beyond the SIBI project. (Appendix 2). The plan included specific activities beyond the new on-farm technology pilot group for the broader adoption of labour saving technology in the WA sheep industry. The plan used results from the WA sheep producers survey and proposed some adoption targets to strive for.

3.4 Demonstration of technology at the Katanning Research Facility

Our team met with the staff at the Katanning Research Facility (KRF) on several occasions to identify what technology was already being used and what could further be implemented at the KRF. This information was summarised in a report on existing technology used at the KRF and a scoping report on opportunities for using new technology in the sheep research at the KRF (available on request).

4 Results

4.1 Develop a value proposition

4.1.1 Case studies incorporating cost – benefit analysis

We have completed 13 case studies in partnership with the SIBI new on-farm technology pilot group (Table 1). Our pilot group consisted of 12 members including 11 sheep producers and 1 sheep consultant.

A further two will be completed by October 2018. All of these case studies are available at www.agric.wa.gov.au/sheeptech.

Table 1. Benefit – cost ratio and payback period results from 15 benefit – cost analyses on a range of technology incorporated into individual sheep enterprises.

No.	Case study title	Host farmer	Benefit-cost ratio	Payback period (years)
1	Remote cameras on tanks and troughs save time, money and sanity	Chris Patmore	5.3	2
2	Laneways lead to labour efficiency	Andrew Slade	2.6	7
3	Automated jetting race increases flystrike prevention and decreases labour costs	Andrew Slade	4.1	2
4	Sheep handler efficiencies affected by flock size	Scott Newbey	0.6	>10
5	Using Pedigree Matchmaker for ewes and lambs cuts labour costs	Thomas Pengilly	3.2	3
6	Electronic identification improves data accuracy and flock productivity	Clayton South	6.6	5
7	Data management software and electronic identification saves labour and improves stud data recording	Peter Walker	11	<1
8	Large flock electronic identification leads to a 10-fold return on investment	Wayne Pech	10.6	5
9	Individual weight-based dosing with drench, vaccine and backline makes fast savings	Scott Newbey	25.8	1
10	Sheep handler use leads to less product waste, better operator health	Emily Stretch	<1[A]	>10
11	Investment in EID and ASBVS by a poll merino stud requires a long term outlook	Jessica Horstman	-1.2[B]	>10
12	An on-farm WiFi network provides the connectivity backbone for further investment in technology	Darrin Lee	7.9	1
13	Proximity sensors can be used to determine maternal pedigree and rank ewes on profitability	Clayton South	-6.6	>10
14	Using a livestock recording app brings efficiency into a sheep enterprise[C]	Tim Stevenson	-	-
15	Investing in a new set of sheep yards pays off[D]	James Campbell	-	-

A. A 'cost per head' approach was used in this analysis rather than a benefit-cost ratio. The cost per head in labour costs without using the handler was $0.63/head. The cost per head with using the sheep handler reduced to $0.42.
B. A sensitivity analysis showed an extra $35 in value per ram was required or an extra 7 ram sales per year to break even on the investment into electronic identification and providing Australian Sheep Breeding Values (ASBVs) on sale rams
C. This case study will be completed in September - October 2018
D. This case study will be completed in September - October 2018

The benefit-cost ratio ranged from – 6.6 to +25.8. Similarly, the payback period ranged from greater than 10 years to less than 1 year (Table 1). Investments into electronic identification tended to produce positive returns ranging from 6 – 10. However, investments into sheep handlers tended to have a payback period longer than 10 years and a benefit-cost ratio of less than 1. The highest benefit-cost ratio (25.8) was achieved where there were substantial savings in expensive drench, backline and vaccine associated with not overdosing sheep and ensuring that each sheep was allocated the appropriate quantity of product for its bodyweight.

Where the benefit–cost ratio was negative, it was generally where the business had invested in technology that was new to their business and the benefits would take a long time to realise, due to having to wait for genetic and generational gain to take effect.

4.1.2 Video on 5 technologies that can streamline sheep management

We selected five key technology infustions from Table 1 that could improve sheep management where an investment was made according to a plan appropriate for an individual business. These were published as a paper (Appendix 1) and were compiled into a video which was presented at the Lambex 2018 conference (available at www.agric.wa.gov.au/sheeptech). Also, all of the technology infusions feature as stand alone videos on our website along with the compiled video.

4.2 Change of work practices by pilot group

We held 8 meetings with the new on – farm technology pilot group. Each meeting was held at a different member's farm. At each of these meetings our economist presented the latest case studies and feedback from the pilot group members was incorporated into the written paper. Further, guest speakers at the meetings presented on a range of topics including electronic national vendor declaration, pastures from space, proximity sensors to determine maternal pedigree and livestock tracking using GPS. There was also time allocated to view the sheep handling equipment and other technology in place where the meeting was held.

Members of the pilot group participated in the case studies and provided feedback on a range of technology infusions that could improve labour efficiency, breeding and traceability within their own sheep enterprise. Whilst many had already dabbled in some technology, many of the pilot group members invested further in technology solutions for their sheep enterprise as a result of participating in the pilot group and the overall Sheep Industry Business Innovation (SIBI) project (Table 2).

Many of the pilot group members made investments into a range of technology solutions including sheep handlers, electronic identification equipment or infrastructure (e.g. new sheepyards). Further, many reported that they will continue to invest in labour – saving technology as a result of their participation in the SIBI project.

Table 2. Technology investments by the new on-farm technology pilot group prior to joining the group and after joining the group. EID = electronic identification.

Pilot group member	Technology already used by the business	New investments made as a result of joining the pilot group
Member 1	Pedigree Matchmaker, EID eartags, EID software, hecton crutching cradle	Prattley autodrafter, V-marker for lamb marking
Member 2	EID eartags, EID software	Clipex sheephandler
Member 3	EID eartags, EID software, Pedigree Matchmaker, ASBVs	-
Member 4	Autodrafter, EID eartags, fleece weighing using EID,	DNA testing using tissue sampling units (TSUs)
Member 5	-	EID eartags, EID software, sheep handler
Member 6	Prattley autodrafter, Hecton crutching cradle, v-machine sheep handler, Electrodip	-
Member 7	Sheep handler	EID eartags, ASBVs
Member 8	Sheep handler, EID eartags, EID software, lamb weighing box	Fleece weighing using EID, proximity sensors
Member 9	EID eartags, sheep handler, hecton crutching cradle	-
Member 10	Tank level sensor	EID eartags, EID software, sheep handler
Member 11	-	Sheep handler, new sheep yards,
Member 12	Sheep handler, ASBVs	-
Member 13	EID eartags, EID reader, fleece weighing using EID, autodrafter	Sheep feedlot,

At the final meeting with the new on-farm technology pilot group, we invited an evaluation specialist to run an informal session with the group to focus on the main outcomes of the SIBI project for their own businesses as well as the wider sheep industry. The session focused on the impact of the new on-farm technology pilot group on individual's own sheep enterprises (Table 3) as well as the impact on the broader sheep industry (Table 4).

Table 3. Brainstorm session of the impact of being involved in the pilot group on individuals

Brainstorm session of the impact of being involved in the pilot group on individuals
Meeting like-minded people across different regions
Opening up your mind to what's out there technology wise
Opened up our minds to what we can't get – frustrations
The way that other people are employing the technology (e.g. size of flock, what works)
Gained a better understanding of sheep handling devices, experience, different devices
Can give others an educated response, relevant contacts and become an advisor to others
Interstate trips were really good – principles we could apply
Missed opportunity – advertising videos; extension could go further to promote videos
Technology is 90% here but it's about implementation/extension – seeing it
Interaction with leading sheep researchers

Table 4. Brainstorm session on the broader impact of the SIBI project on the sheep industry.

Brainstorm session on the broader impact of the SIBI project on the sheep industry:
Electronic ear tags – it has raised the profile of EID eartags and pilot group members get asked a lot more questions (more general interest)
With strong sheep/wool prices more producers are looking into technology
Using EID now is a soft entry into adoption of EID (ahead of it being compulsory)
~85 people at Woolorama used EID at the new on-farm technology display at Woolorama. This led to further questions about the technology.
There is a lot of enthusiasm about the role of technology
More people are interested in sheep handlers and asking more questions of the group
Consultants are giving more thought to the role of technology
People value the independent information from DPIRD and the pilot group, rather than just getting information from salespeople

4.3 Sheep producer survey 2018

A survey of WA sheep producers was conducted between April – May 2018 on their current management practices and awareness of new practices. The survey was also done in 2011 and 2014 and some new questions were included in the 2018 survey. A total of 402 fully completed surveys were returned.

Preliminary data showed there was an increase in the percentage of respondents using autodrafters by 10% between 2011 and and 2018 (Fig. 1). There was only a marginal increase in the percentage of

respondents using electronic ear tags (Fig. 1). However, there was a 10% increase in the percentage of respondents considering using electronic ear tags (Fig. 2).

