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Scoping the benefits of saving labour in sheep enterprises in Australia

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Abstract

Bio-economic modelling identified the relative importance of specific management and genetic interventions to improve labour efficiency and its impacts on profitability. As expected, constraints on the supply of labour had a significant impact on stocking rate, the level of farm profit and the optimum mix of enterprises in both the mixed crop/livestock farms and the livestock only farms. If owner operators, with or without access to hired permanent labour, are unable or unwilling to hire casual labour then they are unable to match labour supply to the seasonal labour demand. Therefore technologies or strategies that reduce the labour required in the seasonal peaks will allow producers to increase profitability by better achieving the potential of their farming system.

On sheep properties there are multiple seasonal peaks and therefore improving the efficiency of most husbandry tasks in isolation generally has little or no impact on farm profit, although there are exceptions for some tasks, regions and times of lambing. By contrast, improving labour efficiency for tasks that involve changes in labour input in a number of periods, rather than one or two periods as occurs for the husbandry tasks, or adoption of a package of changes to the livestock enterprise, can lead to large increases in profit.

Systems to improve the efficiency of pasture and sheep monitoring and grain feeding, plus adoption of ‘easy-care’ sheep, led to the biggest increase in profit across all regions.

Executive summary

The long term decline in the rural population in most regions has reduced the ability of farmers to attract and retain farm labour. This has had ramifications for sheep farmers as sheep production is relatively labour intensive. Furthermore, the rate of improvement in the productivity of labour in the sheep industry has been low compared to the cropping enterprise. There is considerable variation in cost of production between producer's within and between regions resulting from variations in production per hectare and adoption rates of more efficient management practices, such as work amalgamation and sheep handling systems, that allow more efficient undertaking of routine tasks such as drenching, dipping, jetting and crutching.

Genetic improvement to develop 'easy-care' sheep that are more resistant to disease require less intervention when lambing and are more resilient and require less supplementary feeding during periods when there is a shortage of paddock feed can also reduce labour costs and make sheep production more appealing.

However, there is limited information available on the break-down of labour use in sheep production systems, the relative importance of different approaches to labour saving and affect of labour saving on enterprise profitability and optimal farm strategy. Such information is likely to be useful to farmers to help them assess potential gains in productivity and also in the development of research priorities. The aims of this project were:

1. To identify the importance of saving labour in the sheep enterprise and identify critical periods of the year in which saving labour has the highest value (i.e. a relative economic value for labour in different months).
2. To identify the relative importance of specific management and genetic interventions to improve labour efficiency and its impacts on profitability.

Four versions of MIDAS, representing the Great Southern of WA, Central Wheatbelt of WA or the Cereal Sheep Zone, southern Victoria and southern NSW, were adapted to take account of the demands for labour in the sheep and crop enterprises over the course of a year. The upgraded MIDAS models were then used to identify the critical periods during the year for labour saving for different production systems and assess the impacts on profitability of a range of specific management and genetic labour saving interventions. The interventions included running larger mobs of sheep, employing contractors to complete certain tasks, adoption of lick feeders, breeding of "easy care" sheep and adoption of shedding sheep. Finally, the impact of labour supply on value of increasing reproductive rate and fleece weight and the impacts of the shape of the relationships between stocking rate and labour requirements per sheep on farm profit were quantified.

MIDAS proved to be a very effective tool for identifying the relative importance of specific management and genetic interventions to improve labour efficiency and its impacts on profitability. As expected, constraints on the supply of labour had a significant impact on stocking rate, the level of farm profit and the optimum mix of enterprises in both the mixed crop/livestock farms and the livestock only farms. Demand for labour in the sheep enterprise is very seasonal so this demand is best met by hiring casual labour. However, casual labour is not always available and some owners-operators would prefer not to hire casual staff. Therefore technology or strategies that reduce the labour required in the seasonal peaks is likely to increase farm profit. Extra owner labour is not able to fully compensate for low labour availability because there are insufficient owner hours available during the

times of peak demand. Whilst increasing the number of hours worked can improve profit, additional labour needs to be purchased and/or labour efficiency improved to realise the full benefits of overcoming the constraints on labour.

A number of strategies and technologies could be adopted to reduce labour input. Improving efficiency of completing single tasks leads to small or no increases in profit. Freeing up labour in itself is not sufficient to increase farm profit because the spare labour created by the efficiency needs to be able to contribute meaningfully to other tasks that will increase production. This usually requires labour input to be reduced in a number of periods.

Reducing labour input for most general tasks in the great southern of WA and south west Victoria leads to large profit increases. Sheep monitoring and grain feeding led to the biggest increase in profit across all regions. Reducing labour input for pasture monitoring was also of high value in the great southern region of WA and southwest Victoria. Efficiencies in mustering and administration were of high value in most scenarios examined. Easycare sheep and lick feeders were shown to be high value strategies primarily because they led to reductions in the requirement for labour across many periods of the year. Employing contractors to undertake husbandry tasks like dipping and jetting were of lower benefit because they free up labour in only a small number of periods.

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1. Project background

The demographic structure of Australian sheep farmers has changed dramatically over the last 25 years. The decline in population means that most farms experience problems in attracting and retaining farm labour and these labour restrictions have contributed in part to more crop dominant agriculture due to its relatively lower labour requirement compared to sheep production. Improvements in labour efficiency in cropping has been supported through the introduction of more crop options such as lupins and canola, and better varieties such as wheat varieties with different flowering times that suit more environments, introduction of new herbicides and new machinery technology such as direct drill and GPS-based controlled traffic systems.

By contrast, sheep technology has remained relatively stagnant since the quantum changes in productivity that resulted through technologies such as fencing, mechanical shearing, mechanisation, ‘sub and super’ and exotic perennial pastures. Nevertheless, huge variation still exists between producers in costs of production and production efficiency.

Table 1 provides data on the labour efficiency for sheep and beef operations in Victoria. Increased production per hectare and adoption of more efficient production systems and management practices such as optimising time of lambing and turn-off, work amalgamation and access to sheep handling equipment that allow more efficient undertaking of routine tasks such as mustering, drenching, dipping, jetting and crutching are characteristic of more profitable producers. Selection of ‘easy-care’ sheep that are more resistant to disease, require less intervention when lambing and are more resilient and require less supplementary feeding during periods when there is a shortage of paddock feed could also reduce labour costs and make sheep production more appealing.

Table 1. Labour efficiency (DSE/labour unit) for Victorian farms (2010/11)

Region	Enterprise	Average	Top 25%
Gippsland	Sheep	4,782	5,509
	Beef	8,076	9,063
NE Victoria	Sheep	4,570	5,876
	Beef	7,156	11,649
SW Victoria	Sheep	7,506	7,460
	Beef	13,464	15,004

Source: Victorian Department of Primary Industries: Sheep Farm Monitor Project Summary of Results 2010/11

There is however limited information available on the break-down of labour use in sheep production systems and the relative importance of different management and genetic approaches to labour saving and the profitability of different enterprise types and the whole farm. Identifying the ‘critical control points’, together with knowledge of current management, sheep genotype and production levels will provide MLA with insights for an investment program for further research, development and extension work to improve labour efficiency and profitability. The project outcomes would also allow farmers and farm management consultants that have knowledge of the ease and cost that farmers can alter management, to focus their decision-making and management on components of their production system that will provide predictable impacts on labour requirements and profitability. If the major structural issues primarily related to labour scarcity and scale of the sheep enterprise can be overcome there is potential for substantial gains in productivity, especially given more favourable outlooks for sheep meat and wool prices as well as allowing for expansion of sheep numbers either through scale or new entrants.

The key aims of this project were therefore:

1. To identify the importance of saving labour in the sheep enterprise and identify critical periods of the year in which saving labour has the highest value (i.e. a relative economic value for labour in different months).

2. To identify the relative importance of specific management and genetic interventions to improve labour efficiency and its impacts on profitability.

The analysis was completed using MIDAS. MIDAS is an economic analysis tool for whole farm agricultural economic evaluation which has been widely used for a range of ex-ante and ex-post analyses of livestock, pasture, crop and natural resource management issues. An additional aim of this project was to upgrade the suite of MIDAS models to include labour so these models would be better equipped for future analysis of animal based farming systems in Australia. This will have long term but non-specific advantages for red meat producers, MLA and other stakeholders that have invested significantly in MIDAS outcomes.

2. Project objectives

1. By 30-Jun-11, upgrade and standardise the ‘core’ MIDAS models and improve the capacity to use MIDAS for economic analysis of issues related to pastures and animals. This includes incorporation of the cattle sub-matrix (from B.LSM.0027)

2. By 30-Jun-11, refine the labour module and incorporate the module into four MIDAS models (Great Southern WA, High rainfall zone South West Vic, Central wheatbelt WA and southern NSW).

3. By 30-Sep-11, collate labour requirements for the range in farm activities for different enterprises and regions and populate MIDAS modules.

4. By 30-Sep-11, identify the importance of saving labour in the sheep enterprise and identify critical periods of the year in which saving labour has the highest value (i.e. a relative economic value for labour in different months).

5. By 30-Dec-11, identify the relative importance of specific management and genetic interventions to improve labour efficiency and its impacts on profitability.

3. General methods

There were two key components to this project: (i) MIDAS model development to include labour; and (ii) bio-economic modelling to identify the relative importance of different management and genetic interventions to improve labour efficiency and its impacts on profitability.

(a) *Model developments:* Four versions of MIDAS, representing four regions of southern Australia, were adapted to take account of the demands for labour in the sheep and crop enterprises over the course of a year. This included consultation with industry to collate labour requirements for the range of farm activities. The approach adopted by Rose (2011) for including labour requirements was refined by adding some crucial elements to the relationships between labour and farm production. The integration of these production relationships into the model structure of MIDAS was also improved through the development of a labour module. This improved the ease with which labour constraints could be integrated into other versions of MIDAS. The four regions modelled included the Great Southern of WA, Central Wheatbelt of WA or the Cereal Sheep Zone, southern Victoria and southern NSW.

    To maximise the value of adding the labour module other improvements to these core MIDAS models were also made. This included incorporation of the cattle sub-matrix developed in the High Rainfall WA project (B.LSM.0027), modifying the standard sheep module to allow ewe nutrition profile to affect progeny performance and incorporate the findings from the Lifetime Wool project, and upgrading the rotation structure of the Great Southern model to standardise it with the other regularly used models and including the pasture module that was developed in the EverGraze project.

(b) *Bio-economic modelling to improve labour efficiency*: The upgraded MIDAS models with the addition of the labour module were initially used to identify the critical periods during the year for labour saving for different production systems and to develop the relative economic values for labour requirement in each period of the year for each production system. The production systems examined varied in relation to the genotype of the sire (Merino or terminal sire), lambing time (May, July and/or August) and finishing system for lamb (stores or finished). A range of specific management and genetic labour saving interventions were then analysed to determine the fit in each farm system and the impact on profitability. Finally, the impact of labour supply on value of increasing reproductive rate and fleece weight, and the impacts of the shape of the relationships between stocking rate and labour requirements per sheep on farm profit were quantified. The outcomes from each of these analyses are reported separately below.

Activity #1: Critical periods for labour on a cereal sheep farm in wheat belt of WA

Analysis

This analysis quantified the value of extra labour or improved labour productivity for different periods through the year. These results can then be used to identify specific management and genetic approaches to saving labour that are likely to generate the best returns for farmers. The focus for this analysis was the Cunderdin area in the Central Wheatbelt of Western Australia, just over 100 km east of Perth. (Fig. 1). It is comprised of the Corrigin, Quairading and Dowerin Shires. The 350 mm rainfall isohyet runs through the centre of the regions.

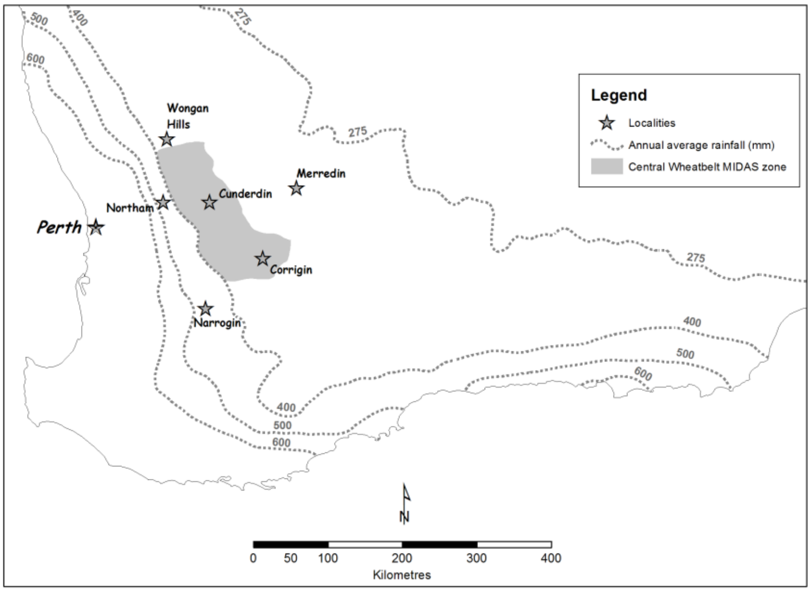


Figure 1. Coverage of the Central Wheatbelt version of MIDAS

The Central Wheatbelt of WA has a broadly similar climate to agricultural regions in other parts of southern Australia, however the average annual rainfall is relatively low and on average less than 20% of this falls outside the growing season. Mixed crop-livestock farms make up the majority of farm businesses. The average crop area is between 50 to 60% although this varies significantly depending on the mix of soils on each farm and farmer preference. The major crops grown in the region include wheat, barley, lupins and canola. Sheep are the dominant livestock and are grazed mainly on annual pasture, although a small area of perennial species are grown. Wool production makes up the majority of the sheep enterprise by value of production, although prime lamb production has increased in recent years as a result of improved prices. The sheep flock is lambing in May, being shorn in September and the husbandry programme includes crutching, drenching, jetting, vaccinating and lamb marking. The timing of these jobs are based on what is typical in the region.

MIDAS (Model of a Integrated Dryland Agricultural System) is a whole farm bio-economic model that describes mixed crop and livestock farming enterprises in a number of regions in southern Australia. Relationships for a large range of a production options are described as well and the interactions between these options. The model is built within an optimisation framework which enables model users to quickly identify the set of activities that meets a desired objective. In the case of MIDAS, the objective function is whole farm profit. MIDAS is a representative farm model, calibrated to describe a farming system that is typical of those within a geographic region that is defined by climate and soil type. It is a year-in-year-out model that compares two production states, but does not model the transition between states. The model comprises a number of sub-matrices representing different components of the farming system, and full details of these sub-marices in MIDAS are generally given elsewhere (Young 1995; O'Connell *et al.* 2000; Bathgate and Blennerhasset 2000; Young et al. 2011). Labour demand for different production activities was specified for 17 periods throughout the year. There are four periods over sowing, three over harvest and the remaining periods correspond with the months outside sowing and harvest. Labour can be supplied from the farm owner, permanent employees or casual employees which can be utilized during sowing and harvest.

The analysis was carried out with the labour requirement dataset developed by Rose (2011). The base assumption for the analysis was that the owner/operator was the only labour unit and that they select a farm programme that is possible with only their labour and that they allocate their time between jobs to maximise profit. The analysis was done in two steps:

1. Determine the potential increase in profit and the change in the farm programme if availability of labour did not constrain the farm programme

2. Examine the change in profit if labour availability was increased in each period individually.

For the second part of the analysis the labour provided by the owner was increased by 20 hours in each period (20 hours is equivalent to around 1 hour per day for most of the periods) without increasing the owner allowance (i.e. the increased labour supply has no cost). The increase in profit achieved indicates the pay-off for that period if greater labour output could be achieved.

Results and Discussion

When the requirement for labour was removed for all the activities performed on the farm the farm profit was increased by over $200,000. This was accompanied by higher stock numbers, higher stocking rates (although a decrease in pasture area) and over 100ha of perennial pasture (lucerne). This demonstrates there is a large potential for labour saving technology or practices to benefit mixed farm enterprises in the Cereal Sheep zone. When labour availability is increased for each period individually most of the periods show little or no value from the increase labour supply (Table 2). The results clearly demonstrate that the sowing period (L6 – L9) is one of high demand for labour, and labour shortages during this time severely limit the productivity of the farm enterprise. The shortage of labour is exacerbated because sowing coincides with lambing and preparation of paddocks for cropping and sowing conflicts with the need to grain feed ewes and frequently monitor mobs. The higher profit from extra labour availability is achieved through increases in stock numbers and stocking rate.

Table 2. Increase in profit ($/farm) from increasing labour availability by 20 hours in each period with 2 different length for the base working day.

		Length of base working day	
Labour period	Period start	9 hour day	10 hour day
L1	1 Jan	0	0
L2	1 Feb	0	0
L3	1 Mar	0	0
L4	1 Apr	6,300	0
L5	1 May	6,300	0
Sowing L6 – L9	8 May	45,500	41,900
L10	1 June	6,900	0
L11	1 July	0	0
L12	1 Aug	0	0
L13	1 Sep	6,300	0
L14	1 Oct	6,300	0
Harvest L15 - L17	1 Nov	nc	nc
L18	21 Dec	0	0

nc: Value for the harvest period was not calculated.

The results also showed that additional labour immediately pre and post sowing also improves farm profit but by a smaller amount of around $6,000-7,000 annually and it drops to zero if the owner's work day increases to 10 hours/day. This implies that the labour supply is limiting when the owner works 9 hrs/day but an extra one hour per day is sufficient to cover the shortage. Other results have indicated that the value of increasing the supply of labour in just one period is limited by the requirement for labour in other periods. This indicates that farmers have developed systems in which the requirement for labour in livestock enterprise is spread across a number of months of the year and there is not just a single bottleneck. Constraining the model to a lower area of crop than is optimal in an attempt to represent a pasture dominant system in this region showed that the critical period for labour was June. In this pasture dominant system the main requirement for labour was during the lambing period when supplementary feeding and frequent monitoring is required.

We concluded that in the cereal-sheep zone the most critical period during the year for labour is during seeding and the period just prior and just after seeding. An extra 20 hours during this period can increase profitability by up to $45,000 per annum. Other than this critical period there was no other single bottleneck but rather a number of months in which labour would need to be simultaneously increased to achieve increases in profit.

Activity #2: Scoping the benefits of saving labour strategies in sheep enterprises in different regions of Australia

Analysis

The analysis in this section of the report was undertaken using MIDAS. As an optimising model it is able to select the best farm strategy for a given set of assumptions from a large range of options. The relationship between labour supply and production levels of different enterprises in mixed farming systems was first considered in MIDAS by Doole *et al*. (2009). BankWest data was used to model the statistical relationship between labour and production for crop and sheep enterprises. However this approach was oversimplified and lacked the detail necessary to estimate the impact of labour saving technologies for different component of the production system. This method was improved by Rose (2011), where the role of labour in different parts of the crop and livestock production systems was made explicit. This study refined the approach adopted by Rose (2011) and added some crucial elements to the relationships between labour and farm production. The integration of these production relationships into the model structure of MIDAS was also improved through the development of a labour module. This improved the ease with which labour constraints can be integrated into other versions of MIDAS. Four versions of MIDAS, representing four regions of southern Australia were adapted to take account of the demands for labour in the sheep and crop enterprises over a calendar year. The four regions included: Great Southern of WA (GSWA), Central Wheatbelt of WA or the Cereal Sheep Zone (CSZ), southern Victoria (SWVic) and southern NSW (SNSW).

A multi-factorial analysis was completed to examine the effect on profit of improvements in the efficiency of labour allocated to sheep husbandry for two lambing times in each of the four regions. The benefit of improved efficiency was determined for each of a range of husbandry tasks as well as the benefit of improving efficiency of all tasks simultaneously. In addition to reducing the time taken to complete individual husbandry tasks the benefits of implementing each of five management changes/innovations was also explored. These were: (i) running larger mobs of sheep; (ii) employing contractors to complete certain tasks; (iii) adoption of lick feeders; (iv) breeding of “easy care” sheep; and (v) adoption of shedding sheep . These were assessed for four scenarios that differed in the availability of labour as an input to production.

Each change above has different demands for labour through the year, and therefore will have differing impact on the optimal production mix and hence differing effect on farm profit. Running larger mobs of sheep has the advantage of reducing the time required to monitor and muster sheep. Contractors were assumed to reduce the requirement for farm labour to undertake drenching, vaccinating, jetting and dipping. Lick feeders were assumed to reduce the time taken for grain feeding, by reducing the frequency of feeding to once per fortnight, from twice per week. Easy care sheep were assumed to reduce requirement for drenching and jetting and monitoring. Underlying these assumptions is that easy care sheep are more resistant to internal parasites and less prone to fly strike. Shedding sheep on the other hand eliminate the need for crutching and shearing as well as jetting and dipping. However, there is also a reduction in wool income as wool is shed in the paddock and not retrieved. Key results for the factorial analysis and analysis of management/innovation were summarised for each region and used to determine the impact of improving labour efficiency on farm profit between four regions of southern Australia.

The analysis of labour in farm production systems using MIDAS was carried out in two steps:

1. Identification of the benefit of reducing the time required for each individual job carried out on sheep properties.

2. Evaluation of specific technologies for saving labour. The technologies evaluated were:

i) Easy care sheep. Assumed to require less monitoring (-50%), can be run in larger mobs (+50%), require less drenching and jetting (-50%) and are 20% cheaper to shear and crutch.
ii) Running sheep in larger mobs (+50%), as may be the case with rotational grazing.
iii) Lick feeders which reduce (up to 25%) the amount of time required for supplementary feeding.
iv) Non-wool (or shedding) breeds of sheep that do not require shearing, crutching, jetting or dipping.
v) Use of contractors for major sheep husbandry jobs (drenching, vaccinating, jetting and dipping).

In each case the labour saving possible and any trade-off with production for each technology has not been quantified on farms so the modelling has been based on estimates of likely savings. Details on key assumption regarding labour efficiency are given in Tables 3 to 9.

Table 3. Hours worked by each labour unit

	Usual		Seeding	
	Week days	Weekend days	Week days	Weekend days
Owner labour	10	4	12	6
Permanent labour	8	-	9	-
Casual labour	8	-	8	-

Table 4. Proportion of owner labour required for supervision

Labour type	Periods 1-5, 10-18	Periods 6-9 (Seeding)
Permanent	7%	2%
Casual	25%	15%

Table 5. Time required for mustering and monitoring sheep flocks

		Mustering	Flock monitoring	
		Time required per mob	Times per week	Hours per mob
Lambs	Merino	1.5	5	0.50
	Merino sold 5 months	1.5	5	0.50
	Merino prime lamb	1.5	5	0.50
	Cross bred-Sucker	1.5	5	0.50
	Cross bred-CO	1.5	5	0.50
Lambs	Post weaning	1.2	1	1.00
Ewes		1.0	1	0.75
Wethers		1.0	1	0.50
Hoggets		1.0	1	0.75

Table 6. Time required for grain feeding.

Filling sheep feeder		
Capacity of auger	1000	Bushel/hr
Time required to fill sheep feeder	0.10	hr/load
	6.0	mins
	0.0010	hr/bushell
Transport between paddocks	0.20	hr/paddock
	12.0	mins/paddock
Frequency of feeding	2.0	/week

Table 7. Time required for fertiliser spreading

	Width of spreader (metres)	Speed (km/hr)	Field efficiency (%)	Rate of application (hr/ha)	Helper time% of tractor hrs (%)
Super Phosphate	20	20	30	0.08	10%
Urea	15	20	30	0.11	10%

Table 8. Pasture cover curve for annual pasture

Pasture period	Feed on offer			
	S1 (kg / ha)	S2 (kg / ha)	S3 (kg / ha)	S4 (kg / ha)
P1	428	450	450	450
P2	858	913	913	913
P3	2,201	2,289	2,448	2,448
P4	3,185	3,342	3,788	3,788
P5	3,895	4,106	4,781	4,781

Table 9. Number of sheep per hour for each husbandry activity

	Drench	Jetting	Dip/Backline	Feed lot	Weaning	Marking	Weighing	Classing	Drafting	Shearing	Crutching
Lambs	300	400	400	1,000	200	500				333	800
Lambs sold 5 months	300	400	400	1,000	200	500	300			333	800
Carryover XB lambs	300	400	400	1,000	200	500	300			333	800
Sucker XB lambs	300	400	400	1,000	200	500	300			333	800
Hoggets - ewe	280	300	300					300		333	800
Hoggets - wether	280	300	300					300		333	800
Ewes	280	300	300						500	333	800
Wethers	280	300	300							333	800

An analysis was also carried out to examine the impact of altering the amount of labour that was required to manage the pasture resource for flocks with varying grazing intensity. It was expected that as grazing intensity increases the amount of time required to allocate the pasture resource to the high priority mobs will increase. However, there is no empirical evidence to calibrate the model so a sensitivity analysis was carried out to examine a range of assumptions (Fig. 2). Three different assumptions were examined:

1. Linear: Labour required to allocate the pasture increases proportionately with increasing sheep numbers, so at 15 DSE/ha the amount of labour for pasture monitoring and allocation is 3 times that required at 5 DSE.

2. Standard: Standard assumptions which increases the amount of labour required at 15 DSE/ha to be 5 times that of 5 DSE/ha.

3. Exponential: Labour requirements increase dramatically as stocking rates increase such that the labour required at 15 DSE/ha is 9 times that of 5 DSE/ha.

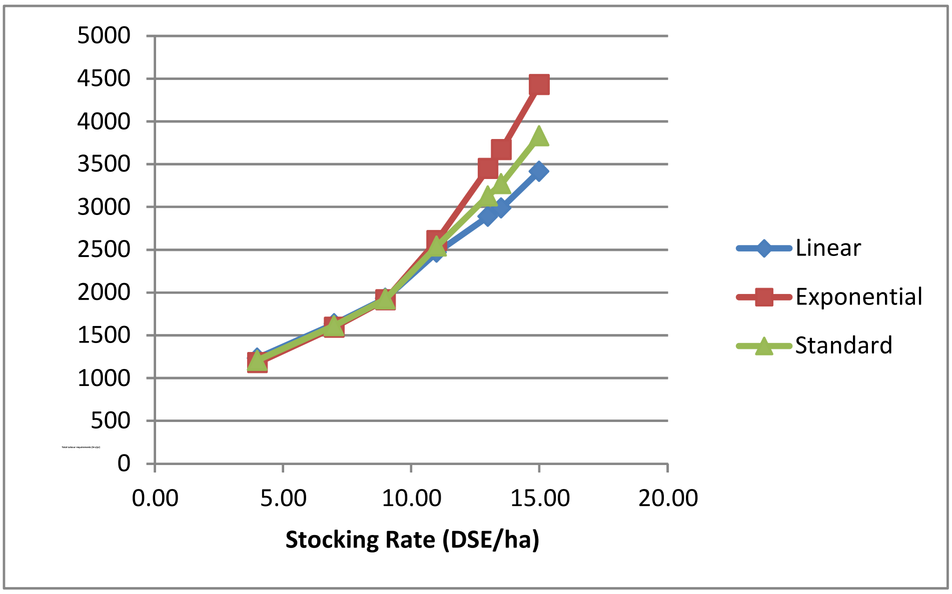


Figure 2. Range of assumptions examined comparing the impact of increasing sheep numbers and stocking rate on labour requirements.

Results and discussion

Standard farms

Table 10. Standard results for MIDAS in each of the study regions with unlimited labour available for hiring.

	Southern NSW	Cereal Sheep Zone	Great Southern	Hamilton
Profit	$269,000	$71,900	$293,700	$484,000
Area (ha)	1000	2000	1000	1000
Pasture area (%)	54	41	100	100
Stocking rate (DSE/ha)	11	5.2	13.5	23.7

Southern NSW:	May lambing self replacing merino ewe flock with proportion of ewes mated to a terminal sire. Pastures based on mixed annuals or lucerne with mixed annuals.
Cereal Sheep zone:	May lambing merino ewe flock with all ewes mated merinos. Pastures based annuals only.
Great Southern:	July lambing self replacing merino ewe flock with proportion of ewes mated to a terminal sire. Pastures based annuals only.
Hamilton:	September lambing self replacing merino ewe flock with proportion of ewes mated to a terminal sire. Pastures based on a combination of lucerne, perennial ryegrass and summer active fescue depending on location in the landscape.

Effect of labour constraints on farm profit

Constraints on the supply of farm labour had a significant impact on both the level of farm profit and the optimal mix of enterprises in both the mixed crop/livestock farms and the livestock only farms (Table 11 (a-d)). This result was consistent for the two times of lambing tested for each of the four regions. Profit increased significantly as the supply of labour increased. The difference in farm profit between an owner operated farm compared with a farm with unlimited labour was around $70,000 in southern NSW (SNSW). This difference is much greater for Hamilton (SWVic) and the Great Southern of WA (GSWA) where the difference in profitability was around $300,000 and $200,000 respectively. The difference in profit between unlimited labour and unlimited labour with no cost was $10,000 for the CSZ and SNSW, whilst the difference was $80,000 for SWVIC.

These differences are a measure of the potential effect of labour saving technology on profit where a farmer is able to employ as much labour as required. The majority of the increase in profit results from saving in the cost of labour. The difference in profit between owner labour only and unlimited labour with no cost is a measure of the potential gains of labour saving technology and is the gain that could be achieved if the farmer could carry out all operations themselves without the need to hire labour. The gains consist of the increase in profit resulting from running higher stock numbers and the reduction in cost of hired labour.

Effect of labour constraints on pasture area and livestock enterprise

The optimal pasture area increased in GSM and SNSW as the constraint of labour input on production was removed. In SNSW the area of pasture was more than double with no labour restrictions, whilst in GSM pasture area increased by between 10-50% depending on the time of lambing. In contrast for the cereal sheep zone the optimal pasture area was significantly lower with the removal of labour restrictions. This increase in crop area is an important adjustment to capitalise on removing the constraint on labour (Fig. 3). This indicates that labour shortage in the cereal sheep zone is impacting on the profitability of the sheep enterprise and would be contributing to the move toward farms with 100% crop in the CSZ, however this is not the case in the other regions.

Table 11. Farm profit, optimal DSE numbers and percentage area of pasture for four labour scenarios in each region.

(a) Southern NSW

	May lambing			August Lambing		
Labour supply	Profit ('000)	Pasture %	DSE	Profit ('000)	Pasture %	DSE
Owner labour only	197	23	1,500	191	24	1,688
Owner + casual	206	20	1,500	205	18	1,539
Unlimited labour	269	46	5,200	268	48	6,605
Unlimited labour – no cost	279	49	5,600	279	48	6,815

(b) Cereal Sheep Zone WA

	May lambing			July Lambing		
Labour supply	Profit ('000)	Pasture %	DSE	Profit ('000)	Pasture %	DSE
Owner labour only	41	61%	4,945	65	57%	4,445
Owner + casual	56	50%	4,790	77	43%	4,440
Unlimited labour	72	41%	4,240	93	46%	5,015
Unlimited labour – no cost	81	37%	4,230	103	45%	5,705

(c) Great Southern Model

	May Lambing			July Lambing		
Labour supply	Profit ('000)	Pasture %	DSE	Profit ('000)	Pasture %	DSE
Owner labour only	69	69%	4,375	69	73%	4,725
Owner + permanent	132	69%	8,185	140	74%	9,130
Unlimited labour	242	78%	10,350	294	100%	13,525
Unlimited labour – no cost	274	80%	10,770	316	100%	14,715

(d) Hamilton

	September Lambing			November Lambing		
Labour supply	Profit ('000)	Pasture %	DSE	Profit ('000)	Pasture %	DSE
Owner labour only	217	100%	12,135	24	100%	6,595
Owner + permanent	338	100%	18,545	46	100%	12,000
Unlimited labour	484	100%	23,720	129	100%	18,875
Unlimited labour – no cost	561	100%	23,740	167	100%	19,010

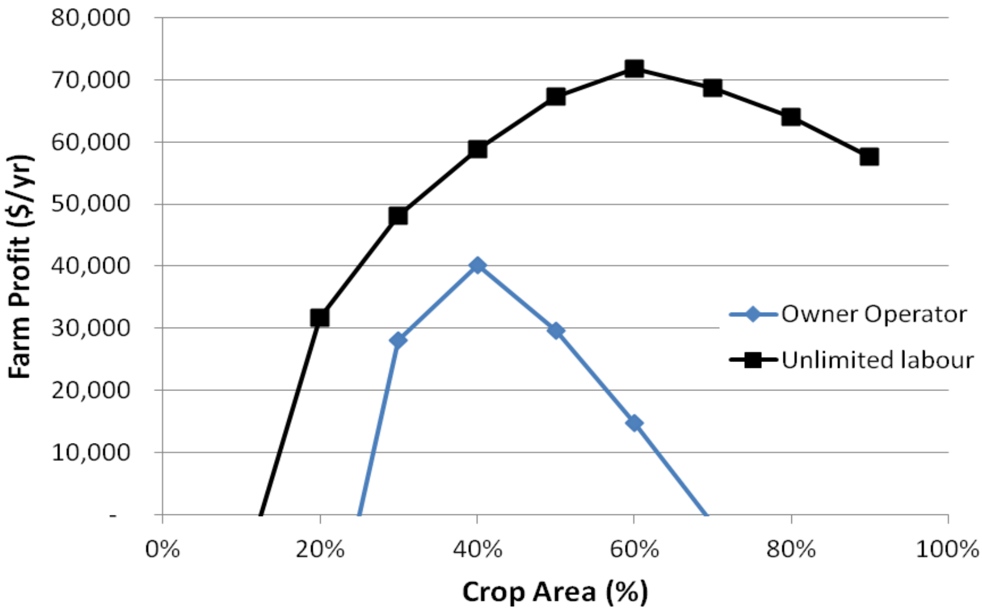


Figure 3. Importance of altering crop area in response of varying labour availability in the Cereal Sheep zone.

For all regions stocking rate was increased with the greater supply of labour. The number of DSEs was more than doubled in three regions between the restrictive owner operator scenario and the unlimited labour supply scenario. In the CSZ the number of livestock only increased by 20%. Employing a casual labourer at specific times when there is a labour shortage (such as seeding and harvest) or one full time permanent does not fully overcome the labour constraints on livestock production. This is highlighted by a comparison of the difference in profit between the owner only scenarios and the casual/permanent labour option and the difference between the casual/permanent and unlimited option. This comparison shows that employing a casual or permanent employee provides less than half of the potential profit increase and much less than half of the potential increase in livestock numbers.