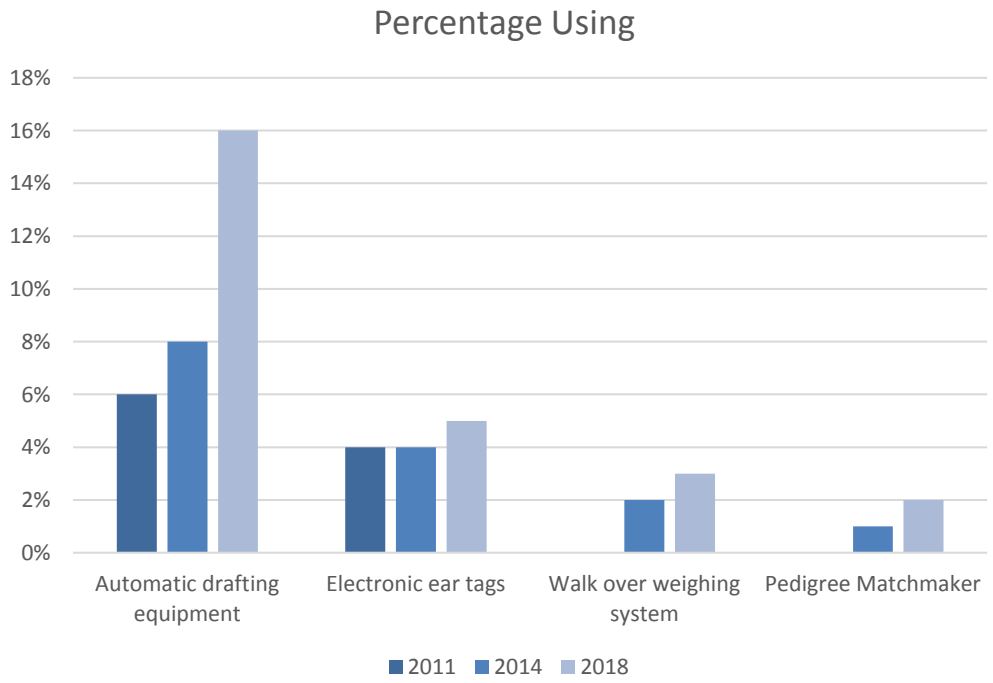

Fig. 2 Proportion of respondents using sheep technology

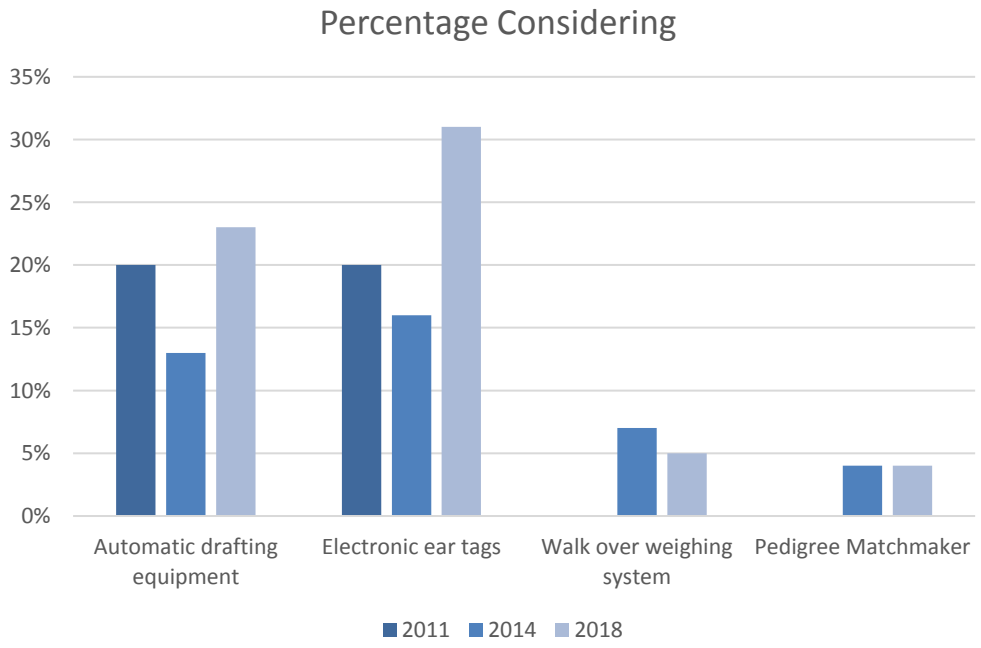

Fig. 3 Proportion of respondents considering using sheep technology

In the 2018 survey, a new question was asked concerning use of additional tools such as a sheep handler. Preliminary data showed that 28% of of respondents used a sheep handler and 26% were considering purchasing one (Table 5).

Table 5. Percentage of respondents considering using or using other labour saving devices (new question in 2018 survey).

Devices	Considering using (%)	Using (%)
Automatic jetting machine	12	20
Sheep handling equipment (e.g. clamp or rollover type)	26	28
Remote water tank level sensor or water point camera and pump controller	16	5
Individual animal data management system such as Sapien, Koolcollect or Practical Systems Stockbook	7	3

Nearly 40% of the respondents indicated they had heard of drones and were interested in using them in their sheep enterprise (Table 6). Proximity sensors to determine maternal pedigree have only just come onto the market in mid 2018 and this was reflected in the 49% of respondents not having heard of them and only 8% had heard of them and were interested in using them (Table 6).

Table 6. Percentage of respondents considering using or using other emerging technologies (new question in 2018 survey).

Devices	Not heard of (%)	Heard of but not interested (%)	Heard of and interested in using (%)
DNA testing for parentage, poll status of flock profile	25	59	16
Unmanned aerial vehicle, also known as a drone	3	59	39
Digital pasture assessment tools such as hand held optical biomass sensor	25	46	28
Proximity sensors to determine maternal pedigree	49	43	8

4.4 Extension and adoption strategy

4.4.1 Specifice activity beyond the pilot group

In January 2017, an extension and adoption strategy was written for increasing the adoption of on – farm technology to improve labour efficiency in the Western Australian (WA) sheep industry (Appendix 2). Specific action beyond the new on-farm technology pilot group was outlined for the broader adoption of labour saving technology in the WA sheep industry (Table 7). These actions were delivered through a suite of activities as outlined below.

Table 7. Specific activity beyond the new on-farm technology pilot group for the broader adoption of labour saving technology in the WA sheep industry. EID = electronic identification.

No.	Activity	What was achieved
1	EID report and workshops	Report on 'Opportunities for individual animal management of sheep in Western Australia' delivered in March 2018. Information presented at the SIBI sheep research open day on March 2018 in Katanning. Report available on DPIRD website and available for further workshops.
2	Demonstrations at the Katanning Research Facility	Labour saving technology presented at SIBI sheep research open days in March 2017 and March 2018. The technology is also used in industry collaborative trials (e.g. Yardstick merino sire evaluation).
3	Case studies	12 case studies delivered on sheep technology webpage (www.agric.wa.gov.au/sheeptech). A further 3 (total 15) will be completed by October 2018.
4	Media	10 articles related to the case studies have been run in the rural press. 11 Youtube videos have been completed featuring the sheep producer and economist discussing each technology infusion (See table 8 for number of Youtube views).
5	Supporting existing extension programs	Case study content and new on-farm pilot group members have been made available to the 'Sheeps Back' extension program.
6	Supporting grower groups	Presentations and demonstrations have been done at the ASheep, Stirlings to Coast and Southern Dirt field days. These field days were attended by 50 – 100 producers at each event.
7	Supporting consultants	Consultants have attended the SIBI sheep research open days and the case study material has been made available to them.
8	Industry study tour	Study tours were run for producers to regional NSW (2016) and regional Victoria (2017). Each producer wrote a report on their return and shared their learnings with their local grower group and neighbours.
9	Field days	Attended 11 field days between 2016 – 2018 and set up a display featuring interactive electronic identification activities, handouts and case study videos playing. Approximately 60 – 80 people attended the display and asked questions at each field day. I also spoke to 1 – 5 people per week from 2016 - 2018 who followed up questions with me after field days.

The remote cameras video has been on Youtube the longest (live since February 2017) and has had more than 1500 views (Table 8). The sheep handler case study hosted by Emily Stretch has been 'live' since May 2018 and has had just over 150 views. The majority of the other films had between 400 – 800 views (Table 8).

Table 8. Number of views on Youtube of each short film outlining key results of each case study

No.	Case study (where a video has been produced)	Host	No. of Youtube views (As of 3/9/18)
1	Remote cameras on tanks and troughs save time, money and sanity	Chris Patmore	1519
2	Laneways lead to labour efficiency	Andrew Slade	529
3	Automated jetting race increases flystrike prevention and decreases labour costs	Andrew Slade	897
4	Using Pedigree Matchmaker for ewes and lambs cuts labour costs	Thomas Pengilly	547
5	Sheep handler efficiencies affected by flock size	Scott Newbey	907
6	Data management software and electronic identification saves labour and improves stud data recording	Peter Walker	219
7	Electronic identification improves data accuracy and flock productivity	Clayton South	327
8	Large flock electronic identification leads to a 10-fold return on investment	Wayne Pech	481
9	Individual weight-based dosing with drench, vaccine and backline makes fast savings	Scott Newbey	198
10	Sheep handler use leads to less product waste, better operator health	Emily Stretch	155
11	A commercial producer using proximity sensors can determine maternal pedigree and improve sheep genetics	Clayton South	Not yet loaded[A]

A. Will be loaded in September 2018 once approvals have been sought

4.4.2 Adoption targets

In the extension and adoption strategy, we set adoption targets that we aimed to achieve by the end of the project. These were ambitious targets, as we didn't achieve them within the timeframe of the SIBI project. For example, in the 2018 sheep producer survey, 16% of respondents reported that they were using automatic drafting equipment but our target was 20% (Fig. 1, Table 9). Similary, 5% reported that they were using electronic eartags but our target was 10% (Fig.1, Table 9). It is expected that through the case studies and ongoing interest generated in technology through this activity there will be ongoing enquiry and interest well beyond the life of the SIBI project and these targets will be attained in future years.

Table 9. Proportion of respondents from a 2011 survey and 2014 survey who use one or more labour-saving devices. Additional data included on targeted adoption rates in 2018 for the labour-saving devices. Note, only the auto-drafter and EID eartags were included in the questions in the 2014 survey. The data from the 2018 survey is only preliminary data.

	2011 survey (%)	2014 survey (%)	2018 survey (%)	2018 adoption target (%)
Electronic weigh crate	53	-	-	75
Crutching cradle	51	-	-	75
Lick feeder	46	-	-	50
Automatic jetting race	17	-	20	50
Sheep handler	17	-	28	50
Auto-drafter	6	8	16	20
EID eartags	4	4	5	10

Sources: Curnow *et al.* 2011; Jones and Curnow, 2015 (2011 and 2014 survey data). Preliminary data from the 2018 survey was supplied by Janet Conte.