The results from all four regions show that limitations on the supply of labour have a dramatic effect on farm profit and the optimal livestock numbers. This suggests there is potential to significantly increase farm profit by reducing labour input per unit of production. The labour demand profiles show that for most regions the demand for labour is very seasonal and is not matched to the steady supply that is achieved with owner operator labour or a hired permanent labourer. If farmers are unable or unwilling to hire casual labour then they are unable to match supply to the seasonal labour demand. Therefore technology or strategies that reduce the labour required in the seasonal peaks will allow producers to increase profitability by better achieving the potential of their farming system. Even in the CSZ, where the results show that labour constraints are limiting crop production to a greater extent than livestock production, livestock production is higher when restrictions on the available supply of labour are removed. This is shown by the higher number of DSEs run with unlimited labour and the much higher stocking rate. Indeed, stocking rates are much higher for all regions when the labour supply is not restricted.

Demand for labour in production

Figures 4 (a-d) show the demand for labour in sheep production (hrs/1000 DSE per week) for the four regions examined in this study. The hours of labour required for production has been standardised across the regions to remove the effects of sheep number and length of labour periods, which differ between models. The CSZ has the highest peak demand and this occurs in periods 6 and 7 which are at the break of season, this is reflecting the large requirement for supplementary feeding at the break of the season for an autumn lambing flock; this is consistent with Activity #1. Hamilton has the most even spread of labour requirement across the season. The peak in labour demand in each region corresponds with the periods in which most supplementary feeding is undertaken. Differences in the peak demand for labour between regions occur because of differences in the time of lambing and the consequent times of sale of lambs. The results therfore indicate that there may be potential gains in productivity through targeting efficiencies in effort required to feed supplementary grain to livestock. The labour demand for CSZ also indicates a potential conflict for labour demand with the cropping enterprise.

Figures 5 to 8 show the distribution of labour demand for the sheep enterprise over the year and how it changes with land-use, flock type, grazing intensity & time of lambing. Tables A1 (a-d) in the Appendix show the detailed labour use for crop and sheep as well as the unused labour in each period, for the four regions. Figure 5 indicates that the potential conflict in demand with cropping can be alleviated to some extent by adjusting lambing time in the CSZ. Figure 8 also shows that labour demand for the sheep enterprise can be shifted to later in the season (after the season break) because this reduces the requirement for supplementary feeding at the break of the season. However, both figures indicates a potential conflict later in the season at harvest time.

Changing the type of flock from a wool focused flock to a meat focussed flock has a relatively small impact on the distribution of labour demand (Fig. 6) although the total demand for labour in SWVic is higher for a self replacing meat focussed flock than a merino only flock mainly associated with extra supplementary feeding and feedlotting of lambs. The results from Fig. 7 show that the amount of labour used in the sheep enterprise in the Great Southern region of WA increases significantly as stocking intensity is increased, this is associated with the extra supplementary feeding and the extra monitoring required with the higher stocking rate. This highlights a challenge for researchers and research funders in improving the profitability of sheep enterprises through improving labour efficiency. That is, the potential increase in profit shown in Tables 11 (a-d) can only be achieved by increasing stocking intensity and that in itself leads to increases in requirement for labour. In addition, improvements in either availability or efficiency are required in most periods. Therefore changes to the production system that alter the labour required in only a few periods are unlikely to result in substantial gains in profit.

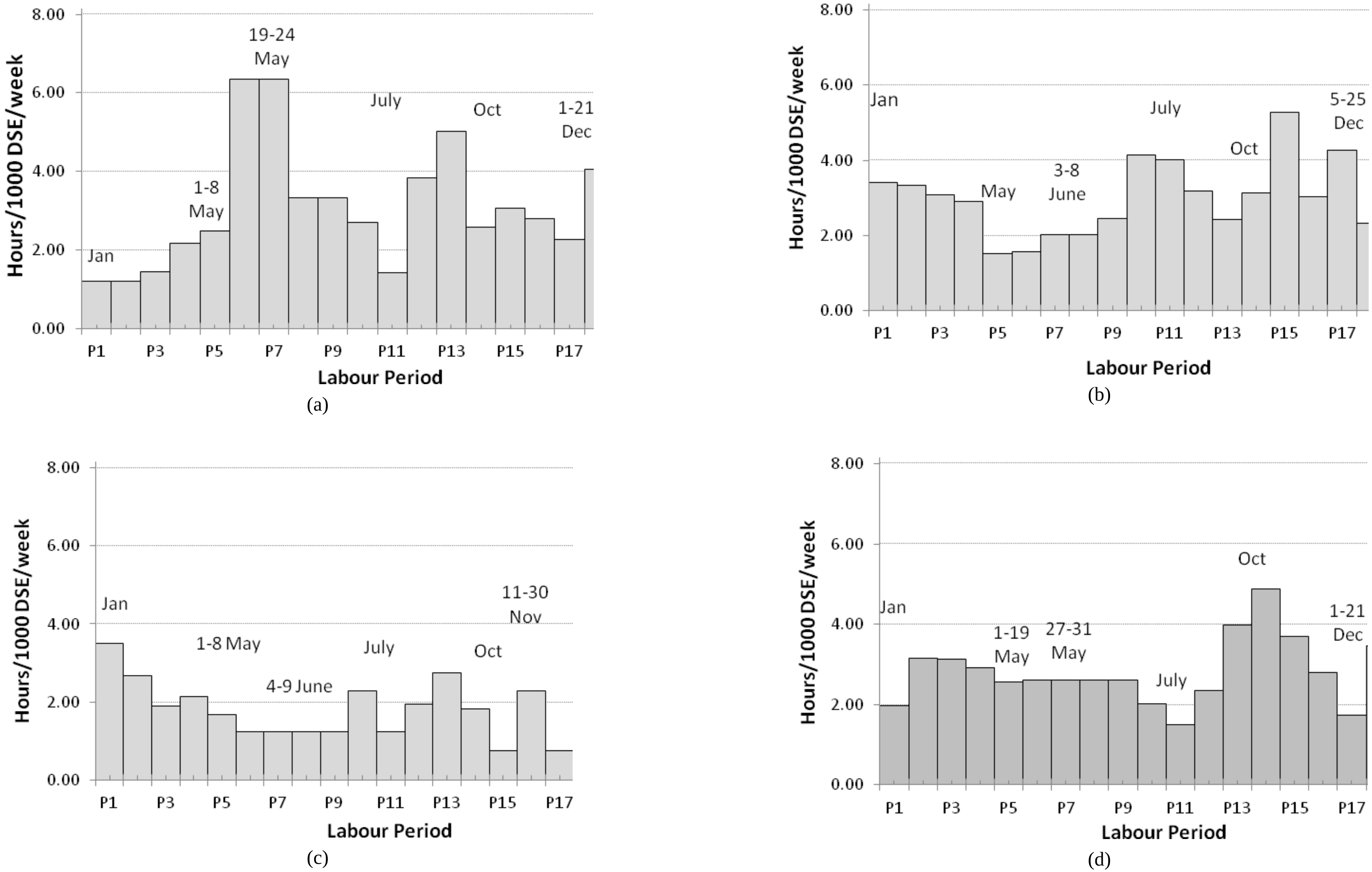


Figure 4. Demand for labour in the sheep enterprise in each period: (a) Cereal Sheep Zone (b) SW Victoria (c) Great Southern & (d) southern NSW

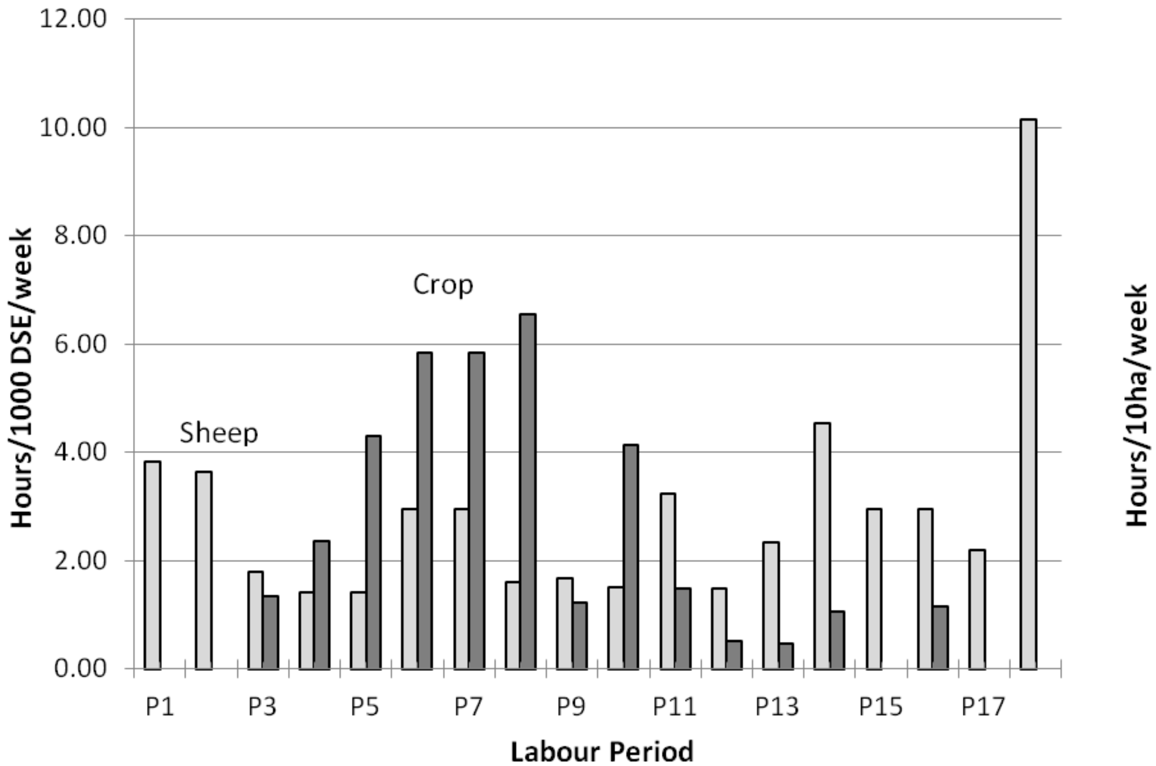


Figure 5. Labour demand through the year for the sheep enterprise compared with the crop enterprise.

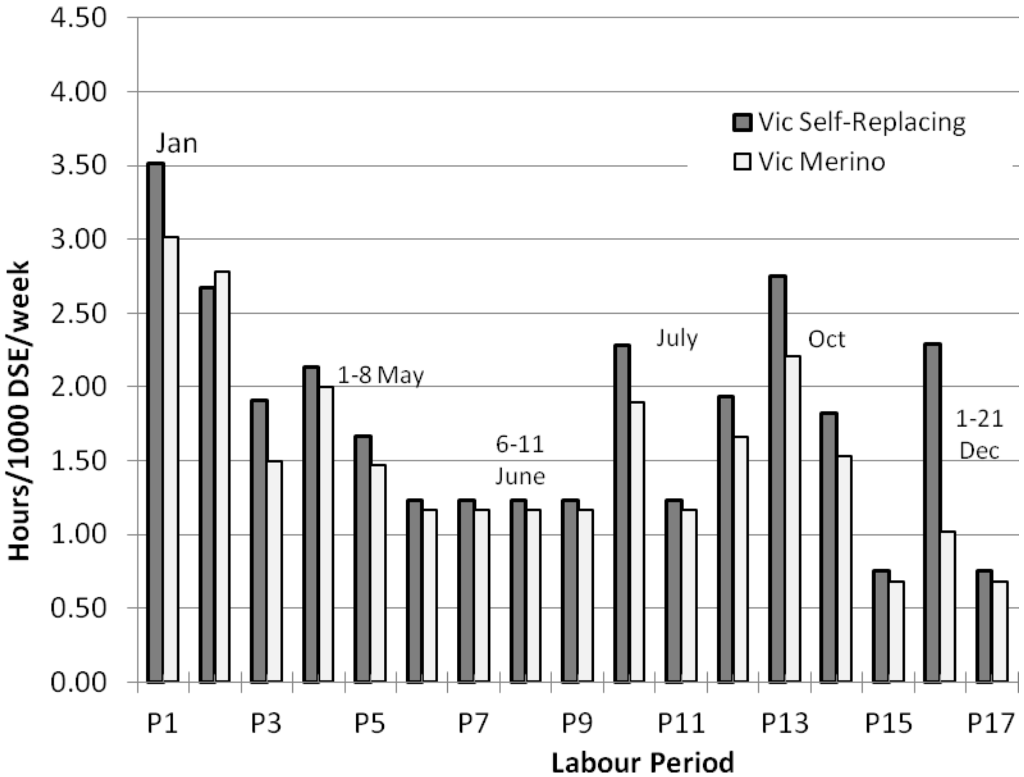


Figure 6. Labour demand through the year for the sheep enterprise with a comparison of a Merino Wool flock and a self replacing flock in which surplus ewes are mated to a terminal sire.

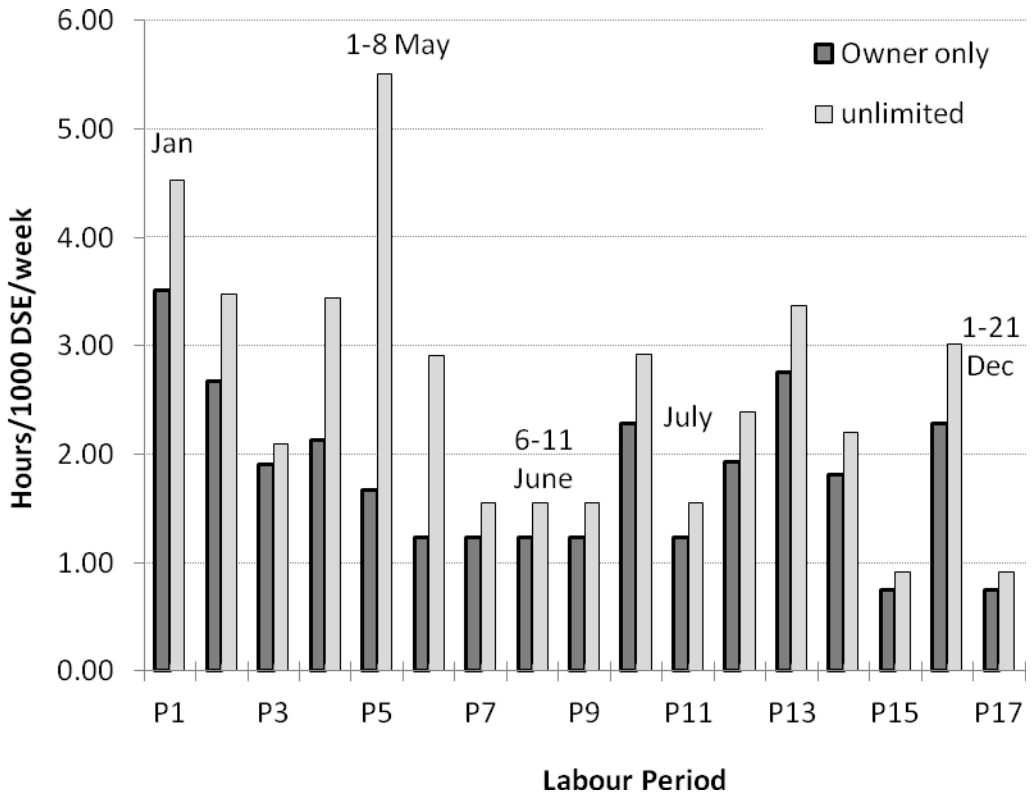


Figure 7. **Labour demand through the year for the sheep enterprise comparing a low grazing intensity system (Owner only) with a higher intensity grazing system (Unlimited).**