4.5 Study tours

During the course of the SIBI project, 3 study tours were planned and executed. The first was a tour of the University of New England SMART farm and the University of Gatton in Queensland in May 2016 by John Paul Collins. The outcomes of the tour were reported back via a written report, a presentation to the new on-farm technology pilot group and a presentation to the Department of Primary Industries and Regional Development staff.

Second, a study tour was planned to attend the 2016 Lambex conference in Albury, NSW and then complete a tour around regional Wagga Wagga visiting leading consultants and sheep producers. The delegates consisted of members of the new on-farm technology pilot group, AgConnect (young farmer division of WA Farmers Federation) and 100% club (industry recognition club for producers that consistently achieve 100% lambing percentage). Each delegate wrote a report and these were compiled into one document. The executive summary is available at Appendix 3.

Third, a study tour was planned to attend the 2017 Sheepvention in Hamilton and to visit leading producers and consultants in the Hamilton region. The delegates consisted of members of the new on-farm technology pilot group (different attendees to the 2016 trip to NSW), AgConnect as well as leading sheep producers who were selected via an expressions of interest process. Each delegate wrote a report and these were compiled into one document. The executive summary is available at Appendix 4.

4.6 Katanning Research Facility

4.6.1 Scoping report

At the commencement of the project, a report was compiled on the existing technology used in the sheep research program at the Katanning Research Facility (KRF). This was based on an interview with a senior technical officer and several technical officers working in sheep research. A scoping report (available on request) was then completed on new technology that could be tested and deployed at the KRF which would make a positive difference to labour efficiency, traceability and improve breeding.

4.6.2 Equipment

As identified in the scoping report, technology solutions were researched and implemented at the KRF. First, we purchased 3 remote cameras for monitoring water troughs and water tanks (Fig. 4). This has made a positive difference to labour efficiency by allowing staff to remotely inspect the supply and quality of stock water in both tanks and troughs from their phone or tablet.

Fig. 4 Remote camera used to monitor a water trough at the Katanning Research Facililty.

Second, we purchased an unmanned aerial vehicle (UAV). We applied for a UAV operator's certificate and controller's certificate through the Civil Aviation and Safety Authority (CASA). This included compiling risk management procedures to ensure a high standard of safety was in place. The UAV was used at the KRF for inspecting sheep in lambing plots and paddocks, inspecting fences and inspecting water points. It will continue to be used for remote observation as needed.

Third, we used existing infrastructure to trial walk-over weighing (WOW) during the summer months. The purpose was to see if we could capture bodyweight of sheep via the passive movement over a weigh platform connected to an indicator and electronic identification reader as the sheep moved between 2 paddocks. We achieved mixed success as it was difficult to reliably capture bodyweights from the whole mob (quite a few of the sheep never presented at the weigh platform) plus when grain is trail fed there is unusable data when there is a stampede over the weight platform. Getting separation between sheep on the weigh platform also proved to be a challenge.

Fourth, we installed two separate sheep handlers in the main yards for physically restraining sheep when measurements were taken or husbandry tasks were being performed. This will allow staff of all strengths to perform tasks such as crutching and reduce the risk of injury by not having to physically tip over and drag heavy sheep.

Fifth, we subscribed to the Landgate 'Pastures from Space' tool which uses satellite data to capture greenness and then convert this to pasture growth rates and feed on offer based on ground-truthing and algorithms. Further, we purchased a handheld optical sensor that measures greenness and we have been working with a leading producer group who are using the sensor to convert the greenness into a feed on offer measurement based on a local calibration. We regularly use the optical sensor at

the KRF with local calibrations to allow the staff to capture real-time feed on offer data and then use this in feed budgeting decisions.

4.6.3 New electronic identification equipment

Electronic eartags and electronic identification (EID) had been used at the KRF for the past 10 years, however the equipment was old. We purchased three new EID stick readers that have advanced functionality including the ability to enter data. Additionally, we purchased three barcode printers for printing barcodes for wool, faecal and blood samples to increase efficiency and reduce error associated with sampling. We also purchased an EID and livestock recording software package for entering and storing data collected from the sheep trials.

4.6.4 Training courses

We conducted three training courses for KRF staff in using new electronic identification gear and a new electronic identification and livestock recording software package that we purchased. Two of these courses were run by consultants that specialize in EID equipment and software (Fig. 5). One of the courses we ran was on using a new livestock recording app we purchased for recording mob treatment details, movements, feeding information and inventory management.

Fig. 5 Training course for KRF staff in using electronic identification recording software.

4.6.5 Data platforms

Microsoft Excel has historically been used for data collection at the KRF. Despite Excel being an excellent program for manipulating data and generating charts it has limitations when used in conjunction with EID equipment and for data storage. There is also the risk of data corruption. Consequently, we purchased a purpose-build EID software program for collecting and storing data which is collected using EID. This will continue to be used at the KRF in sheep trials, such as the Yardstick sire evaluation trial and will be a good opportunity for industry partners involved in sheep trials to be exposed to the latest data collection software.

4.6.6 Proximity sensors

In a separate trial which is part of another project at the KRF, we tested to see if proximity sensors could be reliably used to determine maternal pedigree. The sensors were programmed as beacons or receivers using a Bluetooth signal. Beacons were fitted to ewes and emit a signal every minute. Receivers were fitted to lambs and record the signals (hits) received by the beacons. This allowed us to determine which ewe a lamb spent the most time with, expressed as hits per hour. Successful lamb to dam matches returned from the sensors was 95% across all the flocks measured so far (both at the KRF and on commercial properties). Preliminary analysis showed that the sensors were similarly reliable to mothering up at birth. Proximity sensors to determine maternal pedigree are now commercially available and will be beneficial to studs that want to reduce their labour costs associated with motherine up by using sensors. One of the case studies we completed was on the use of proximity sensors by a commercial producer to determine maternal pedigree and calculate ewe profitability (combination of kg of fleece grown per year and the kg of lamb produced per ewe). This case study is available at www.agric.wa.gov.au/sheeptech.

4.7 Support activity to a stud to implement EID and ASBVs

We conducted a support activity using an expression of interest (EOI) process to identify a suitable stud breeder for introduction to EID and Australian Sheep Breeding Values (ASBVs) via Sheep Genetics Australia (SGA). The purpose was to demonstrate how simple and user-friendly the process of adopting EID and ASBVs can be. Complexity and confusion have been indicated by producers as previous barriers to adoption.

This activity concluded with Mulga Spring Poll Merino Stud hosting a Sheep Technology field day in September 2017 in combination with DPIRD and the Northern Agri Group. The field day was attended by 30 sheep producers who were positively impacted by the project. Event feedback showed the overall effectiveness was at 86% in terms of providing tools and information that would improve the profitability of their sheep enterprises, and 70% of attendees indicated that they would make changes to their sheep enterprise. The level of understanding of ASBVs increased by 22%, with farmers responding that after the event they now have a 70% level of understanding of the ASBVs concept. Relevance of the field day topics were all rated above 80%. A copy of the final report for this support activity is available in Appendix 5.

5 Discussion

5.1 Industry pilot group to guide the activity

Despite the original project objective requiring a minimum of six producers to incorporate technology into their sheep enterprize, we formed a pilot group of 12 producers (new on-farm technology pilot group). The pilot group formed in late 2015 and they met 8 times during the course of the project. Each of the pilot group members made investment into their own sheep enterprise as a result of the project and directly influenced at least 50 – 100 other sheep producers. There was also additional enquiry during the term of the SIBI project from other producers about the group and how they could be involved, highlighting the perceived value of involvement in the pilot group. We determined topics for case studies through suggestions and ideas from the pilot group.

5.2 Developing a value proposition for investing in electronic identification using a case study approach

The case study with the highest benefit-cost ratio (25.8) was on the weight – based product applicator that uses electronic identification and the sheep's individual weight from a weigh head to

provide the exact dosage of backline, vaccine or drench. This was based on more expensive animal health products and showed that there were substantial savings that could be made by saving product associated with not overdosing sheep. Even though the producer was open about the technical and connectivity difficulties he faced with this new technology, he did indicate it was 'the way of the future' and would be an exciting area of development as technology improved and the costs come down. This weight-based applicator was also viewed by many members of the pilot group as the 'logical next step' once a producer had invested in EID and a sheep handler.

Where EID was the technology being investigated, the upfront and ongoing maintenance costs were documented along with the ongoing benefits such as improvement in reproduction, lamb growth rates, fleece weight and weaning percentage. The benefit-cost ratio (BCR) for the 3 case studies featuring EID was in the range of 6 – 10 so was mid-range in the context of all of the case studies. This shows that investment into EID was profitable in these cases and also provided other tangiable benefits such as reducing error and making it feasible to collect data such as fleece weights where it may not have been feasible before. However, the results are high dependent on the assumptions made in the individual case studies and other producers wanting to invest in EID need to look at the specifics of their own enterprise, particularly defining their breeding objective and the data they need to collect to advance towards their breeding objective.

The BCR on an investment into a sheep handler tended to produce a BCR less than one, with a corresponding payback period of more than 10 years (case studies 4 and 10 – Table 1). This is not surprising considering that it is difficult to put a value on many of the benefits of a sheep handler, such as reduction in operator fatigue, less risk of injury, improvements in animal welfare and improvement in management associated with making it easier to collect bodyweight or perform a husbandry task such as opportunistic crutching. Further, there was no improvement in throughflow and often a second or third labour unit was still required when using a sheep handler.

Similarly, the investment of a merino stud into EID and ASBVs produced a negative BCR. Any investment concerning genetics relies on the ongoing impact of genetic gain to be quantified as a benefit and so a negative return in the early stages is not surprising. The proximity sensors case study (case sudy 13 – Table 1) also had a negative return owing to the benefits of genetic gain and generational gain not being enough to counter the high labour costs associated with applying and removing the proximity sensors and the ongoing data analysis costs associated with each sensor. However, this is very new technology which has only come onto the market in 2018. Future improvements to this technology should see costs come down as well as a reduction in size so it can be incorporated into an eartag.