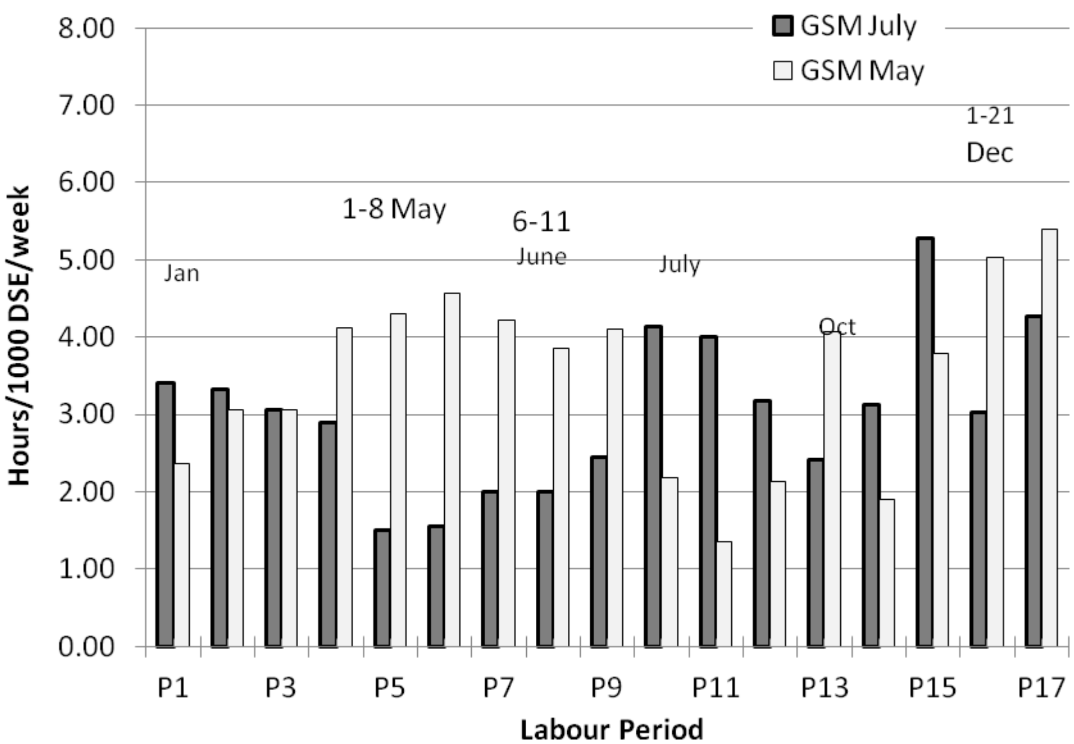
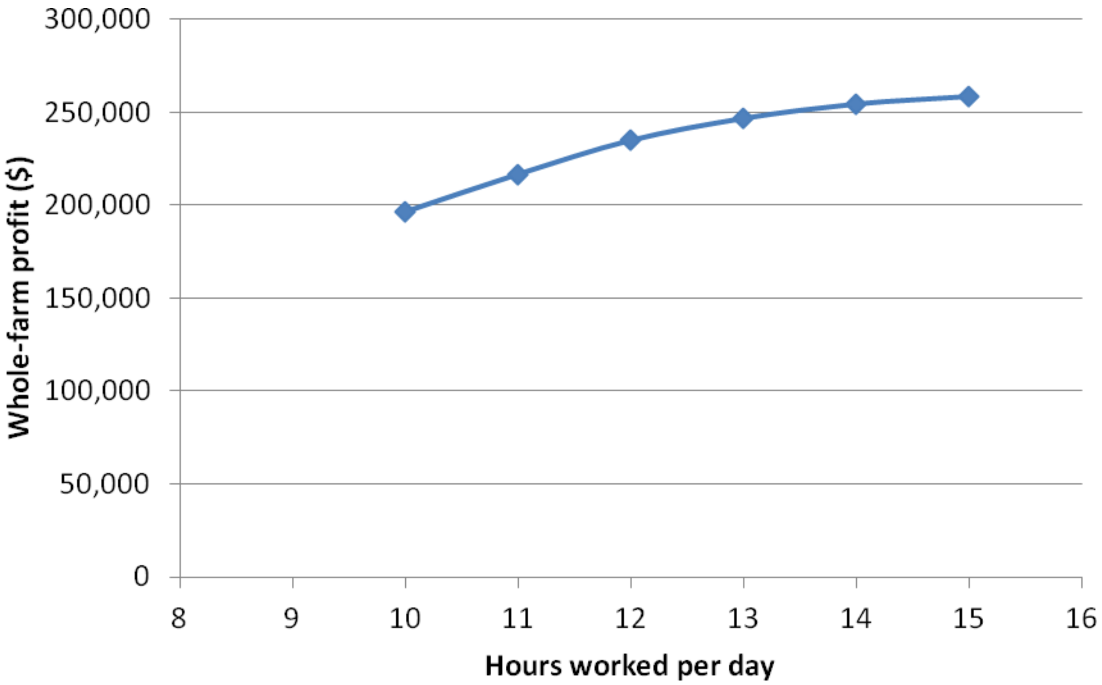


Figure 8. **Labour demand through the year for the sheep enterprise comparing May and July lambing.**

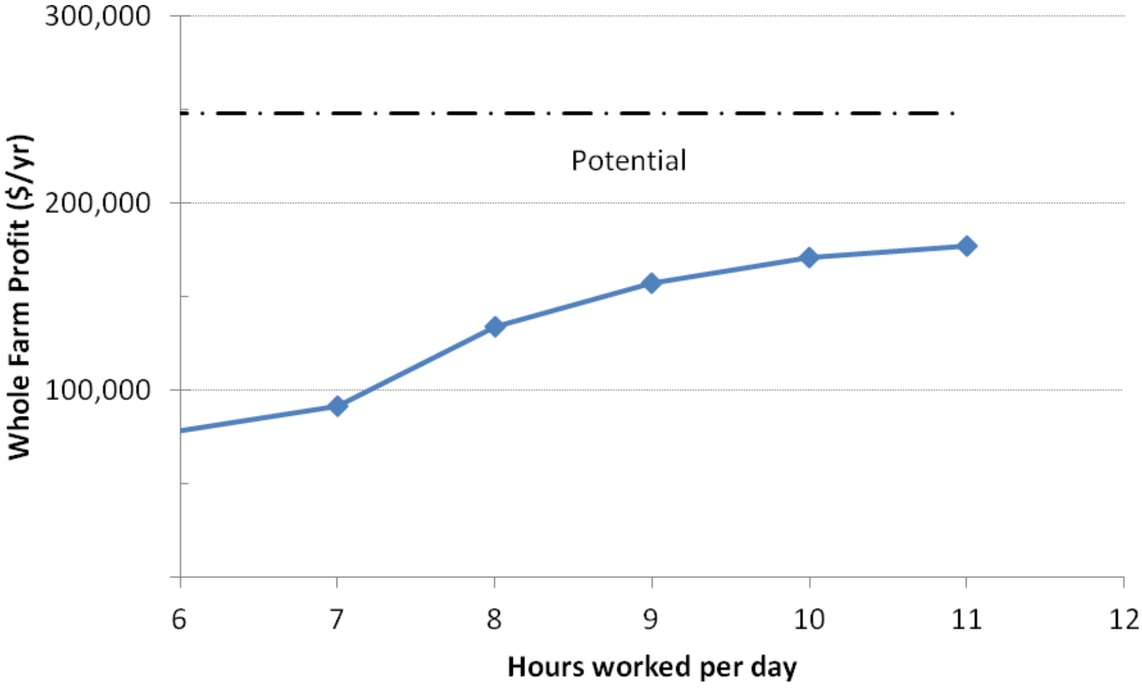
Increasing owner operator labour

Increasing the hours worked by the owner operator only realises a small proportion of the total potential benefits of reducing labour constraints (Fig. 9 a-d). In the SNSW region, where it was assumed that the farmer works 10 hours per day and 8 hours during the weekend, farm profit is $197,000. Farm profit increased by around $17,000 for every additional one hour per day worked, up to 13 hours per day. Additional time worked above 13 hours per day resulted in a much smaller increase in profit, which peaked at just over $250,000. This is around $20,000 less than the profit achieved when there are no constraints on the hiring of labour. This demonstrates that increasing the supply of labour through increasing hours of work by the owner operator cannot alone address the labour constraint faced by many farm businesses. This is consistent with result from other regions, the main difference is that the gap between the profit from working additional hours and the unlimited labour scenarios is much greater in CSZ, GSWA and SWVic. Owner labour is unable to fully compensate for low labour availability because there are insufficient owner hours available during the times of peak demand.

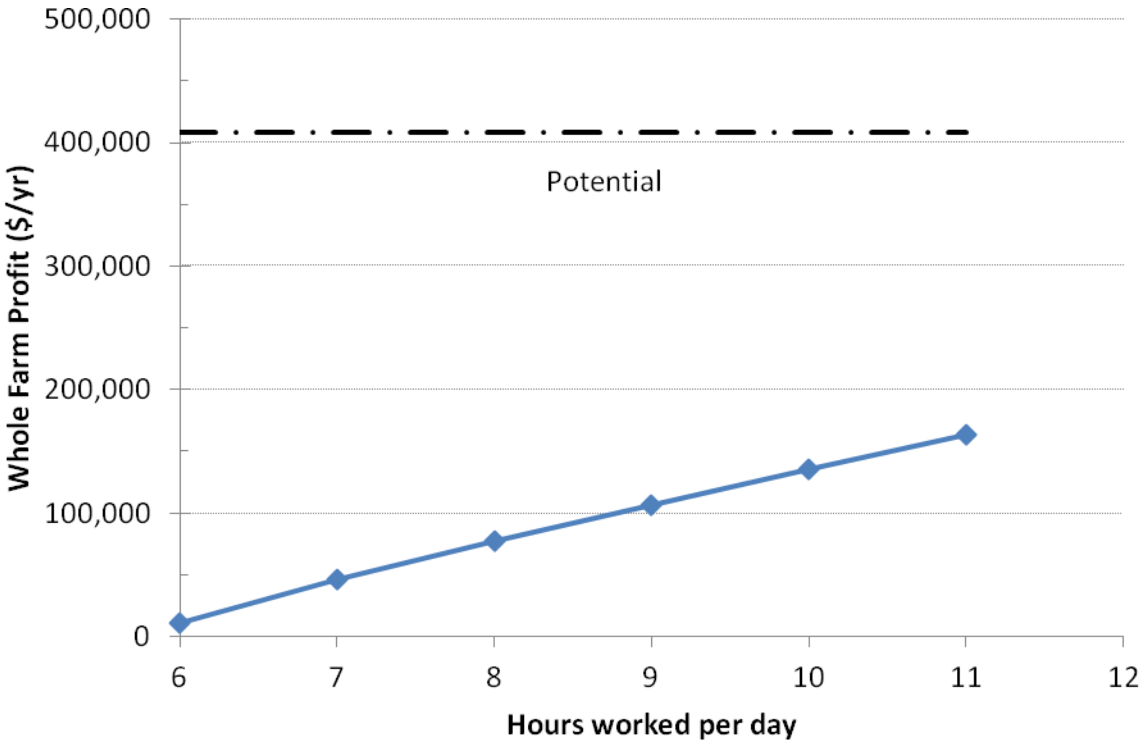
(a) Southern NSW



(b) Cereal Sheep Zone



(c) Great Southern



(d) Hamilton

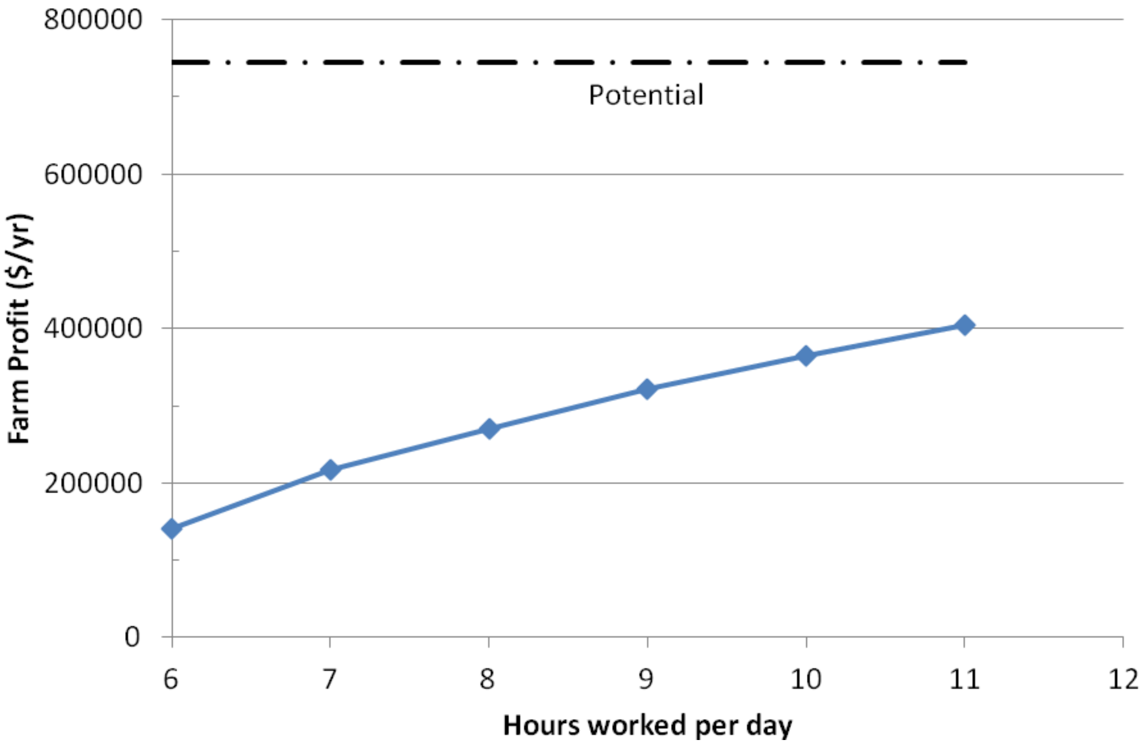


Figure 9. Relationship between whole-farm profit and input of owner labour in the absence of hired labour.

Labour efficiency of husbandry tasks

Table 12 shows the effect of improving efficiency of individual husbandry tasks on farm profit. In general improving efficiency of most individual husbandry tasks in most regions has little or no impact on farm profit. Drenching in all regions except SNSW, dipping for GSWA and SWVic, drafting and weaning in SWVic and shearing in GSWA are the exceptions, at some times of lambing. Differences between regions occur because different distributions of labour demand affect the extent to which efficiencies free up sufficient labour at times that it may be utilised to increase production and hence profit. That is, freeing up labour in itself is not sufficient to increase farm profit unless the spare labour created by the efficiency can contribute meaningfully to other tasks that will increase production. An important consideration when assessing potential value of increasing efficiency is the cost of implementing strategies or technologies that might reduce labour input. This analysis provides the total level of benefits from reducing the requirement for labour and provides the upper limit on what farmers could spend to achieve the specified labour savings. The ability to generalise in regard to directions for research to improve labour efficiency on individual husbandry tasks is limited because of varying results across regions and scenarios.

Labour efficiency for general tasks

Table 13 shows the results for tasks that involve changes in labour input in a number of periods, rather than one or two periods as occurs for the husbandry tasks shown in Table 12 husbandry. Reducing labour input for most general tasks in the GSWA and SWVic leads to large profit increases. Sheep monitoring and grain feeding led to the biggest increase in profit across all regions. Reducing labour input to pasture monitoring was also of high value in GSWA and SWVic. Efficiencies in mustering and administration were of high value in most scenarios examined.

Table 12. The increase in farm profit that can be achieved from improving the efficiency of labour utilised in husbandry jobs. The increase in efficiency reflected a reduction in the time required to complete each job of 50% of the standard assumptions.

(a) Owner only

Husbandry	SNSW		CSZ		GSM		Hamilton	
	May	August	May	July	July	May	Sept	Nov
Drenching	652	0	0	9063	7936	5328	8262	0
Jetting	0	0	0	3400	14	12	2784	0
Dipping	0	0	0	0	5648	1262	0	0
K.FLTime	0	0	0	0	0	0	158	367
Weaning	0	0	0	0	0	0	3583	0
Marking	0	0	193	0	0	0	0	0
Weighing	0	0	0	0	0	0	0	2797
Classing	0	227	0	0	2115	0	1106	0
Drafting	0	580	0	1984	0	0	9437	0
Shearing	651	0	0	0	3538	0	0	0
Crutching	0	104	0	0	0	0	0	0

(b) No labour limitation

Drenching	0	1	0	345	1636	1150	3695	909
Jetting	0	0	0	167	598	308	1036	0
Dipping	0	94	0	0	436	135	911	548
K.FLTime	0	94	0	0	86	0	395	369
Weaning	0	0	0	0	94	0	1286	967
Marking	0	83	90	0	0	0	545	0
Weighing	0	0	0	0	134	0	821	730
Classing	0	62	0	0	114	0	238	0
Drafting	123	62	0	100	276	0	1052	0
Shearing	0	62	0	0	960	0	1848	1132
Crutching	94	62	0	0	94	311	417	0

Table 13. The increase in farm profit that can be achieved from improving the efficiency of labour utilised for general jobs. The increase in efficiency reflected a reduction in the time required to complete each job of 50% of the standard assumptions.

Management tasks	SNSW		CSZ		GSM		Hamilton	
	May	August	May	July	July	May	Sept	Nov
(a) Owner only								
Husbandry	0	3,754	194	12,669	18,033	6,479	18,167	3,299
Administration	0	1,613	1,520	6,840	27,223	24,395	22,144	12,208
Learning Crop skills	4,819	807	1,841	1,774	6,954	6,292	-	-
Learning past. Skills	2,077	1,518	1,227	1,183	1,159	1,049	3,390	2,035
Mustering	1,038	8,048	237	9,362	7,858	3,779	18,167	-
Sheep monitoring	1,498	7,087	6,442	9,139	13,735	13,733	39,490	6,814
Feed wheat	6,495	2,563	2,554	2,042	-	-	-	-
Feed barley	5,974	-	1,144	167	23,345	29,872	-	-
Feed oats	5,550	1,152	-	-	17,464	25,417	-	-
Feed lupins	0	3,276	1,368	-	31,810	40,833	-	16,344
Pasture monitoring	3,350	0	1,416	1,608	12,013	9,996	31,794	7,670
Sheep maintenance	2,887	3,754	0	0	-	-	-	-
(b) No labour limitations								
Husbandry	218	414	90	345	4,091	1,907	11,603	4,655
Administration	471	62	201	638	1,852	2,686	3,019	1,634
Learning Crop skills	233	62	115	223	436	547	-	-
Learning past. Skills	117	62	77	154	76	91	454	228
Mustering	428	62	108	453	1,980	1,218	11,923	3,180
Sheep monitoring	1,192	62	600	925	5,543	6,650	20,011	3,556
Feed wheat	650	62	480	422	-	-	-	-
Feed barley	844	62	515	898	-	-	-	-
Feed oats	0	62	-	-	-	12,229	12,362	-
Feed lupins	0	62	377	381	10,064	2,734	-	12,614
Pasture monitoring	747	62	183	363	3,933	4,793	9,688	3,640
Sheep maintenance	0	62	0	0	94	0	1,629	0

One important issue not explored in this analysis was the extent to which there are trade-offs with changes to labour input. For example, reducing time to monitor sheep or pasture may have unintended impacts. Less time in the paddock may reduce farmers knowledge about the general state of the production system, and consequently less effective decisions about farm strategy. However, there is currently only limited data on the potential trade-offs.

Specific labour saving packages

Tables 14 and 15 show the potential increases in profit that would result from a package of changes to the livestock enterprise. The results show using contractors for some tasks improves profit significantly in the GSWA but not in SWVic. In GSWA the jobs for which contractors are available occur through periods of the year in which the owner is fully occupied and therefore utilising contractors can increase profit, however, the increase is only 10% of the total gains that could be made if casual labour could be readily employed. To expand the benefits from using contractors would require expanding the range of jobs that they perform.

There are large benefits to EasyCare sheep in all scenarios and regions. The large profit increase from EasyCare sheep is a result of a combination of reduced labour input, reduced shearing and crutching costs (-20%) and increased mob size. There is the possibility of production trade-offs resulting from different genetic production potential of EasyCare sheep. The results indicate that a reduction in fleece value of 10-15% would offset the benefits of EasyCare sheep for the producer with unlimited labour however, this increases to 25-30% for the owner operator who is unwilling or unable to hire labour.

Lick feeders provide significant benefits also by reducing frequency of carting grain to the paddock. The benefits of both lick feeders and Easycare sheep are highest for the higher rainfall regions. The benefits to the CSZ are higher than those for SNSW which is in line with total sheep numbers, also in the CSZ there is a much larger area of crop and there is more competition for labour around the season break. Freeing up labour at this time not only advantages the livestock enterprise but provides a potential for improvements in labour use in the cropping enterprise the cropping enterprise.

The results show that adopting shedding sheep has a negative impact on farm profit if reproductive rate is the same for the non-wool sheep as the merino. Previous analysis (Young unpub) has shown that non-wool sheep require a 40-50% increase in reproductive rate to have a similar profitability to merinos. This previous analysis was done with unlimited labour, combining the two sets of results indicates that for producers who are unable or unwilling to hire labour, reproductive rate would only need to be between 10 and 15% higher for the non-wool sheep to be equally profitable. This level of extra production appears to be realistically achievable.

Table 14. Increase in profitability from adopting labour saving packages in the Great Southern of WA and south west Victoria.

Innovation	GSWA				SWVic			
	July		May		Sept		Nov	
	OO	Unlimited	OO	Unlimited	OO	Unlimited	OO	Unlimited
EasyCare	37,617	28,489	34,024	31,180	111,208	78,601	40,074	36,885
Lick Feeders	46,529	13,709	70,722	21,667	1	18,586	18,265	18,931
Large Mobs	18,809	6,488	16,660	7,729	81,337	38,939	30,799	17,199
Non Wool	-35,245	-200,586	-69,134	-241,620				
Use Contactors	20,589	985	10,877	-304	-752	-14,442	-6,482	-11,349

Table 15. Increase in profitability from adopting labour saving packages in southern NSW and the Cereal Sheep zone of WA.

	SNSW				CSZ			
	August		May		July		May	
	OO	Unlimited	OO	Unlimited	OO	Unlimited	OO	Unlimited
EasyCare	16,165	13,777	14,095	11,318	21,914	13,985	27,050	11,809
Lick Feeders	4,330	1,483	9,699	1,363	5,143	5,384	13,651	6,626
Large Mobs	10,357	2,336	8,662	1,485			6,443	600

Change in distribution of labour demand

Figure 10 (a-d) shows the change in the demand for labour in each region when running larger mobs of sheep. Two key features are evident. Firstly there is a fairly even reduction in labour requirement across the year, particularly for GSWA and SWVic. Secondly, the reduction in labour requirement per 1000 DSE/week is fairly small. Interestingly, the regions where the benefits are highest have the lowest reduction in labour requirement per 1000 DSE. However, the total reduction in labour is highest by virtue of the greater number of DSE run on farms in these two regions.

The reduction in labour in Figure 11 (a-d) shows the affect of introducing lick feeders into paddocks. The benefits in each region correspond closely to the relative changes in labour requirement over the year. SWVic has the lowest benefit for an owner operated farm (September lambing), mainly because the need for supplementary feeding is low because of the inclusion of summer active perennials in the farm system. Figure 11c shows that the reduction in labour occurs in only two periods and the total labour saved is less than 1 hour per week for every 1000 DSE. GSWA on the other hand has the largest reduction in labour and lick feeders result in the highest benefit of all of the regions. They are also of benefit in the CSZ but the benefits are much smaller. This is mainly because the reduction in labour requirement in the first half of the year is balanced by the need to employ more labour in the second half of the year.

The distribution of the reduction in labour requirement for EasyCare sheep is similar to that for running large mobs of sheep (Fig. 12). However, the absolute reduction in labour requirement was higher for EasyCare sheep, thus the benefits of adoption are much higher than for runner large mobs of sheep. The impact of using contractors for drenching, dipping, vaccinating and jetting on the distribution of the requirement for labour is shown in Figures 13a and 11b. In most periods the impact on the requirement for labour is minimal, however, in the periods that include the summer drenching there is a reduction in labour requirement. Adoption of non-wool sheep reduces the labour requirement for sheep particularly over the early spring and summer months which coincide with fly control strategies and shearing (Fig. 13c). However, there is an increase in late spring which coincides with the finishing and sale of the lamb progeny.

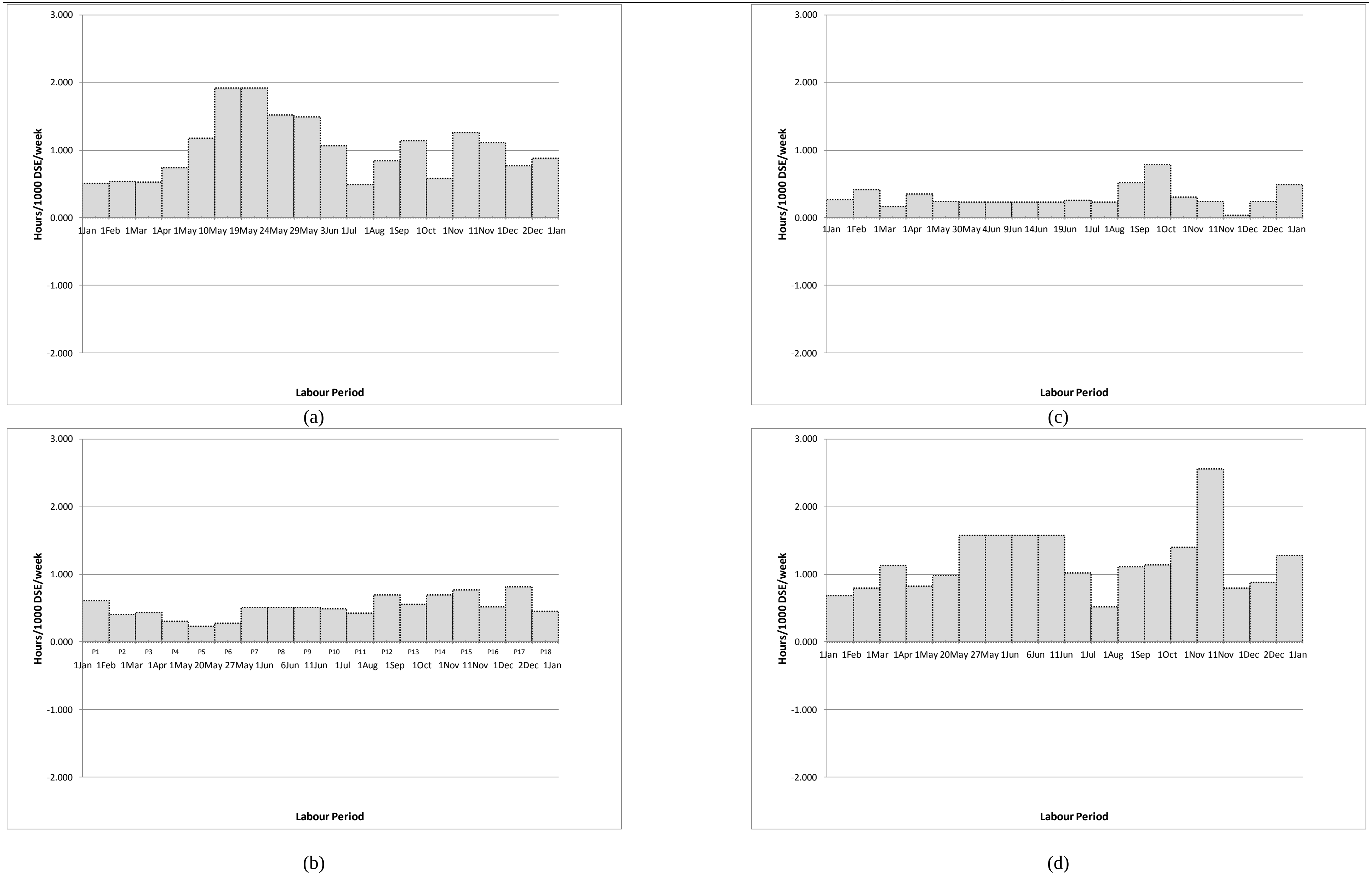


Figure 10. Change in labour requirement for the sheep enterprise when sheep are managed in larger mobs. (a) Cereal Sheep zone, (b) Great Southern, (c) SW Victoria, (d) southern NSW.

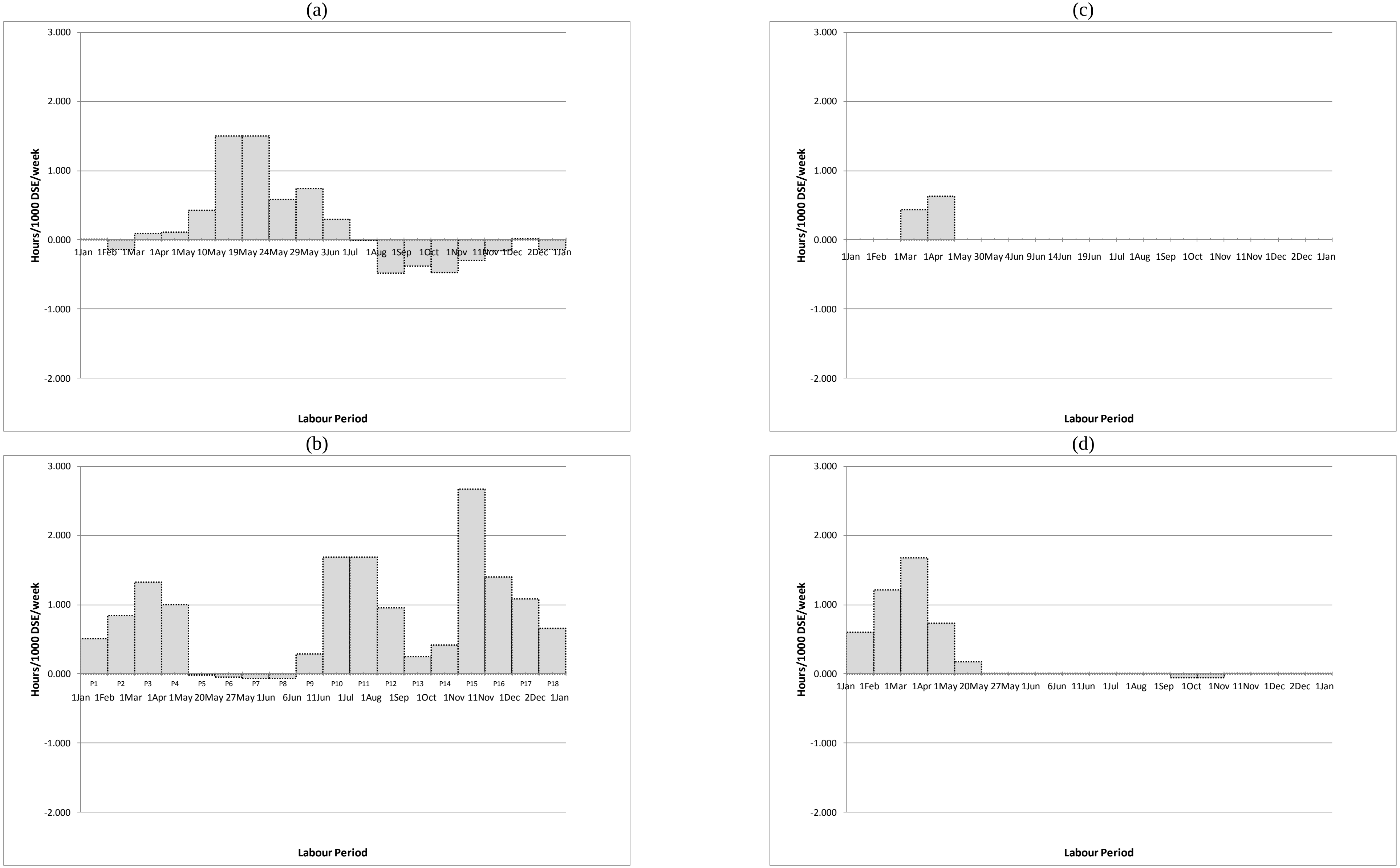


Figure 11. Change in labour requirement for the sheep enterprise when supplement is fed using lick feeders. (a) Cereal Sheep zone, (b) Great Southern, (c) SW Victoria, (d) southern NSW.