Results from the case studies above show that investment in stand alone items of technology for specific tasks can be profitable. Moreover, they show that as costs come down and problems are eradicated, the technology will be accessable to more sheep producers. Thompson and Young (2013) showed that improving the efficiency of sheep husbandry tasks in isolation has little impact on whole-farm profit. By contrast, improving labour efficiency for tasks that involve changes in labour input in a number of periods or adoption of a package of changes to the livestock enterprise, can lead to large increases in profit (Thompson and Young, 2013). Tools that were investigated in the case studies such as EID that could apply to a range of tasks (e.g. body weights, fleece weights, muscle scanning, pregnancy scanning etc.) support the notion that implementing a package of changes can be profitable.

5.3 Sheep producer survey and adoption targets

In the extension and adoption strategy we wrote in January 2017, we assigned some adoption targets for 2018 when the project was finished. These were ambitious targets but we were relying

on a groundswell of interest generated through the sheep technology case studies and the wider SIBI project to translate into adoption.

The reality is that in Western Australia (WA) our state flock is more wool focused and live export focused than meat focused. Thus, on-farm breeding objectives are tailored more to increasing clean fleece weight, decreasing micron and turning off a wether suitable for live export after shearing. Currently wool prices in WA are at an all time high. For example, in the latest AWEX point of micron report for the Western region in August 2018, 20 micron merino fleece wool was selling for $22.38/kg. Many WA producers have expanded their crop enterprises over the last 10 – 20 years to capitalise on the higher gross margins from cropping in a good year. Consequently, there is lot of sheep infrastructure that has been neglected on farms such as shearing sheds and sheepyards. Anecdotal evidence indicates that there are lots of sheep producers investing in renewing their sheep infrastructure. Once this investment has been completed, it is expected that sheep producers will invest further in technology solutions to improve the management of their sheep enterprises. This is highlighted in the sheep producer survey that showed approximately 30% of respondents were considering investing in technology solutions such as electronic identification and sheep handling equipment. Given that there will be a lag in investment in capital expenditure on sheep technology it is expected that this will be the next item on many producers agenda and there will be an improvement in adoption from 2018 onwards.

5.4 Investment into Katanning Research Facility as a demonstration site for sheep technology

At the KRF, there has been an ongoing investment into infrastructure and equipment. Through the DPIRD capital works program, there have been many improvements including refurbishment of the office, extending WiFi to the sheepyards, building a roof over the sheepyards and constructing a dust-proof room inside the yards for storage of EID equipment. Supplementary to this program, we have purchased further remote monitoring equipment, EID equipment and software to improve labour efficiency and accuracy of data collection. This has already been of wider benefit to the broader sheep industry. We have held two sheep research open days in March 2017 and March 2018 which both attracted more than 200 attendees. Further, the new on-farm technology pilot group held their final meeting at the KRF and some of the group members took the opportunity to view the improvements to the KRF. There will also be ongoing opportunities for members of the broader industry to learn from the investment into infrastructure and equipment at the KRF.

Our activity to date has focused on incorporating individual devices and tools into a sheep enterprise to improve labour efficiency, breeding and traceability. However, with the advent of IoT (internet of things) and ‘Smart farms’ there will be a focus in the future on integrated technology where data is collected in one central point from multiple sensors and devices.

Key research staff have participated in a needs-analysis for connectivity solutions at the KRF. We are planning to build a whole of farm WiFi network which will deliver connectivity solutions involving sensors and devices deployed for data collection in research trials. One of the key requirements of the end solution is interoperability and open-source of the components, so sensors and equipment from different brands can work within the network. This will deliver multiple benefits, including improvements in occupational health and safety, data collection and security. An example would be collecting bodyweight data and condition score in a indicator in a remotely located set of sheepyards on the KRF and the ability for the data to sync to a cloud-based server which could be accessed by a researcher working on the trial. The requirements for the end solution will be put out to tender in September 2018 and it is expected that the on-farm WiFi network will be constructed in early 2019.

We have purchased new EID equipment and software with advanced functionality. This includes the ability to collect pregnancy status or classing data using an autorecord board. The EID eartag of the sheep is scanned and then the scores are entered into the software using EID eartags with corresponding scores and traits on a board. We have introduced this technology into the sheep trials at the KRF and there will be many opportunities for this technology to be exposed to industry through industry – partnered trials. For example, we have a Yardstick sire evaluation trial, which measures a range of meat and wool traits of the progeny from a range of different industry sires. The stud breeders who provide semen from these sires participate in the data collection days and will be exposed to the use of advanced technology for data collection.

5.5 Extent to which project objectives were met

Project objectives listed below in dot-point with the extent to which they were met written below:

- To work with a group of at least six farmers (initial Pilot Group) implementing specific new technologies within their sheep enterprise. The devices and systems being implemented and integrated into the sheep enterprises will allow the farmers to be better informed about the value to their business.

We achieved this specific project objective. A pilot group of 12 sheep producers was formed in late 2015 and they met 8 times during the course of the project. Each of the pilot group members made investment into their own sheep enterprise as a result of the project and directly influence at least 50 – 100 other sheep producers (clients, members of their grower group etc.).

- Measures and documents the insights gained, and processes used during the on-farm trial and adaptation of the technologies into the system. A benefit-cost analysis will be used to determine the value of the investment and payback period.

We achieved this specific project objective. Each of the case studies were presented to the pilot group by an economist and the feedback from the pilot group was incorporated into each case study. Benefit – cost analyses were done on each of the case studies and five of the case studies were presented at the 2018 Lambex conference.

- The learnings from the above will then be communicated to the wider sheep industry through case studies, field days, via media and the pilot farmers becoming 'farmer champions' promoting labour-saving technology.

Each of the 15 case studies had a technical report available at www.agric.wa.gov/sheeptech. 11 of the case studies also had short 4 minute Youtube videos featuring the producer and economist. Eight of the case studies were written into feature articles that appeared in the rural press (Farm Weekly and Countryman). Each of these case studies were also presented to a public audience at industry events including Wagin Woolorama (2017 – 2018), Southern Dirt Techspo (2017), Stirlings to Coast livestock field day (2017) and the Muresk Smart Farm field day (2018). This included the Youtube videos playing on repeat and handouts of the reports.

- Demonstrate key technologies to producers at the Katanning Research Facility. This will allow producers to see first-hand how the devices and systems have been integrated, but will also allow for more thorough testing under research conditions where more detailed measurements are routine. Surveys of producers attending field days at the Katanning Research Facility will be conducted at the end of each event to gauge their interest and intention to adopt one or more bits of new technology.

We demonstrated EID equipment, remote cameras and sheep handlers to producers at the 2017 KRF open day. This was complemented by economic information on the remote cameras and sheep handlers case study. For the 2018 KRF open day we had Nathan Scott from Achieve Ag solutions present the outcomes of his report on 'Opportunities for individual management of sheep in Western Australia'. There were in excess of 200 producers at each of these events. We did a 'dartboard' style evaluation where producers indicated the value of the presentations to their own sheep enterprise and this showed that the majority of the attendees saw value in what was presented. We could have improved this by getting each attendee to complete an individual written survey but we were restricted by practical limitations.

6 Conclusions/recommendations

This project demonstrated a clear value proposition for investment into technology solutions applicable to a sheep enterprise. We used a case study approach, industry study tours, direct support to a stud and showcasing the investment into the KRF to support that technology can be used to improve labour efficiency, breeding and traceability. There has been a previous focus on expanding the crop enterprise on many farms in the cereal – sheep zone in Western Australia and consequently this has taken priority for labour allocation. For sheep enterprises to expand on – farm, ongoing technology solutions are required that reduce labour requirements as quality labour is increasingly hard to source. Further, recent high wool and meat prices have helped to convince many sheep producers that expanding their sheep enterprise is a profitable strategy given the risky nature of cropping.

Future research and development should continue to focus on technology as it becomes commercialised. For example, the proximity collars have just been released to the open market as a collared device but future research should be directed at reducing the size of the sensor so it can be attached as an eartag. Further, innovative sheep producers that have unique ideas for improving their sheep management using technology should be supported in developing their concept and taking the concept from an idea to reality.

Ongoing feedback from the pilot group indicates that using a specialist consultant is a practical approach to an investment into electronic identification and data management software. They tend to have the practical and technical knowledge to best match solutions with the producers breeding objective and data collection needs. Moreover, they can train the producer in the use of the equipment and help to solve any of the inevitable problems.

Further activities that would help the red meat industry achieve full value from technology would include awareness sessions, training and support workshops for many of the products currently available to red meat producers. This includes DNA flock profile testing, RamSelect, genomics testing and using Australian Sheep Breeding values. Electronic identification tends to be an entry point for many producers. Once the EID eartags are purchased, they then look to further technology solutions such as autodrafters, recording software, barcode printers and weight-based product applicators (e.g. drench guns).

Sheep producers will have increasing access to objective carcase information in the future. Some processing facilities have been given industry and government support to install DEXA (Dual-energy X-ray absorptiometry) in their kill-chain. This will provide objective data on meat, fat and bone and will give an individual lean-meat yield per carcase. If producers can access this data on an individual carcase basis using EID, it will be a powerful tool for them to manipulate their genetics and management to optimise lean meat yield. Some commercial producers have already worked in

partnership with their processor by scanning the EID eartags of their lambs at the beginning of the kill-chain and obtaining hot standard carcase weight (HSCW) on an individual basis to use in their management program.

7 Key messages to industry

Key messages from this activity include (but are not limited to) the following items:

- Sheep producers should research technology specific to the context of their own sheep enterprise, but seek advice and guidance from other producers who have experience in using the equipment.
- If time is a constraint, then outsource specialist areas such as data analysis and equipment set-up to ensure time is spent optimally and equipment is properly set up and data captured in the right way.
- Any investment in technology is not worthwhile unless a sheep producer makes better informed management decisions to realise the investment in the technology.
- The value of an investment into technology may not be realised unless the solution is an integrated solution where data from multiple sensors and devices can be streamlined into a single platform from which decisions are made. Future research should focus on the value of an on-farm WiFi network that can stream data into a single accessible location from multiple sensors.

The key economic, social and sustainability benefits from the adoption of technology in the sheep industry include an improvement in genetic gain for many economically – important traits such as growth rate and lean meat yield. This will benefit the industry in a broad sense. Further, where there is a lack of quality labour then this can be partially offset through an investment in labour – saving technology.

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9 Appendices

9.1 Lambex 2018 paper

Five technology infusions to consider

Beth Paganoni[1] and John Paul Collins[2]

1. Department of Primary Industries and Regional Development
3 Baron-Hay Court
South Perth, WA 6151
Contact: beth.paganoni@dpird.wa.gov.au. 93678078

2. Department of Primary Industries and Regional Development
10 Dore St
Katanning, WA 6317
Contact: john.collins@dpird.wa.gov.au. 0427 170035
Social media: j_p_collins (twitter) and https://www.linkedin.com/in/john-paul-collins-68884b50/ (linked in)

About the presenter

Department of Primary Industries and Regional Developments (DPIRD) Beth Paganoni is a livestock industry Research Officer and is focused on increasing the reproduction and performance of Western Australia's sheep flock. More recently, Beth has become involved in the application of Actigraph proximity and movement sensors to match lambs to ewes as an alternative to current expensive and labour-intensive methods of obtaining pedigree information.

John Paul Collins is a Research Officer with the Department of Primary Industries and Regional Development (DPIRD) and is based in Katanning, Western Australia. John Paul has been working to increase the adoption of labour saving tools and technology in the sheep industry, to make the management of sheep easier. This work has included cost benefit analysis to quantify the benefits of purchasing and installing applications like remote monitoring, electronic identification and sheep handlers.

Take home messages

- Research technology specific to the context of your own sheep enterprise
- Outsource data analysis and equipment set-up if you are time-poor
- Make better informed management decisions to realise the investment in technology

Introduction

On–farm labour has been identified as a key constraint in the expansion of the West Australian sheep flock. Whilst there are a range of labour saving tools and technology systems on the market, information is required on how best to integrate these into a sheep enterprise, and which products are most suitable to specific sheep enterprises. Total cost and an acceptable pay-back period should to be determined prior to investing in any new technologies.

In this paper we discuss 5 key technology infusions sheep producers can introduce into their sheep enterprise to optimise management practices by increasing the number of sheep run per labour unit and improving efficiency and productivity. Implementing technology has the potential to attract and

retain producers and professionals by creating exciting opportunities around innovative practice and ensuring data collection is quick, accurate and timely.

The technologies that have been reviewed include:

- remote monitoring
- electronic identification
- a weight – based product applicator
- benchmarking flock genetics, and
- proximity sensors to determine maternal pedigree.

Discussion

1. Water monitoring

We compared a camera system with manual checking to inspect tanks and troughs on a Poll Dorset and Border Leicester sheep stud. The 4000 ewe flock were managed over an area of 10,000 hectares, covering 5 locations and 3 shires. Previously, the trough inspection over summer - autumn required a 400km round trip 2-3 times each week at a cost of $565 per trip (labour and vehicle costs).

Remote cameras were installed at troughs accessed by sheep and the cameras took images on a set schedule. The images were then available to the producer via the mobile phone network, the cloud and an app.

Over a 10 year period, the cameras cost $22,500 but resulted in a saving of $21,400 per year in labour and vehicle running costs. The pay-back period for the cameras was 2 years (Table 1). Labour savings were redirected to other farm activities and unquantifiable benefits include ‘peace of mind’ and improved time management.

2. Electronic identification

A cost – benefit analysis was used to determine the pay-back period of the upfront and ongoing investment into electronic identification (EID). This analysis looked at the increases in wool production and weaning percentages that can be obtained from aggressive selection using data collected using EID.

The case study used a flock consisting of 16,000 Merino ewes. Seventy percent of the ewes were mated to Merino rams and 30% were mated to Suffolk rams. Rams were bred from two nucleus flocks.

Merino ewes were first tagged with EID ear tags in 2015. Data collected from the EIDs was sent to a consultant for analysis who then calculated an index to rank each ewe for allocation into the nucleus flock, commercial merino flock, terminal flock or cull flock.

The purchase of the EID equipment and ear tags was approximately $27,000 with an annual cost of $20,000 in analysis fees, ear tags and labour. The pay-back period was five years (Table 1) and the investment into EID has allowed the sheep to be managed objectively.

3. Weight-based product applicator

Traditionally sheep producers drench according to the heaviest sheep in the mob. There is a risk sheep receive non-optimal levels of drench. This problem can be avoided by using a weight – based product applicator which delivers the precise quantity of drench, vaccine or backline, calculated on the animal’s individual weight. For this case study, we used an automed® applicator, one of the weight based applicators on the market. The applicator uses EID to record treatments, manage inventory and capture information for audit purposes.

The sheep producer had already purchased a sheep handler and invested in electronic identification. A cost – benefit analysis was used to determine the payback period of the applicator (Table 1).

Savings were made by reducing the amount of animal health products used (drench, backline and vaccine).

As with any new technology there were initial functional issues (hardware and connectivity) but these were quickly resolved. Other unquantifiable benefits may include the reduced likelihood of animals becoming resistant to animal health products. The technology also provides a complete individual report of treatments for each animal for reporting purposes or if selling to an abattoir or feedlot.

4. Benchmarking flock genetics

Tools are available to commercial sheep producers to establish a baseline of their flock's genetic merit. The Sheep CRC DNA flock profile test is a test that has been cross-validated with industry data. The test estimates the genetic merit of a merino flock, allowing breeders to track the genetic progress of their flock in order to make better selection decisions. Testing involves taking samples using blood cards or tissue samples from randomly selected sheep.

The Ram Team Manager in RamSelect.com.au allows a producer to track their rams to ensure they are improving each year. The cost of the DNA Flock Profile test is approximately $800 per test. Generically, the pay-back period for commercial producers is 18 – 24 months, providing the results are used to make better selection decisions. The analysis assumes 3 months for the results, 1 – 3 months to improve selection, 5 months gestation and 8 – 12 months to make improvements. Establishing a benchmark of a flock's genetics to track progress can reduce generational lag.

Pay back periods will only be achieved if information is used to select rams each year. The Ram Team Manager costs $25 per year for commercial producers. This cost will be readily recovered with an improvement in the genetic potential for any given trait.

5. Proximity sensors to determine maternal pedigree

Pregnancy scanning for multiples is a well-accepted management strategy to increase reproduction rate. It is also important to know the number of lambs reared per ewe.

Working with a commercial sheep producer, proximity sensors were used to match lambs to their mothers using Bluetooth technology. The sensors were placed on each ewe and lamb for 2 days prior to weaning and removed at weaning. The sensors determine which lambs belong to each ewe based on their proximity in the paddock. Commercially available sensors are available for $12.50 each. A $600 reader and app is required to download the data from the sensor and link it to the EID or visual tag number of the ewe or lamb. Analysing the data costs $2.50 for each device.

The proximity sensors are beneficial to a stud breeder to determine maternal pedigree and have a clear role to play in reducing the labour cost of manual mothering and maintain accuracy. A 0.95% genetic gain would be required to recover costs within a 10 year period (Table 1). It is important to remember that while proximity sensors provide maternal pedigree, the ram has the biggest influence on genetic gain. Genetic gain is can only be expected if genetically superior rams are also selected.

Table 1: Benefit – cost ratio and payback period for five technology infusions that can make a positive difference in streamlining sheep management

Technology infusion	Benefit – cost ratio (Return for every $1 invested)	Payback period
Water monitoring	5.3	2 years
Electronic identification	10.6	5 years
Weight – based product applicator	25.8	1 year
Benchmarking your flock's genetics	No analysis was done	1.5 – 2 years
Proximity sensors to determine maternal pedigree	0.8	> 10 years

Conclusion

There are various technology infusions available to sheep producers. Introducing them into their sheep enterprise can optimise management practices by increasing on – farm efficiency. All but one case study had a commercially acceptable pay-back period of 1- 5 years however, it is recommended individual enterprises review their specific needs. For further information please visit www.agric.wa.gov.au/sheeptech.

Acknowledgements

We thank the members of the Sheep Industry Business Innovation (SIBI) new on-farm technology pilot group whose input, participation and feedback has led to the completion of a series of economic case studies on a range of labour saving tools that make managing sheep easier.

9.2 Extension and adoption strategy

Strategy for increasing adoption of on-farm technology to improve labour efficiency in the Western Australian (WA) sheep industry

Royalties for Regions

Sheep Industry Business Innovation (SIBI)

Centre Operations and Research Infrastructure: New on-farm technology

(Activity 1.2)

John Paul Collins

Department of Agriculture and Food, Western Australia

January 2017

1. Introduction

Our sheep flock in WA is estimated to be 14 million sheep and lambs in July 2015. This includes 7.5 million breeding ewes of which 6.7 million were mated. Approximately 5350 farm businesses in WA included a sheep enterprise with an average flock size of 2700 sheep and according to the 2011 census, 17% of sheep farms had flocks containing over 4000 sheep and accounted for 50% of WA ewes (Pritchett, 2016).

The sheep flock in WA has steadily declined from 38 million in 1991 to the current situation. There has been little incentive for those currently in the industry to increase their involvement or for newcomers to be involved. However, with an increase in demand for red meat protein from Asia and the Middle East there is now a real incentive and opportunity for WA sheep producers to either expand their flock or enter the industry.

The decline in the rural population in many regional centres has reduced the ability of sheep producers to attract and retain farm labour (Thompson and Young, 2013). Moreover, on-farm labour has been identified as a key constraint in the expansion of the sheep flock in WA. Many farm businesses have increased their crop enterprise and the sheep enterprise tends to be a lower priority in labour management decisions. As mixed-enterprise producers have purchased the latest technology for their crop enterprise (e.g. auto-steer, yield mapping and variable rate technology), they should be open to the idea of purchasing new technology for their sheep enterprise. Data and information on how the technology can be integrated into their sheep enterprise is required to support their decision.