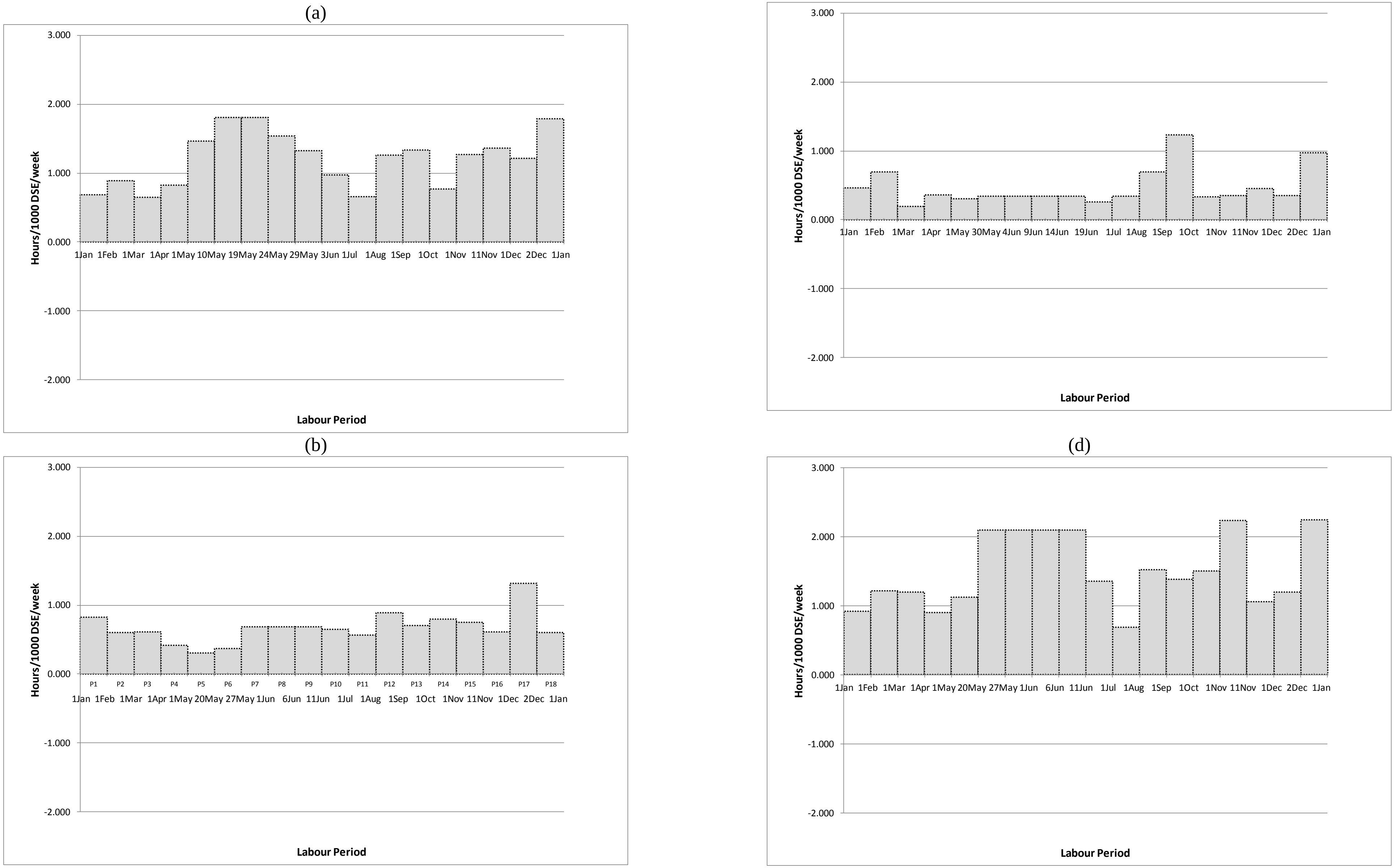
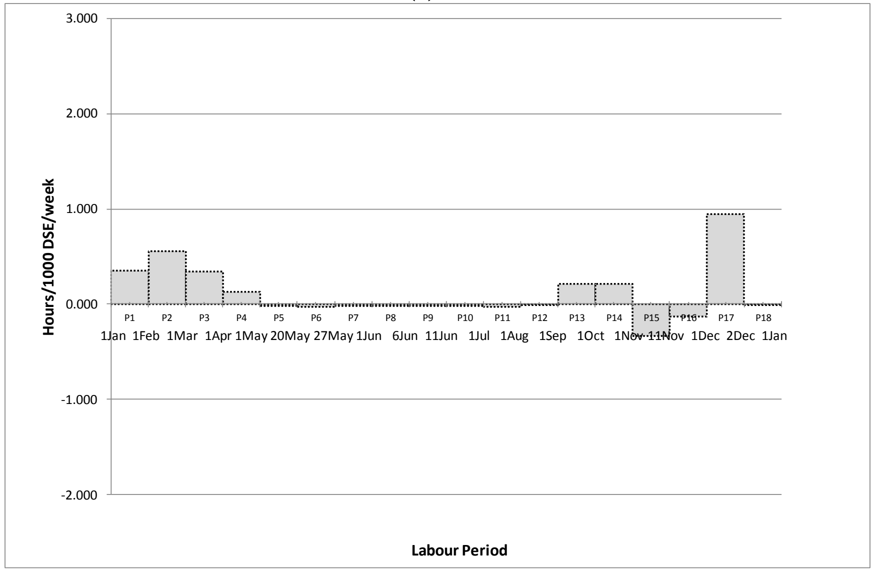
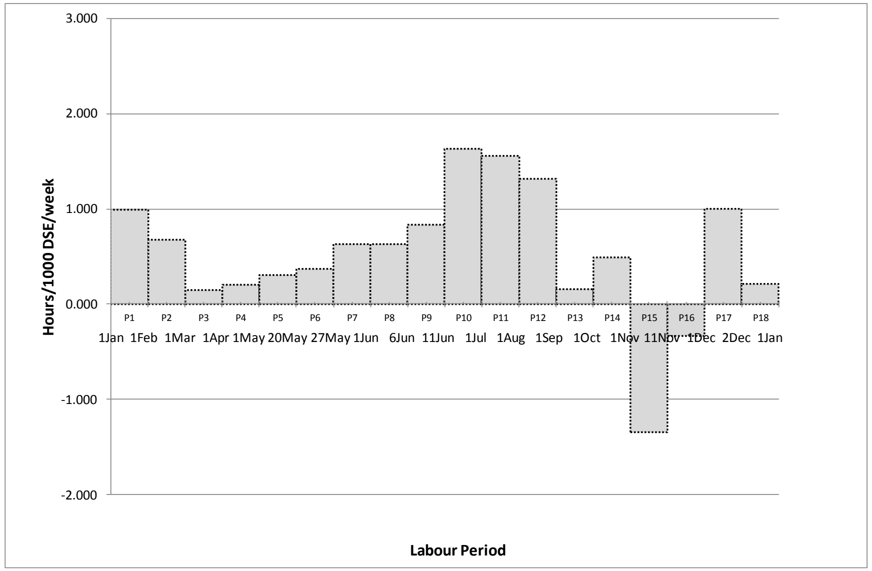


Figure 12. Change in labour requirement for the sheep enterprise from running 'Easy Care' sheep. (a) Cereal Sheep zone, (b) Great Southern, (c) SW Victoria, (d) southern NSW.

(a)





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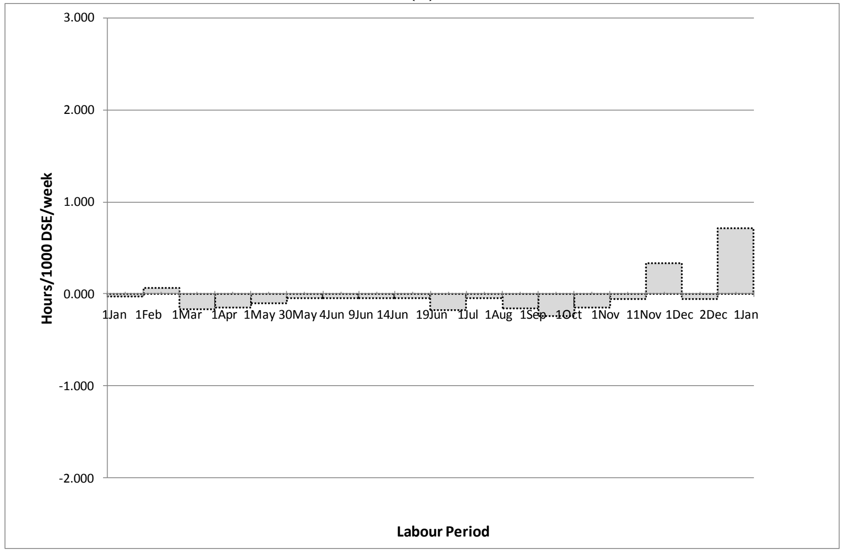

Figure 13. Change in labour requirement for the sheep enterprise from using contractors to perform drenching, vaccinating, jetting and dipping (a) Great Southern, (b) SW Victoria and from running non-wool sheep (c) Great Southern.

Impact of labour supply on importance of reproduction and wool production and optimum turnoff age of lamb

Increasing the supply of labour increased the total value of improving reproductive rate as measured by $/farm (Fig. 14). However, the extra increase in profit when more labour was available was solely due to the higher number of ewes on the farm because the increase in profit, expressed as dollars per ewe per 10% improvement in lambing percentage, was the same for each of the labour scenarios. This indicates that improving weaning rate is equally valuable for an owner operator as it is for a farmer with more labour, so the only difference is the scale of the operation. The increase in profitability with increasing weaning rate was also linear for all levels of labour available and there is no sign that there is an optimum weaning rate and that this will vary with the amount of labour available on the farm (Fig. 14). This finding is consistent with the modelling done for the National Reproduction Strategy which showed that profit increased linearly over a wide range of weaning rates.

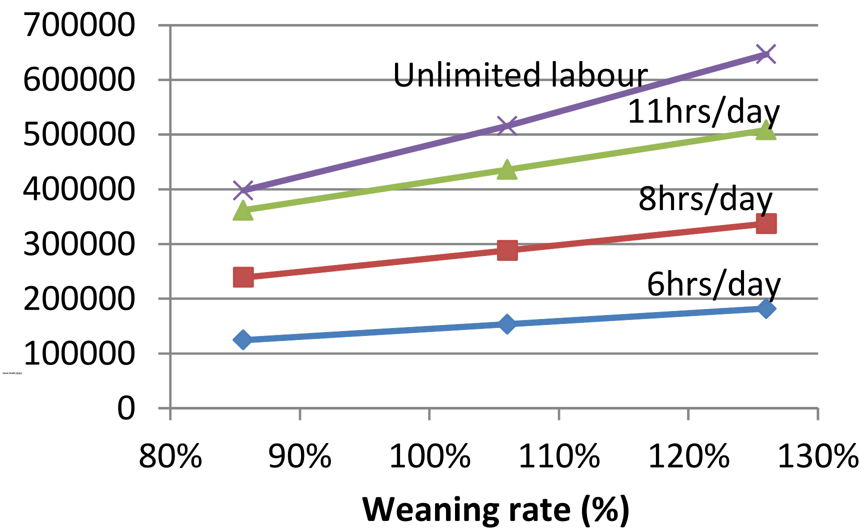

Figure 14. Increase in farm profit due to increasing weaning rate on a property with varying labour supply, ranging from unlimited labour to Owner Operator (OO) working between 6 and 11 hours per day.

Increasing the labour supply increased the optimum clean fleece weight per hectare (Fig. 15) which is in line with increases in optimum stocking rate with increasing labour available on farms. There did not appear to be an extra effect of labour on the optimum level of clean fleece production because wool production per DSE did not vary with extra labour except on farms that have the option of growing Lucerne. On these farms adjustments to capitalise on having extra labour involves altering pasture species mix and flock structure and CFW/DSE was reduced by approximately 10% when labour was increased from 6 hours/day to 11 hours/day.

Constraining the amount of labour available on the farm also did not affect the optimum sale age of prime lambs. The optimum sale time was turning off lambs out of a feedlot at 5.5 months of age. Increasing the hours worked per day by an owner operator from 6 hours per day up to 11 hours per day did not increase the profitability of selling suckers at 4.6 months of age.

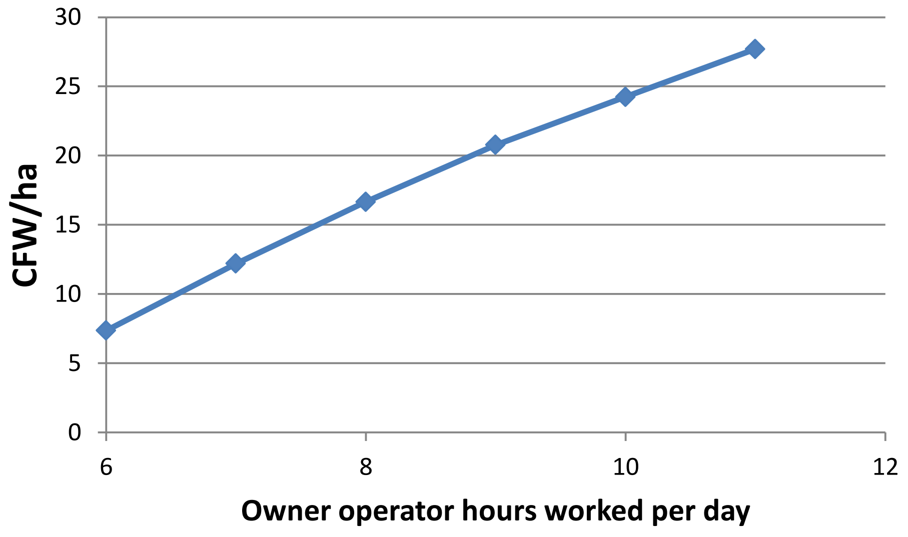

Figure 15. Change in optimum level of clean fleece weight per hectare as the level of labour on the farm changes.

The effects of stocking rate and labour requirements per sheep

Changing the assumptions about the amount of labour required as sheep numbers increase has little effect on the optimum stocking rate on the farm for either the farm with unlimited labour or the farm with owner operator labour only (Fig. 16 and 17). For the farm with unlimited labour there is no change in the optimum stocking rate and the only effect is a change in the amount of labour hired and a corresponding change in profit. On the farm with owner operator labour only the stocking rates are much lower and therefore below the level where the labour requirements are changing. From this analysis it appears that having a detailed understanding of the change in labour requirements of the sheep and how it changes as stock numbers change is not a high priority.

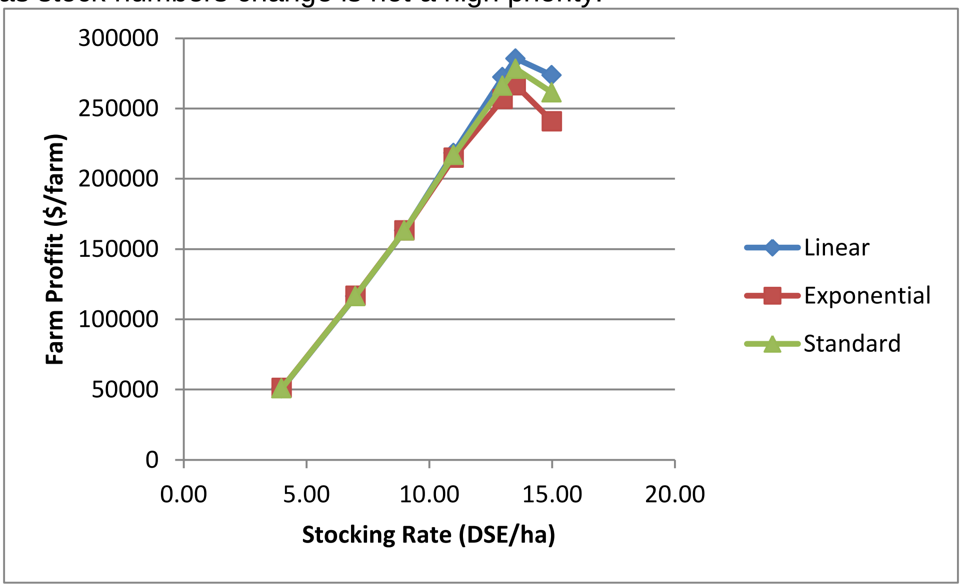

Figure 16.The effect of altering the assumptions about impact of increasing sheep numbers on labour requirements for a farm with unlimited labour (Great Southern, July lambing).

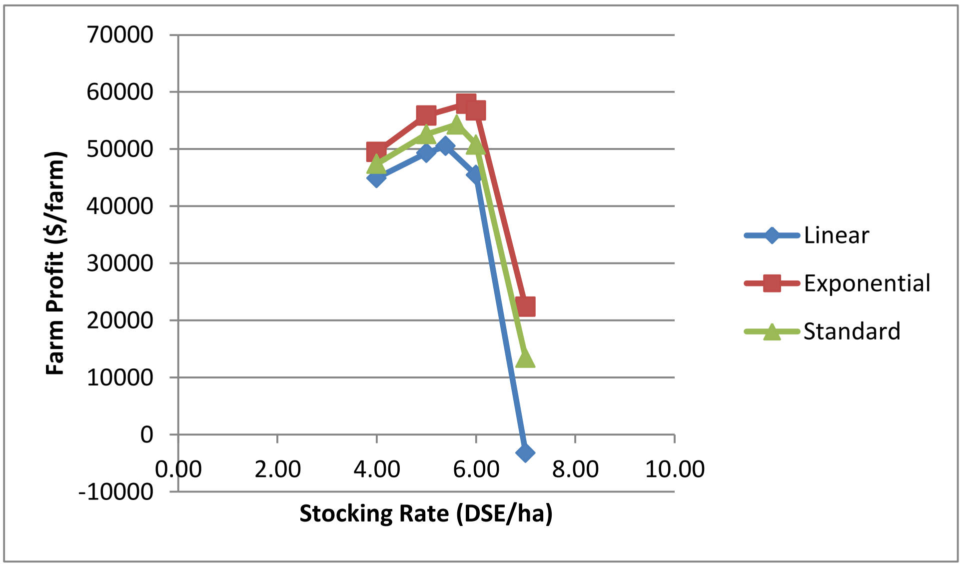

Figure 17. The effect of altering the assumptions about impact of increasing sheep numbers on labour requirements for a farm with owner operator labour only (Great Southern, July Lambing).

4. General conclusions and implications of research findings for industry

Labour shortages on farm clearly have a large impact on farm profitability and MIDAS proved to be a very effective tool for analysis of labour in sheep production systems of southern Australia. There are some general findings from this analysis that have implications for the sheep industry and are researchable issues. These include:

1. Farm profitability could be improved dramatically if labour could be hired to supplement the owner operator. The requirement for labour in sheep production systems is very seasonal, however it is difficult to hire casual labour during these periods because there is no pool of willing workers or some owners are unwilling to employ casual labour. A potential area of research is to improve sheep handling methods to encourage workers to be involved in sheep operations, rather than their current preference for cropping jobs that are machinery oriented. Surveying farmers and examining the impediments to employing more labour would also be valuable to better understand how these impediments could be removed.

2. For a strategy to be profitable across a number of environments and times of lambing it must reduce the requirement for labour for a number of periods of the year. Reducing the labour demand in short windows is not as valuable because labour shortages in other periods will limit the extent to which sheep numbers can be increased.

3. The returns from saving labour are much greater in the sheep dominant higher rainfall regions. Therefore future R&D into labour efficiency should be focussed on the needs of these producers in order to maximise the net benefit to the sheep industry. It is likely that targeting the needs of the high rainfall zone farmers to improve labour efficiency will also lead to benefits in other regions.

4. Quantifying the tradeoffs between production and saving labour would help farmers better prioritise jobs on farm. That is, assessing the production penalty for delaying

jobs from their optimum time. It is likely that some farmers intuitively understand this already and they are the farmers that are able to manage large sheep flocks profitably, whereas others are less likely to maintain per head production when they increase stock numbers and therefore not achieve the expected increase in production per hectare which could lead to a reduction in profit. If the tradeoffs that relate to timeliness of jobs could be quantified then on-farms jobs could be better prioritised. It would also allow improved modelling to help determine optimal job allocation

5. Increasing the efficiency of monitoring sheep and pastures has a high value. Some effort has been expended in the area of remote monitoring of pastures, however, to date there has been limited uptake by producers. The insight gained from this project indicates that the lack of adoption may be due to the focus on technology that provides farmers with data on pasture growth rate. However, information that provides a warning that the animals or pastures need closer monitoring, may be of more value. This would allow the farmers to physically monitor their paddocks and stock less often thus reducing labour input at particular times of the year.