A key barrier to adoption of technology is cost. To begin with, running a sheep enterprise requires a heavy investment into capital expenditure (e.g. fencing, laneways, sheep yards and shearing shed). Improvements in use of technology will push up capital expenditure requirements. A reduction in the need for labour may offset the higher capital investment, but the offset may not be sufficient to promote the necessary investment (Clear Horizon Consulting, 2016). Additionally, overall farm productivity can improve with the better use of existing technologies if they allow in increase in economies of scale (Kingwell *et al*. 2013). Thus, an increase in adoption of labour saving technology will need to be supported by data on the value in terms of saving labour costs and an ability to increase scale.

The key ‘levels’ of change that this activity will need to influence include:

- Change in awareness (knowledge)
- Change in understanding and skills (persuasion and decision)
- Change in practice/behaviour (implementation)

Supporting information including the value of the investment in terms of labour saved and increase in efficiency will be an important component of achieving a change in understanding and skills. After implementation, there should be a confirmation that the change was for the better and a shift in becoming an advocate for the technology and influencing others to change. Some specific tasks in this activity have been incorporated into the adoption process to show where they fit (Figure 1).

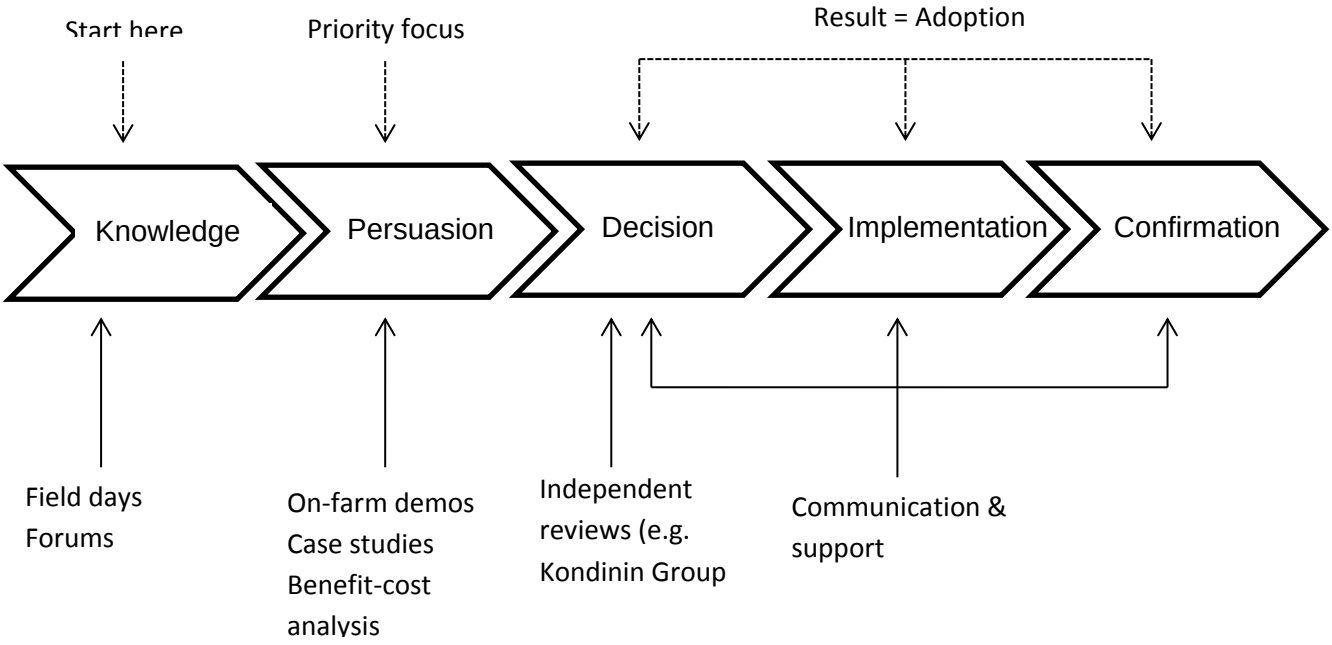

Figure 1: Adoption process outlining tasks within the new on-farm technology activity

Clear Horizon Consulting (2016) have compiled a report outlining the barriers impacting on the growth of sheep production in WA. Both the high technology/capital costs and access to labour issues were identified as barriers. In light of these barriers the report specifically recommends:

- Identify opportunities for improved sheep management through better use of existing technologies and identify and promote opportunities for leasing or share arrangements for equipment and facilities that optimise the benefits while reducing high capital outlays
- Support the testing, development and transfer of new technologies that reduce the labour required in the seasonal peaks and increase sheep management efficiencies

2. Situation analysis

A survey of WA sheep producers with more than 500 sheep commissioned by DAFWA in 2011 revealed that the most popular labour saving devices were electronic weigh crate (53% of respondents), crutching cradle (51% of respondents) and lick feeders (46% of respondents). However, the percentage of respondents using other devices including automated jetting races, sheep handlers, auto-drafters and electronic identification (EID) eartags was low (all < 20%) (Curnow *et al.,* 2011). Additional questions were asked when the survey was repeated in 2014. The first question was about the use of walk-over-weighing (2%) and the second was about the use of Pedigree Matchmaker to determine dam pedigree in ewe/lamb flocks (1%) (Jones and Curnow, 2015).

Use of EID eartags is a key technology being promoted by the new on-farm technology activity. It allows individual management rather than mob-based managed so superior sheep can be identified and selected and consequently improve production. Further, it allows more efficient data entry/analysis and adoption of additional devices such as walk-over-weighing (WOW) or Pedigree Matchmaker (PMM). In the 2011 survey, only 4% of respondents were using EID but 20% of respondents were considering EID (Curnow *et al.* 2011). Similarly in the 2014 survey 4% of respondents were using EID but 16% were considering EID (Jones and Curnow, 2015). The interest in EID has been sparked by the Victorian government bringing in mandatory EID from 1 January, 2017. There are opportunities to support the increase in adoption of EID in WA through providing data on costs and benefits to a sheep enterprise from a productivity point of view and additionally through the enhanced biosecurity and traceability benefits.

There are some farm businesses in WA that have adopted many labour saving devices in their sheep enterprises and are further explored by Thompson and Young (2013). Bio-economic modelling was used to identify the importance of specific management and genetic interventions to improve labour efficiency and determine the impact on profitability. Constraints on the supply of labour had a significant impact on stocking rate, farm profit and the crop: sheep enterprise mix. Overall, it was found that improving efficiency of sheep husbandry tasks in isolation generally had little or no impact on farm profit. However, if labour efficiency was improved for multiple tasks through the year, or there was adoption of a package of changes to the livestock enterprise, then this would lead to large increases in profit (Thompson and Young, 2013). One specific example given in the report was a case study on David and Lyn Slade in Mt Barker. They were able to increase their whole farm profit through implementing a package of changes to improve labour efficiency throughout the year incorporating fencing, feeding grain, feeding hay, mustering and livestock handling (Thompson and Young, 2013). Thus, whilst we can support the adoption of stand-alone devices or systems to improve labour efficiency, there will be little impact on farm profitability unless they are part of a whole suite of interventions to the enterprise.

3. Objectives

Within the DAFWA strategic plan, there is a goal to double by value of the WA sheep industry by 2025. The new on-farm technology activity fits within this goal through growing productivity, growing profitability and growing people. First, adoption of technology will aid in productivity growth of farm businesses with sheep through an improvement of labour efficiency and an increase in the size of individual flocks. Second, adoption of technology will improve profitability through the ability to collect and use objective data to identify and retain genetically superior sheep. Furthermore, use of labour-saving devices can reduce the need to source reliable labour and reduce the cost of production. Third, adoption of technology will require the skill development of sheep producers and those higher up in the supply chain. As technology becomes more widely adopted there will be a grower need for skill development of stock agents and processors with the introduction of technology such as electronic National Vendor Declaration (NVD) forms and carcase tracking. The use of technology in the sheep industry will appeal to younger farmers who may have been drawn away from sheep previously by the lure of technology in the cropping industry. Thus, younger farmers are an important focus within this activity.

The objectives of this activity are to:

- Develop a value proposition, including a cost-benefit analysis for the integration of at least 5 existing and emerging technologies into a sheep enterprise to improve labour efficiency
- Measure the change in work practices of the members of a pilot group of producers over the period of the project as an indicator for the level of adoption
- Incorporate specific questions on adoption of new technologies into the next survey of WA sheep producers scheduled as part of the overall SIB I project

This activity aims to achieve a minimum of 10% of WA producers who are using EID by 2018. Further, we aim to achieve a minimum of 40% of WA producers who are considering adopting EID into their sheep enterprises. Additionally, we aim for a minimum of 50% of WA producers to be using some of the labour-saving devices mentioned in the 2011 sheep survey including the automated jetting race and sheep handlers.

Milestone

Develop and submit a detailed extension/adoption strategy outlining specific activity beyond the pilot group of participants and specific adoption targets reflecting the project investment.

This document outlines the strategy to meet the milestone above.

4. Target audiences

To increase the adoption of new on-farm technology by WA sheep producers we need to convince sheep producers of the value of the technology and motivate them to use it. The value will include a financial component in terms of a benefit-cost ratio and payback period to recover costs. There is also a benefit to improving occupational health and safety standards, reducing the physical labour required to perform husbandry tasks and improving animal welfare through improved and more regular monitoring.

This activity aims to present a set of well-documented, integrated, modern and technological solutions for sheep enterprises to improve decision making and reduce the cost of labour. Young farmers are a key target due to the relatively high age of sheep producers. In particular, we will provide opportunities for participation in events, study tours and demonstrations by members of AgConnect. This is the young farmer and agribusiness professional division of WA Farmers. They already have a strong, established network that we can use to share and distribute new knowledge.

The target audience of the new technology activity is as follows:

- Producers who have capacity to increase sheep numbers in their enterprise
    - Incoming generation (< 35 year olds)
    - Current generation (>35 year olds)
- Producers who currently have no sheep in their farm business and may be attracted back into them
    - Incoming generation (<35 year olds)
    - Current generation (35+ year olds)
- Specialist consultants who provide advice to sheep producers
- Forward thinking livestock agents who are a respected source of information on sheep

There is a lot of practical knowledge amongst experienced sheep producers about gaining efficiency through good design of capital items such as laneways, sheep yards and shearing sheds. It is hoped that producers who will be enticed back into sheep can benefit from this practical experience and this activity will seek opportunities to share design efficiencies.

5. Specific activity beyond the pilot group

5.1 EID report and workshops

DAFWA is currently putting on a consultant to write a report analysing the opportunities for individual sheep management in WA. This report will examine the latest thinking around the use of EID and the value it can offer sheep producers in WA to increase profitability, traceability and efficiency of the sheep enterprise. Further, the report may also be used as a foundation report in building an appreciation of the impact at an industry level. This report will cover current uses, limitations, future opportunities, a benefit-cost analysis for each opportunity and a summary of the skills, services and infrastructure needed for WA producers.

The outcomes of the report can also be integrated into workshops for producers covering EID. There is emerging interest in EID amongst producers about the value it can bring to their sheep enterprise. The new on-farm technology activity will work with industry consultants to help deliver practical workshops that can provide useful and timely information to producers as well as the outcomes of a benefit-cost analysis to support any decision making.

5.2 Demonstrations at Katanning Research Facility

An integral part of the new on-farm technology activity is transforming the Katanning Research Facility (KRF) in to a state-of-the art facility incorporating the latest technology in terms of remote monitoring, EID and sheep handling. As this is a facility that hosts multiple sheep trials, there is already EID equipment in place. We have built on what is currently there by also adding remote monitoring of tanks and troughs, Pedigree Matchmaker for determining ewe pedigree, walk-over-weighing and additional sheep handlers. Our aim is to showcase the technology at the KRF and how it can be integrated into a sheep enterprise with supporting economic information at regular industry forums and field days. We are also exploring opportunities to open up the KRF to further input from grower groups in doing sheep research and examining how technology can improve labour efficiency.

5.3 Case Studies

A central focus within the new on-farm technology activity is developing practical case studies on how a specific device or system has improved labour efficiency, with a supporting benefit-cost analysis. We have commissioned an economic consultant to interview the farmer and capture the costs, savings and other ongoing costs such as maintenance. Key figures that will be presented include the benefit-cost ratio (BCR) to obtain the dollar return (or cost saving) for every $1 invested. Further, the analysis will provide a payback period allowing other farmers to see how quickly the initial investment is recovered. The analysis is done over a period of time relevant to the specific technology and the returns are discounted back to present dollars.

We have produced case studies on remote cameras to externally monitor water troughs, a laneway system, an automated jetting race, using pedigree matchmaker to determine ewe pedigree and use of a sheep handler. Future case studies will be on EID, further investigation into sheep handlers and how an on-farm WIFI network can increase efficiency as more devices require internet and farms become more connected.

Outcomes of the case study will be written up in a short technical report and available on the DAFWA website.

5.4 Media

We plan to employ a freelance journalist to write a feature article suitable for the rural press on each of the case studies. This will include commentary from the producer about the value of the specific device or system has brought to their business. We will put out media releases about the key outcomes of each case study and any interested media outlets will be sent the feature article. Additionally, we will develop audio files as podcasts featuring the verbal interview with the farmer for downloading off the DAFWA website.

Each of the case studies will also be developed into a 3 – 4 minute film suitable for the DAFWA Youtube channel. This will be available on the DAFWA website and will feature the producer speaking about the device and how it has improved labour efficiency. Some economic information will also be included and interested viewers will be directed to the DAFWA website to explore further.

5.5 Supporting existing extension programs

We will seek out and identify opportunities to value-add and collaborate with existing extension programs within WA. One of these programs which has a focus on labour efficiency is The Sheep's Back. This is a sheep network in WA made up of over 1000 people interested in the sheep and wool industry. There are regular seminars and field days held regionally where the current and timely information is provided to sheep producers. Additionally, they host an annual 'Sheep Easy' field day which features a panel session of farmers who run an efficient sheep operation with low labour input.

5.6 Supporting grower groups

There are grower groups in WA who have members interested in increasing their sheep numbers. We plan to support these groups by providing access to case study material or inviting them to be involved in a case study. Several grower groups have informed us that the use of technology to improve efficiency is a topic many of their members are interested in. As well as supporting their field days by providing speakers on technology we will provide resources to assist in any demonstrations the members of the grower groups want to do within their own sheep enterprise.

5.7 Supporting consultants

Many mixed enterprise producers use the services of a consultant. This has allowed many producers to successfully grow their business by obtaining specialized advice and timely information to support their decision making. As consultants play a key role in the decision making of sheep producers, we will provide them with access to our case studies and other relevant information to pass on to their clients. This will allow them to see the economic benefits of technology and help adapt the technology to suit the needs of their clients.

5.8 Industry study tour

There are sheep producers outside of WA who have already successfully integrated EID into their sheep enterprise. In 2016, we organised a study tour to regional NSW to attend the Lambex conference and to visit producers who had incorporated technology such as EID into their sheep enterprise. Victoria has now passed legislation to make it mandatory for sheep to have an EID eartag from 1 January 2017. This presents a unique opportunity to explore the adoption of EID and to observe the key issues faced by participants along the sheep supply chain. We aim to organise a study tour to regional Victoria in 2017 to explore how EID has been accepted by the sheep industry and to bring back any learnings to WA.

6. Specific adoption targets reflecting the project investment

In the 2011 survey of WA sheep producers, some questions were asked to determine efficiency based on a range of labour-saving devices outlined in Table 1. The use was highly variable and reflected a mix of the perceived value of the device, the time the device had been in the market place, the ease of integration into the farm operation and the cost. Electronic weigh crates, crutching cradles and lick feeders already had the highest ownership, with approximately 50% of respondents owning these devices (Table 1).

Around 20% of respondents indicated in the 2011 survey they were considering one or more of lick feeders, EID tags and auto-drafters, indicating this is where the growth would occur. We believe that through the data supplied to interested sheep producers on how the devices can be integrated into the sheep enterprise, adoption of these devices will improve. Our target adoption for EID is 10% of survey respondents by 2018, as more sheep producers see the value in using EID to identify and retain profitable sheep. Further, our target adoption for auto-drafters is 20% of survey respondents with more sheep producers understanding their value in differential management of sheep for optimum productivity and welfare outcomes. We would expect other capital items such as sheep handlers and automatic jetting races to be adopted by at least 50% of survey respondents as these are featured in our case studies (Table 1).

Table 1: Proportion of respondents from a 2011 survey and 2014 survey who use one or more labour-saving devices. Additional data included on targeted adoption rates in 2018 for the labour-saving devices. Note, only the auto-drafter and EID eartags were included in the questions in the 2014 survey.

	2011 survey (%)	2014 survey (%)	2018 adoption target (%)
Electronic weigh crate	53	-	75
Crutching cradle	51	-	75
Lick feeder	46	-	50
Automatic jetting race	17	-	50
Sheep handler	17	-	50
Auto-drafter	6	8	20
EID eartags	4	4	10

Sources: Curnow *et al.* 2011; Jones and Curnow, 2015 (2011 and 2014 survey data)

In the 2014 survey of sheep producers, the proportion of respondents actually using either walk-over-weighing (WOW) or Pedigree matchmaker (PMM) were very low (Table 2). Whilst there are benefits of WOW in remotely capturing liveweights, there are costs associated with training the sheep, the infrastructure required and the data analysis and interpretation. Thus, WOW technology may only suit specialized feedlotters who need to continually track growth rates of individual sheep. Many producers may opt to capture static weights through integrated sheep handlers with load bars fitted whilst performing other jobs such as pre-lambing vaccination or weaning. Use of integrated handlers is highly labour-efficient by preventing mustering and drafting where more than one job can be combined at once. Thus we expect only a modest increase in adoption and have set a target of 5% by 2018 (Table 2).

Similarly, we have set a modest target of 5% for the adoption of PMM (Table 2). This is a proven labour-saving technology for studs by determining ewe pedigree with reasonable accuracy through ewe – lamb combinations that walk past a fixed EID reader. However, there is other technology such as DNA analysis, where full parentage can be obtained for around $17 per sample. There is also research currently taking place in the new on-farm technology activity into using sensors on ewes and lambs which are applied after marking. These have Bluetooth technology and are programmed as either beacons or receivers and record 'hits' when a ewe and her lambs are within 1m proximity. Early trial work suggests full ewe – lamb pedigree can be obtained after 24 hours. Once this technology becomes proven and less cost – prohibitive it may be a more viable option than PMM.

Table 2: Proportion of respondents from a 2014 survey and targeted adoption rates in 2018 for sheep producers who are using either walk-over-weighing (WOW) or Pedigree Matchmaker (PMM).

	2014 survey (%)	**2018 adoption target**
Walk-over-weighing system	2	5
Pedigree Matchmaker	1	5

Source: Jones and Curnow, 2015 (2014 survey data)

7. Monitoring and evaluation

As technology becomes less cost prohibitive, there will continue to be new systems and devices that enter the market that will have labour saving benefits. For example, whilst PMM is currently a viable option to obtain ewe pedigree, there may be proximity sensors contained in an eartag that can be purchased and applied to ewes and lambs in the future to obtain ewe pedigree. Or the cost of DNA may reduce to the extent that it comes viable on a large scale. Thus, it can be a challenge to evaluate the uptake and adoption of specific labour – saving devices as new devices come onto the market.

We initially aim to measure the change in work practices for each member of the pilot group to determine if they integrate a new system or device into their sheep enterprise, as an indicator of broader adoption. The pilot group members are a good representation of sheep producers who already run large sheep enterprises, are open to technology and could be convinced to increase their sheep enterprise if the economics are there.

In order to capture the level of adoption in the broader community of sheep producers, we will include questions on the use or consideration of various labour-saving devices in the 2018 DAFWA survey of sheep producers. This will allow us to determine if we have met the adoption targets outlined above.