6. Increasing the efficiency of mustering also has a high payoff for most regions and particularly for the regions with high sheep numbers. This indicates that producers may be better off by investing in laneways to allow easy movement of sheep because this is likely to be profitable.

7. Increasing mob size increases farm profit in all regions. One method of managing larger mobs is rotational grazing. Rotational grazing has been evaluated in trials however, the requirement for labour has not been formally assessed to our knowledge. Collecting on-farm data on this would add an extra dimension to the decision about adoption of rotational grazing and using larger mobs.

8. Improving the efficiency of all the husbandry operations has a high payoff for the regions that are livestock dominant. A possible mechanism for achieving this is through improved sheep handling facilities. This improvement dovetails with point 1 regarding making sheep related jobs more acceptable and less physically demanding.

9. One of the limitations encountered in carrying out this analysis was a lack of data on the amount of time producers spend on different jobs. In order to carry out detailed benefit-cost analysis on potential labour saving projects this baseline information would be required. It might be possible to collect this data on-farm if farmers were provided a datalogger and trained in its use. Provided the period of time being logged was kept short farmers are likely to be willing participants.

10. EasyCare sheep and non-wool (or shedding) breeds of sheep both showed as likely to be profitable for the owner operator who is unable or unwilling to hire labour. These two genetic approaches to saving labour are likely to be competing for adoption with the same producers and therefore improving the information available on the productivity of the genotypes and the amount of labour saved would allow more informed decision making.

11. Use of contractors will not lead to large increases in profitability unless the range of jobs that they perform is increased. If farmers become more sophisticated with the management of labour then there is likely to be a market niche for contractors who provide a wide range of services to industry.

12. This analysis has shown that labour management on farms has a big impact on profitability. It is also likely that labour requirement will be an important determinant of the profitability of ‘new technologies’ and before to be able to analyse a new technology

it will be important to have an idea of its labour characteristics. Technologies with different labour characteristics could be adopted by the different groups of farmers (owner only, owner + permanent, owner + casual, unlimited labour) at different levels based on their ability to carry out the necessary jobs. In order to assess different technologies the industry requires a picture of the typical producer's labour profile and the proportion of producers in each group (owner only, owner + permanent, owner + casual, unlimited labour). This would require surveying producers to determine the labour they employ and their attitudes to employing more labour.

13. The time required for farm administration is a major impost on farm management. The majority of the time that we allocated to administration was related to tax compliance (although the records required for tax compliance are also necessary for good farm management), however there may be other administration jobs that could be streamlined.

5. Communications

There has been limited communication of the project outputs as this was not a focus of the Project. John Young presented the key results at two large forums focused on labour efficiency in the sheep industry organised by 'Sheeps Back' in 2012. A series of producer case studies focused on labour effeiciency have also been written by Jill Griffiths (Griffiths Environmental). These case studies complement many of the conclusions from the MIDAS analyses and will be published in rural press and MLA communications following approval from MLA.

Labour efficiency case studies

HEADLINE: BIG PLANS NEED EFFICIENT LABOUR

Snapshot:

Tim and Georgie Leeming
Location: Pigeon Ponds, western Victoria
Property: 1,330 hectares
Enterprise: sheep enterprise – prime lamb; some wool (about 15% of income); some cattle trading and agistment when markets and seasons permit
Livestock: About 7000 sheep – Coopworth composites, Coopworth and White Suffolk gene pool; self-replacing prime lamb flock
Pastures: Phalaris, sub-clover and perennial ryegrass
Soil: Sandy loam
Rainfall: 600-620 mm

Two years ago Tim and Georgie Leeming bought 880 hectares six kilometres down the road from their 450 hectare home farm at Pigeon Ponds, western Victoria. Before the expression of interest to buy the new property had gone in, Tim had already mapped out the contours on an aerial photo and drawn up a water plan.

“There’s a big catchment dam at the high end of the property and a lot of spring fed creeks. From the start my plan was to drought proof the property,” Tim said.

That drought proofing plan includes installing 55 kilometres of fencing and a whole lot of polypipe and troughs over five years and will not only give water security to every paddock but will increase productivity and labour efficiency. So far, 12 kilometres of polypipe have been put in the ground which is 80% of the water infrastructure completed. The Leemings have also increased the area of perennial pastures, with an additional 340 hectares being sown to phalaris, sub-clover and perennial ryegrass in the past two years.

“We have no choice but to be efficient with our labour – we have taken on a big task, and I work off-farm as well and we have two young daughters, so life is busy. When we do a job, we need to do it quickly and efficiently, so we can move on to the next thing.”

Tim’s water plan involves putting in a lot of troughs – one for each paddock. He has costed that out as being more efficient, in terms of cost and labour, for his property than it would be to install dams. Tim and a worker can install three troughs in one day. He has calculated the cost of watering his farm at $75/ha.

Small paddocks bring benefits

"The plan is to have the new farm fenced into paddocks of 16-19 hectares; on the home farm the paddocks average 10 hectares.

"With small paddocks, you can run more stock because you get much better use of pasture, but you have to fence to land classes. If you set it up right, you open a gate and the sheep move themselves.

"Using this approach, we hope to ultimately run about 13 to14 DSE/ha on the new place, when we get the pastures and waters up to scratch and all the fencing done – it'scurrently at 11 DSE. The home farm over the past 10 years has benchmarked at 16-17 DSE/per ha."

Sharing the labour

In the short term, Tim and Georgie decided not to employ full time labour but do most of the work themselves and when needed use casual labour for specific times of the year for tasks such as fencing, lamb marking and weaning.

"We need to set up systems to make it quicker and easier, more efficient and more profitable," Tim said.

"We get contractors in to help through the peak times, which for us is really the selling season – October to November, when we are weaning, selling off the lambs and so on.

"But really, 80 per cent of our current workload is capital works – fencing, water, and pasture improvement."

Tim said contract labour was not an issue in his local area. We have got some great people in our area who are very good at their particular jobs. We also have some great people around that have quiet times that can help with tasks such as fencing.

"There is also a lot of machinery available, thanks in part to a push on cropping a few years back. There are plenty of people around with machinery who are good at what they do and they're only too happy to put it to use," he said.

As with any sheep enterprise, shearing is a time of a peak labour demand. The Leemings ran two three-stand, raised-board sheds last year, with Tim in charge of one and a hired worker in charge of the other.

"My idea with shearing is to get it over and done as quickly as possible," Tim said. "Last year, the guys averaged a couple of hundred sheep a day each or 1,200 per day between them. This year, we'll turn one of the sheds into a four-stand and we'll be looking at shearing 1,350 to 1,400 a day. We aim to shear 9000 this year and will try to keep it under seven days."

A local shearing team is brought in to do the shearing, and shedwork, and last year shearing cost $4.20 per sheep, including all costs from superannuation to meals, and the cost of hiring wool presses.

"I can't see the sense in having thousands of dollars tied up in wool presses when they only get used one week in January," he said. "I'd rather put my money into things that make a difference throughout the year."

Central laneway

Tim said that one of the most important aspects of property's efficiency is a central laneway system which all the other paddocks run off.

"The laneways are the key to being labour efficient," he said. "Whether we are moving stock, checking them, feeding out or checking water troughs, the laneways are the key. This will form our main emphasis this year on the new farm. To date, we have erected 32 km of fencing in two years and hope to total over 35 kms by the end of this year. “I can drive down the laneways and check the sheep. I can even check the water troughs from the ute – the troughs are in the middle of the paddocks because you get more even grazing that way – but we’ve put in bottom-filled troughs with no lids, with fluoro ball floats that we can spot from the laneways, 500 metres away.

“Eventually I’d like to invest in a remote device linked to my mobile for monitoring farm water .”

Managing the sheep

“The ewes start lambing the end of June and go through until August – we split join from the end of January through to the end of March. We have a four-week joining, a week-long pause, then another three weeks. Essentially we join for seven weeks but manage it in two defined lambings. This assists in better feed allocation, more effective animal health and better efficiencies with lamb marking , weaning and marketing later on.

“Our lambs are ready for sale from October through November, and that too is a busy time.

“Up until last year we did our own lamb marking, but last year we contracted it out and that worked really well for us.”

The Leemings have scanned the ewes for multiples for the past 17 years consecutively.

“At lambing time we run smaller mobs – ideally for twins we run mobs of around 120 ewes or less and for singles around 150 to 300. Basically the smaller the mobs, the more you mark. We mark around 130-145%, but ideally will get that up a bit. It is hard on the new farm with poor fencing infrastructure to enable effective mob management and feed allocation.

“We crutch in November using crutching trailers, which are an asset to being efficient. With the trailer, 1,200-1,400 ewes a day can be crutched and given the first summer drench.”

Bigger mobs for joining and supplementary feeding

Aside from during lambing, the Leemings run their sheep, except their single mated stud mobs during joining, in bigger mobs.

“Big mobs are far more efficient when you need to put out supplementary feed.

“Last year we grew 190 tonnes of oats to feed out and we also bought in barley, to make up a total of 240 tonnes of grain fed out.

“We have got to be efficient at feeding out – to the point where one person could feed 8,000 sheep in three and a half hours. We fed up to 1.5 kg per head twice a week. We have a ute with a feeder behind it. We pull up at the silo and leave the ute running. The 40 bag feeder has electronic scales on it so we can get the exact amount. We have a nine-inch auger so can get 2.5 tonnes in two and a half minutes, three and a half tops. That’ll feed during the season anywhere between 1,600 to 2,500 sheep and we can drop it one paddock in 15 minutes.

“We used to have a smaller feeder but the bigger one has been a really good investment. The one we have now is a pretty flash piece of equipment but is the most used and useful piece of machinery on the farm. They’re worth investing money in for the time and stress they save.

“There’s more money to be made in accurate feeding; doing feed on offer assessments and to continually update when you need to supplement and how much is vitally important.”

“Pasture management is also important. I don’t have a lot of rank dry, carry over feed – I manage the pasture to keep fit healthy sheep. I don’t go into the depths of winter with rank horrible grass hiding lots of ugly worms. When we have cattle in the system, we run them together and by themselves. We put ewes into the cattle country to drench themselves. We expose the ewe lamb replacements to worms a bit to build up their resilience.”

Sheep selection

Tim says investing in good genetics is another good investment in terms of efficiency.

"I started using Coopworths in 1992. They're the only maternal sheep entirely performance recorded in the country," he said.

"I've never bought a ram or semen that isn't on LAMBPLAN. I look at a range of performance criteria and in recent years have placed emphasis on putting some fat and muscle back into the sheep to balance growth and fertility. We have placed emphasis on worm tolerance for the past 10 years.

"An easy care sheep that requires minimal worm control, no mulesing and no fly control expenses and is crutched once a year assists in labour efficiency.

"If ewe condition and feed on offer are adequately managed our ewes require very little attention during lambing. They are tough sheep and bloody good mothers so you can leave them be for the majority. We are now implementing our fourth age group of sheep with electronic ID and we will look at implementing some more strategic use of this technology with flock ewes and ewe lamb replacement selection this year. Birth status will be coded into all ewe lambs and overlayed with weaning and post weaning weights to ensure better decisions are made on which ewe lambs will make the grade.

"At the moment 80% of our time is going into capital works. Therefore day to day tasks of running a sheep enterprise have to be done efficiently. We cannot waste time pretending to be busy. If an activity can be completed in less time, have the same outcome and be more cost effective, then you do it that way or make sure you aim to move towards it," Tim said.

"We have estimated that a bulk of our sheep enterprise tasks for 8,500 sheep can be completed inside 30 working days. This includes shearing, crutching, lambmarking, scanning, weaning, and pre lambing treatments." This will incur various amounts of contract or casual labour but it then allows time and energy to be used in farm development and strategic decisions which in turn makes for productivity gains.

Labour efficiency case studies
HEADLINE: Investing for labour efficiency

Snapshot:

David and Lyn Slade
Location: Mount Barker, Western Australia
Property: 4,000 hectares cleared land, plus another 500 hectares bush.
Enterprise: Sheep (prime lamb) and cattle (beef); 1,000 hectares cropped.
Livestock: 7,000 Greeline maternal composite ewes; 700 - 800 Sussex cows outcrossed with Angus.
Pastures: Mediterranean pasture – annual ryegrass and clovers
Soil: Loam over gravel clay
Rainfall: 500-550 mm

Lamb marking trailer

Feed out bin and metal sheep feeders

Sheep conveyor

The basic principle of running a labour efficient sheep enterprise is making sure you do the necessary jobs easily, on time and efficiently, according to David Slade, who farms a 4,000 hectare property at Kojonup, Western Australia.

“It probably works out that there is the equivalent of about five full time people working on the farm, by the time you add up the hours put in by me, my wife Lyn, our son Andrew, his wife Nicole, our daughter Vanessa, her husband Scott, and an employed worker. Between us we run a fairly large and intensive enterprise, so we need to make sure it’s run efficiently,” David said.

“We do everything ourselves. You could run this farm with three people but you’d need contractors to do fencing, harvesting, baling, crutching, fertiliser-spreading, etcetera. We do it all.”

Job board

A central aspect of the way the farm is run is two white boards in the house on which all the jobs that need to be done are listed, along with when they need to be done and who will do them.

“Some jobs need to be done today but some can be done any time – next week or the next month or two,” David said. “So you begin with what needs to be done immediately. When there’s nothing urgent, you get on and do the other things that need to be done some time – like fencing and maintenance.

“It’s not hard to be a good farmer, you just have to do the jobs on time and keep reinvesting in the farm.

“You have to make sure everything is in good working order. When you go and get a machine out, it has to be ready to use – never put something away broken, it just wastes time at critical periods.”

Central laneway

A key element of the Slade’s efficiency is a laneway system. “The farm has a central laneway system that we put in 14 years ago. We run about 25-30 km of internal runways. The central laneway system feeds almost every paddock and provides for fast and efficient movement throughout the farm.

“We maintain the laneways to be as good as a gravel road. Grading the laneways is one of the jobs that has to be done. We have to be able to drive down there in the ute at 100 km/h. If we can travel around at speed, we get things done quicker; we don’t waste time getting bogged or bumping slowly across rough tracks. They’re also safer.

“You don’t lose as much land as you may think you would with a laneway system. And it means you’re not driving across the paddock wrecking the pasture.

“The laneways are an essential investment. Everything gets moved down the laneways – we use them to drive around the farm, to put out feed, to move the sheep and cattle,” David said.

Paddock management

“We have a dam in almost every paddock – just a few paddocks close to the house have troughs, and those are set up on the laneways so you can check them as you drive past.”

But generally, David prefers dams to troughs. “If there’s a trough, I have to check it every day, for the sheep’s health and welfare. With a dam, I can leave it for a week. “Dams are much more labour efficient and cheaper to put in if your country can support them.

“Rotational grazing also saves labour – you can run bigger mobs and you get better usage of the pasture. I can have a mob of 2,000 sheep at some times of the year, and that’s better for pasture composition, usage and supplementary feeding.

"But at lambing, we drop back to small flocks – say 250 ewes – and set stock. You can't rotate lambing ewes".

"We go around and do health and welfare checks during lambing but don't interfere too much. We don't want animals suffering unduly but we do minimal shepherding. You can't close shepherd your flock, it's just not profitable."

David says the answer is easycare sheep, which brings him to passionately enthuse about Greelines. The property runs a flock of 7,000 Greeline maternal composite ewes.

Concentrating on good genetics

"I brought the Greelines in from New Zealand in 2006, after I went there on a study trip. I went around a few composite flocks and picked out the ones that best suit Australian conditions and market requirements. The Greeline is a stabilised composite developed in New Zealand. It's a self-replacing maternal that has the carcase qualities of a terminal breed."

David's motivation for choosing the Greeline was to maximise prime lamb production with a maternal, self-replacing sheep that has been bred especially to maximise meat production – high fertility, strong mothering ability and milk production, fast early growth and a good meaty carcase.

"The biosecurity aspect of a self replacing flock was also very important to us and enables us to run a closed flock by using only AI to introduce new genetics. This reduces the exposure of our flock to the introduction of animal health problems such as footrot, OJD, lice and resistant worms".

"With our Greelines, we know exactly what we will get with a very even and consistent line to market. We were delighted with recent abattoir feedback from a line of 720 lambs indicating over 700 lambs fitting within the top grid specification".

"With our elite stud ewes, we consistently record lambing rates over 150%. The broader flock marks around 125% and our aim is to get that up to 150%."

Sheep management

"For about four or five months of every year we need to feed out," David said. "We feed our sheep with a truck – six tonnes of grain goes out at a time. We fill the bin quickly with a nine-inch auger or better, and then feed out from the truck bin using an electric-over-hydraulic control that is operated from the cab. There's no point mucking around with inadequate machinery".

"We can feed 10,000 sheep in two hours and travel anything up to 50 kilometres to do so."