Additionally, the broader SIBI project will be running Sheep field days at the KRF as well as other industry forums and field days. We will use this opportunity to display and discuss labour-saving technology. Supporting information from our case studies will also be made available, as well as presentations from sheep producers who have successfully integrated technology such as EID into their sheep enterprise. As part of the general evaluation of the day, we will include specific questions about the level of interest in technology. Further, we will use the opportunity to ask questions about which devices have been adopted and making a positive difference to labour-efficiency.

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9.3 NSW study tour report opening page

Background

The Sheep Industry Business Innovation (SIBI) project is a $10 million investment by the state government's Royalties for Regions which will run until June 2018. The overall goal for the WA sheep industry is to be internationally competitive and grow in value in the future. To help achieve the goal of growing the WA sheep industry, the Department of Agriculture and Food, Western Australia (DAFWA) invited applicants on a study tour to examine research and practical applications of research in NSW.

Participation in tour

Two activities within the SIBI project – Business skills development and New on-farm technology jointly combined to deliver the study tour. The Business skills development activity includes the 100% club, which is a group recognizing leading sheep producers that achieve a 100% lambing percentage (lambs marked/ewes joined). It was a timely opportunity to invite 100% club members to apply for the trip to acknowledge their achievement and help them in growing their sheep enterprise further. Moreover, the new on-farm technology pilot group was formed to provide feedback and direction on devices, systems and applications that can make sheep work easier and more efficient. Interested farmers were invited to apply for the group and the group was selected based on merit and skills. Members of the group were invited to apply for the study tour. Additionally, we wanted to give an opportunity to younger members (18-35) involved in the WA sheep industry. We put aside two places for AgConnect members. AgConnect is the young farmer and agribusiness division of WA Farmers Federation. The participants of the study tour area listed in Table 1.

Content of study tour

The first part of the sheep tour was attending the Lambex pre-conference tour and the Lambex conference. This is the premier, national conference for the Australian lamb industry with a whole of supply chain focus. Following the Lambex conference we set out an itinerary involving visits to Pooginook merino stud, Charles Sturt university and Anthony Shepherd (SheepMatters sheep consultant) and some of his clients who had invested in electronic identification (EID) and infrastructure to improve their sheep enterprise.

Each participant reported that the networking aspect of the trip was the most valuable component – being able to meet new people, hear about what they were doing and how they were growing their business. Outside of our day schedules, we also met with other people during dinner such as Dawson Bradford (former chair of WAMMCO) who was on the Lambex committee and Elise Bowen (data management consultant formerly from York, WA) and were able to share our experience with them.

9.4 Victoria study tour report executive summary

To help achieve the goal of growing the value of the WA sheep industry, the Sheep Industry Business Innovation (SIBI) project ran a study tour to regional Victoria to examine practical applications of technology and sheep research. Participants in the study tour represented a cross section of producers from the major sheep regions of WA as well as supply chain participants, including a feedlotter, supply chain manager, agricultural college teacher and a consultant. There were three major themes identified in the individual reports submitted by each participant.

First, the precision management of sheep enterprises by leading Victorian producers was a challenge for WA producers to imagine applying these principles to their own enterprises. Examples of the precision management included synchronised-split-mating, small lambing mob sizes and paddocks and re-use of best lambing paddocks within a season. Application of these management strategies regularly resulted in over 90% of lamb survival in twins which is much higher than what the WA producers on the tour were achieving. There are many tools available to WA producers to boost their lamb survival and these need to be applied and adapted for individual sheep enterprises in WA.

Second, the mandatory introduction of electronic identification (EID) for lambs born after 1 January 2017 in Victoria presented many opportunities. We were exposed to the huge cost to industry if there was a major outbreak of foot and mouth or a similar disease, and all participants gained an appreciation for the need for a system allowing rapid traceability. Furthermore, EID allows the ability to individually monitor the performance of sheep and improve your ability to make management decisions on whether to cull or keep. Gross income per sheep can be calculated and provides a powerful tool to aid decision making.

Third, the internal networking within the group was a major highlight of the study tour. The ability to discuss each tactic, tool and technique we viewed and reflect on how it could be applied to the WA sheep industry was identified as a key benefit of the tour. All of the tour participants were open about how they ran their own enterprises and had a shared passion for applying new ideas to their own enterprises in a process of continual improvement as well as a passion to contribute to the growth of the WA sheep industry.

9.5 Support activity to a merino stud report

Background

The use of electronic identification (EID) in sheep breeding is a key starting point for adoption and integration of a wide range of technologies into the sheep enterprise that can assist in improving sheep productivity. It needs to be implemented first before producers can move onto other technology such as EID-equipped auto-drafters and the software packages for recording and managing data.

In a survey of 369 WA sheep producers, 20% of respondents indicated that they were considering EID technology and only 4% were using it (Curnow *et al.,* 2011). The low level of adoption can be attributed to many factors including cost, lack of perceived economic benefit and many farmers opting to reduce the size of their sheep flock in favour of cropping. One of the key constraints to many farmers expanding their sheep flocks is access to reliable labour. Using technology such as EID can potentially allow farmers improve their efficiency in labour requirements and continue to maintain or expand their flock. It will also allow objective decisions to be made to improve their breeding and help meet their breeding objective.

Genetic improvement is another fundamental tool for improving productivity in sheep enterprises. The Australian sheep industry has made significant advances in developing and adopting objective measurement and genetic evaluation, however there is still a lot of progress to be made, especially in Merinos (only 23% Merino rams sold under-hammer in WA have ASBVs compared to 60% of Terminal rams) (Cornelius, 2015). Many barriers to adoption have been identified, including claims of it being too time consuming and complex, which could be rectified with use of EID and related technology.

On-farm demonstration sites with EID technology provide a great opportunity to display the value of EID technology and how using it can simplify and improve the time efficiency of objective measurement for genetic purposes.

This activity is primarily part of the new on-farm technology activity in the SIBI project (Activity 1.2), but is also part of the adoption of genetic technologies activity of SIBI (Activity 3.2) which aims to increase the adoption of ASBVs. This support activity used an Expression of Interest (EOI) process to identify a suitable stud breeder for introduction to EID and ASBVs via Sheep Genetics Australia. Further, it was used as a case study to demonstrate how simple and user-friendly the process/system of adopting EID and ASBVs can be. Complexity and confusion have been indicated by producers as previous barriers to adoption.

Objectives

- Integrate EID and genetic tools (ASBVs) into the management of a stud operation
- Increase communication between stud breeders, their client group and wider industry on the benefits of technology for genetic selection, labour efficiency and traceability
- Develop a case study of how the stud has integrated EID and genetic tools into the management of their stud

Outcomes

This activity concluded with Mulga Spring poll Merino Stud hosting a Sheep Technology field day in combination with DPIRD and the Northern Agri Group. The field day was attended by 30 sheep producers who were positively impacted by the project. Event feedback showed the overall effectiveness was at 86% in terms of providing tools and information that would improve the profitability of their sheep enterprises, and 70% of attendees indicated that they would make changes to their sheep enterprise. The level of understanding of ASBVs increased by 22%, with farmers responding that after the event they now have a 70% level of understanding of the ASBVs concept. Relevance of the field day topics were all rated above 80%. A summary of the feedback from the field day is available in the Appendix.

Expenditure

Figures presented below are ex-GST and include the stand-alone operating costs of this support activity only. Salaries were not included as DPIRD staff involved in this activity offered their time on an in – kind basis.

Budgeted operating expenditure (ex GST)

Item	Amount
Hire of stick reader	825
EID software	2000
On-farm and phone support from consultant	2200
Merinoselect subscription to Sheep Genetics Australia	400
Individual stud ram subscription	840
Consultant field day costs	2000
Journalist and film expenses for case study	2000
TOTAL	**$10,265**

Actual operating expenditure (ex GST)

Item	Amount
Shearwell EID tags	936
12 month Support package from consultant	1500
EID stick reader and barcode printer	1242
Software package (purchase and 1 year subscription)	690.91
Merinoselect Subscription to Sheep Genetics Australia	400
Individual stud ram subscription (91 rams @ $2.10)	191.10
Field day toilet and chair hire	182
Field day – tea, coffee, water etc.	32.05
Field day – catering (lunch, afternoon tea, nibblies)	340
Consultant extra support to stud breeder before field day	640
Consultant costs – delivery of 3 sheep sessions at field day	450
Consultants travel costs – field day	489.33
Short 3 – 4 minute film	2700
Print media journalist expense to write up story and take photos (estimate)	1000
TOTAL	**$ 10,793.39**

In – kind DPIRD staff days contributed to activity

DPIRD staff	No. days
John Paul Collins	20
Mel Dowling	5
Beth Paganoni	2
Naomi Simpson	1

Outputs

This activity has delivered a solid case study to demonstrate how easy it can be to implement EID and ASBV technology into a stud sheep enterprise. The process developed a relationship and goodwill that in turn has resulted in trust in the information presented at the field day and a willingness to adopt and change practice. This project not only delivered financial support but also people support in the form of expertise that has led to adoption of technologies at Mulga Spring poll Merino Stud and encouragement to invest further into EID technology. The knowledge that has been gained by Mulga Springs will act as a conduit to other sheep farmers in the area wanting to adopt EID and ASBV technology.

Learnings and Next steps

This project has been a highly successful adoption model based on goodwill and relationship. The process of investing in upskilling a prominent stud in a poorly supported geographical location has resulted in SIBI being able to extend its footprint in the area. The project success was increased by the strong links between Mulga Springs stud and the Northern Agri grower group and the ability to share the experience with like-minded farmers.

Moving forward, similar support activities of investing in a key stud breeder and developing a relationship alongside implementing EID and ASBV technology shows potential to be a highly effective adoption model. The involvement of a grower group for the concluding field day also proved highly successful and because a relationship had been developed the willingness to adopt the technology was high. Rolling out similar projects across the state in combination with studs that have strong links to a grower group could increase the SIBI footprint and also the adoption of EID and ASBV technology.

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