Out in the paddock, there are interlocking feeders which, like a lot of the equipment on the farm, were designed and built by David. He has the view that if something isn't available commercially to do a job that needs doing, he may as well get on and make it himself.

"The feeders allow all the sheep to feed at once – we allow about 10 metres of trough space per 100 sheep – and that way we don't get a tail on the mob. They all get the feed that they need.

"I do the feeding myself and check every sheep while they're on the trough," David said. "We feed hay out as well – and we bought a six-wheel ex-army truck that can take 10 big squares out at a time. It saves a heap of time."

The sheep are jetted twice in summer, which enables flystrike to be kept under control. "I purchased a new Electrodip jetting race from New Zealand and using that we can jet 1,500 sheep an hour. We don't need to mess around catching sheep.

"With shearing, we make it easier on ourselves by having well-designed yards that make the sheep want to run where we want them to run. You have to work with the sheep, not against them.

“And good dogs are essential. I’ve got six, my son Andrew has four and son-in-law Scott also uses two dogs” David said.

“For lamb marking, we use a hydraulic lamb marking trailer, which is pulled by a tractor. I built that about five or six years ago. We lamb mark in the paddock which saves time on bringing sheep in and out and it’s also cleaner and less disease risk for the sheep.

“The purpose-designed trailer incorporates the draft, lamb pens, cradle and all the lamb-marking gear. This makes it very quick and easy to set up and move between paddocks. It keeps everything clean and off the ground and we can push through up to 2,500 lambs a day. It keeps the workers out of the sun and makes the job easier, so we can go faster.

“For crutching, two Hecton air-operated crutching cradles are used in conjunction with a double moving floor that I built to make it easier to push sheep up to the cradles. This enables a four-man team to crutch 2,000 sheep a day and makes everyone’s job much easier.

“I saw the Hecton when I was on holiday in New Zealand 20 years ago and told Lyn I just had to have one of them,” David said.

He took some ‘time off’ from his holiday to watch the crutching cradle being used and to use it himself. “If you use something you have to find someone else who is using it and you have to see it used. You need to find out what’s going to work. You have to get the right gear. Go and spend a day using it, then you can make your own decisions.”

Another item that David first saw in New Zealand, and subsequently bought, was a Pratley conveyor. “We do everything through the conveyor now. The sheep are restrained so it’s much quicker and easier, and it’s safer for the handlers.

“If we’re vaccinating, there’s no danger someone’s going to get a needle stuck into them. We can vaccinate 2,000 sheep an hour. If we’re bulleting, we can do 500 an hour.

“The conveyor cost me about $30,000 and will probably last 20 years or more. But it’s one of our biggest labour-saving devices. People need to have things like this.”

David said that while he has invested significantly in labour-saving machinery and fencing, it is not that much money when you consider that the farm produces 9,000 lambs a year.

“You don’t do all this stuff at the same time – you just look for the opportunity and do it as you go,” David said.

Looking after people

“You need to make it safe and easy. People don’t want to be belted by sheep and cows all day. They don’t want to risk being jabbed with a needle. “I want people to like working here. I like to work with people and to help them. I don’t want workers to leave.

“If I say that I want to drench 8,000 sheep, no one around here complains. We just get on and get it done – the conveyor makes that job quick and easy. We haven’t run sheep through the drenching race for 10 years now.”

David says it is important to surround yourself with capable people.

“I believe in letting other people do what they are good at – my stock agent is very good at marketing, so I let him do the marketing. My agronomist is a good agronomist. I can’t be everything, it’s just too much. We use expert people for any extra expertise we need.”

The rest they just get on and get done at the appropriate time.

Labour efficiency case studies

HEADLINE: Sheep don't have to be hard

Snapshot:

Craig and Helen Lubcke
Location: Darkan
Property: 2,356 hectares
Enterprise: Sheep (wool and meat) and cropping (37% of farm area cropped)
Livestock: 5,700 Merino ewes, 1,700 cross-breds (Kelso terminal sires); property runs 17,000 DSE
Pastures: Annual pastures
Soil: Loamy flats to gravel
Rainfall: 450 - 500 mm

"People think sheep are too hard, but that's because they do it the hard way," explained Craig Lubcke who, with his wife Helen and father Bob, runs a total of 17,000 DSE (dry sheep equivalents) on a 2,400 hectare property at Darkan, Western Australia.

"There's a lot of good gear out there that can make a lot of sheep work easier and you simply have to have it. Else it's just too bloody hard."

Craig's favourite piece of machinery is a VE machine – a conveyor belt for moving the sheep along. "If I can't do the job on the belt, I won't do it. I simply refuse to work in a drenching race.

"With the belt, we turn up in the morning – having gotten the sheep in the night before – drench them, needle them, whatever it is we're doing, and get it over and done with by ten o'clock or so. The sheep are held – two people can work them. Dead easy. It's just so much harder in a drenching race."

Mostly the 'two people' doing the sheep work are Craig and Helen, with assistance from Craig's two dogs, but at peak times, they do bring in some extra labour.

"We bring a full team in at shearing. They work the shed and we do the outside stuff – getting the sheep in and drenching, vaccinating, backlining.

"All our sheep are crutched in a crutching cradle, which was actually invented by Dad.

"All our yards are roofed and watered, for dust suppression" Craig said. "Shade is really important – for the animals and the workers. If you're improving sheep yards, the first thing to do is to roof them. Putting water in is next. Improving the design is the third thing.

"Working in the beating sun or the pouring rain is no fun at all. No-one wants to do that."

Spreading the load

The Lubckes generally manage to have the workload spread over the year but do run into a difficult period due to a clash between pregnancy testing the ewes and cropping.

"We lamb late, so that our peak stocking rate coincides with the spring flush. But that means we are preg testing as we are putting the crop in," Craig said.

"Last year we got around that by hiring someone to do the preg testing. It's imperative to scan for multiples. It gives a whole new level of certainty to the enterprise and it is great for productivity.

"We put the twin-bearing ewes into smaller, better paddocks. That way we can really look after them – give them hay if they need it, feed them up. If you don't look after them, you lose the ewe and the lambs. There's no money in the sheep you bury."

Easy lambing

A change in sheep breed has enabled the Lubckes to increase their lamb marking rates.

“We used to put the ewes to White Suffolk or Poll Dorset rams but last year we put 1000 ewes to Kelsos. The lambs are smaller at birth which makes for an easier lambing, but they still come up to a good weight for selling.

“Last year we put 5,700 ewes to Merino rams. Overall, we had a marking rate of about 95-98%, including the maidens.

“I like to sell the cross-bred lambs as soon as possible, ideally straight from the paddock. All the Merino lambs go into a standing forage crop – usually oats sown with ryegrass and balansa clover. They go in just as the crop is haying off and that keeps them going, and saves us the job of feeding them. You need 15 to 16 lambs per tonne of oats.

“We aim for the live trade but that’s been a bit hard the last couple of years,” Craig said.

Grazing management

The property is mostly set-stocked but deferred grazing at the break of the season is also used and it’s a strategy that Craig likes.

“The sheep go on to stubbles after shearing in January, and might stay right through to June,” he said. “The stubbles are a great source of roughage and a kilo of lupins per sheep per week increases the protein, keeping them in good condition for mating – Condition Score 3. Dad feeds out once a week with a trail feeder. He checks water while he’s there. All the paddocks have at least one dam so water isn’t a problem generally.

“Because we lamb late, we don’t have much of a problem with the autumn feed gap. At that time of year, the ewes are really only one DSE each and they can live on a kilo of lupins a week plus some stubble. If you lamb earlier, it’s harder to get the sheep through autumn.”

Craig said the other advantage of late lambing and deferred grazing is that the pasture paddocks don’t go as bare as they do with an earlier lambing and therefore more pressure on autumn and early winter grazing.

“If you put them on earlier, you run out of feed. With late lambing, the pasture gets up and away – you really don’t want to be lambing when there’s no feed around.

“And we don’t want ewes lambing when we are marking. So we work the dates exactly– the rams go in on a set date and come out again. It’s all worked out so that our peak stocking rate is at the spring flush. It also works in well with the cropping enterprise.”

Timing the whole farm enterprise

Income on the Lubcke farm is split fairly evenly between cropping, wool and sheep meat, with some variations due to seasons and markets. The split means Craig and Helen can’t ignore the cropping side of the enterprise and need to work it in with the sheep tasks.

“We do all the cropping ourselves – seeding and harvesting. We have a big air-seeder and a big header. The machinery we run is probably bigger than we need but it means we get it done quickly. Harvest time can be busy because there’s sheep work on then too – weaning, shearing and selling sheep.”

Craig and Helen have changed the timing of some of their sheep work to make the enterprises mesh together better.

"We used to crutch first, then lamb-mark and jet later," Craig said. "But everyone wants to crutch in September, so we changed the timing of our operation. Now, in the second week of September, we lamb-mark and jet. Four to six weeks later, in mid-October, we crutch.

"We've found this works a lot better. For one thing, we're not crutching at the same time as everyone else, so it's easier to get crutchers. But we've also pretty much eliminated breech fly strike. Body fly strike we've pretty well bred out, so all up we're finding we no longer have much of a fly problem."

Fencing for purpose

A central laneway system links every paddock on the property and the paddocks are fenced according to the suitability of the land to different uses.

"We have some good, average sort of cropping country and run the sheep in the wetter, flat country and on the saltland," Craig said.

"We have some paddocks set up smaller – down to 20 hectares – and we use these for the twin-bearing ewes.

"Over time we've moved fences when the setup didn't seem to be working, so I guess our system has evolved over time.

"Things like our sheep yards have also evolved. You have to spend money on these things. People spend big money – say $100,000 – on a tractor, but not $20,000 on a new set of sheep yards."

Craig said it was important to have some economies of scale in a sheep enterprise, to make the investment in labour efficiency worthwhile.

"And sometimes you have to see it from the sheep's point of view, and make it easier and less stressful on them.

"Over time, you train the sheep. You bring them in into yards that work well and they're not being slammed into wooden fences and so on, it gets easier and easier.

"It really shouldn't have to be hard."

Labour efficiency case studies
HEADLINE: Keeping it in the family brings efficiencies

Snapshot:

Name: Mark and Karen Wunnenberg
Location: Darkan, Western Australia
Property: 2,600 hectares
Enterprise: Wool and prime lamb; Crop (450 ha) canola and oats
Livestock: 9,000 Merinos ewes
Pastures: Annuals
Soil: Jarrah gravel – small ironstone gravel to loam, with some gravelly sand
Rainfall: 550-600 mm

Sharing the sheep work at critical times enables the extended Wunnenberg family to cope with the high demand periods across four properties. Mark and Karen Wunnenberg run a 2,600 hectare sheep and cropping enterprise near Darkan, Western Australia. Mark's brother and uncle farm nearby.

"We always have got in and done the work that needed to be done, which enables more jobs to be done at once," Mark said.

Family history

"Family members have always shared the workload, "My brother crutches and we employ a second crutcher. I mules and we employ casual cradle staff for lamb marking.

"We start at my place, and then we go and do my brother's flock, then our uncle's. Between us, we work on five different locations for crutching and lamb marking, and we all do the same things on the different properties.

"I manage the lamb marking side of it and my brother organises the crutching side of it," Mark said.

"We've been using a crutching cradle for 30 years and wouldn't do it any other way."

The Wunnenbergs start crutching on 20 August and it takes about a month to get through all the flocks.

Lambing

"We are winter-spring lambers and we time all the farms to work in together. We each have set days for the rams to go in with the ewes and come out again. Between us we mate 22,000 to 23,000 sheep and it's all coordinated so that we can lamb-mark on the properties one after the other.

The timing of the system is based around joining in February.

"February is the best time for ovulation rates so you get the highest conception rates – that's the basis of our timing," Mark said.

Of Mark and Karen's 9,000 ewes, 2,000 go to Suffolk rams in early February and the remainder to Merinos in late February. Last year their lamb marking rate was 100% and is generally in the 90's.

Juggling priorities

From December onwards, the lambs are being sold off, but there's also a crop to be harvested. "We grow fodder crops as well, mainly oats and peas".

“There’s an argument that says it’s not economical to grow the fodder crops – that you’re better off to grow a cash crop then buy in feed – but not having to hand feed lambs saves a lot of time and worry, and I reckon that’s worth a lot”.

“After the lambs are weaned, they go into a 350 hectare fodder crop. If you have a large number of lambs – a good fodder crop will carry 40 lambs/ha from weaning in early November for three or four months over summer. That way, we don’t need to hand feed them through summer, when we’re busy shearing”.

“We need to do some hand feeding in late autumn, but generally very little. When we do feed out, we do so with lupins, which we buy in”.

Drought proofing

Mark said water supply is a key element of running sheep efficiently, especially during the summer months.

“Our farm is drought-proofed. We have large dams in areas designed to make the farm drought proof. When I put in a dam, I put in a big one – that way if you get the rain, you can keep the water.

Mustering efficiently

Mark said a lot of time can be wasted moving sheep around so you have to be efficient in the way you do it.

“You definitely need laneways for moving sheep around. We also have four sets of good efficient stockyards on this farm, which means that for most jobs, we don’t have to move the sheep very far, so we don’t waste time mustering. And it’s essential to have good dogs,” Mark said.

Along with laneways and efficient yards, Mark lists a crutching cradle and VE belt as essential for labour efficiency in handling sheep. He also sees promise in a new combined drench and lice backline to be used post-shearing.

“Being able to do those two jobs at shearing saves a lot of stock handling time – the product is still new and reasonably expensive, but it will have a lot of savings in terms of labour. It’s one less time to get the sheep in,” Mark said.

Keeping casual labour

Mark is satisfied with the way they operate now and considers it important to make the work enjoyable.

“If it’s pouring with rain and the sheep and wet and soggy, we don’t work. There’s no point – it’s not pleasant for anyone. I don’t expect anyone to do anything I’m not prepared to do myself.”

Over the years, Mark has been able to retain good casual staff when necessary, with the same people tending to come back year after year. He attributes this at least in part to making the jobs and the conditions as good as possible”.

“Retaining good labour is important to overall labour efficiency. You know they know how to do the jobs the way you want them done, so you can leave them to it and get on with other things”.

“And the money you save with your efficiencies and by doing things yourself, you put back into the farm to make things better.”

6. Acknowledgements

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8. Appendix 1

Table A1. Time required for grain feeding in each labour period scaled for feeding rate per head

Southern NSW

	Period	Rate of emptying			Expected feed rate		Mob size	MJ fed/Mob	Time req'd	
		kg/sec Lupins	Bush/hr	hr/Bu	g/hd/d	MJ/hd/d		per feed	hr/MJ	MJ/hr
January	L1	1.800	240.0	0.004	100	1.211	500	2119	0.00009	10,596
February	L2	1.800	240.0	0.004	100	1.211	500	2119	0.00009	10,596
March	L3	1.800	240.0	0.004	150	1.817	500	3179	0.00006	15,894
April	L4	3.600	480.0	0.002	200	2.422	500	4239	0.00005	21,193
May	L5	3.600	480.0	0.002	200	2.422	500	4239	0.00005	21,193
Seeding period A	L6	3.600	480.0	0.002	200	2.422	500	4239	0.00005	21,193
Seeding period B	L7	3.600	480.0	0.002	200	2.422	500	4239	0.00005	21,193
Seeding period C	L8	1.800	240.0	0.004	150	1.817	500	3179	0.00006	15,894
Seeding period D	L9	1.800	240.0	0.004	100	1.211	500	2119	0.00009	10,596
June	L10	1.800	240.0	0.004	100	1.211	500	2119	0.00009	10,596
July	L11	1.800	240.0	0.004	100	1.211	500	2119	0.00009	10,596
August	L12	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
September	L13	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
October	L14	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
Harvest legumes	L15	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
Harvest cereal	L16	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
Harvest late	L17	1.800	240.0	0.004	30	0.363	500	636	0.00031	3,179
December	L18	1.800	240.0	0.004	50	0.606	500	1060	0.00019	5,298

Table A2. Labour input for crop and livestock enterprises by labour period.

(a) sNSW

	Hire labour			Owner only		
Labour Period	Crop	Sheep	Unused	Crop	Sheep	Unused
L1	19	69	*68*	16	34	*106*
L2	6	98	*136*	0	48	*192*
L3	103	89	*0*	91	46	*0*
L4	110	72	*69*	129	42	*79*
L5	78	60	*8*	67	30	*49*
L6	117	23	*0*	59	11	*0*
L7	34	16	*0*	42	8	*0*
L8	0	16	*34*	42	8	*0*
L9	163	16	*0*	42	8	*0*
L10	17	48	*109*	18	22	*135*
L11	53	51	*164*	53	23	*193*
L12	18	101	*160*	18	50	*211*
L13	0	104	*156*	0	64	*196*
L14	97	149	*13*	76	86	*97*
L15	3	15	*72*	0	8	*82*
L16	12	29	*139*	16	16	*148*
L17	0	29	*151*	0	16	*164*
L18	0	48	*42*	0	24	*66*

(b) Cereal Sheep Zone

	Hire labour			Owner only		
Labour Period	Crop	Sheep	Unused	Crop	Sheep	Unused
L1	0	29	*98*	0	26	*101*
L2	0	41	*151*	0	37	*155*
L3	60	35	*2*	50	31	*16*
L4	116	52	*19*	98	45	*44*
L5	136	23	*0*	38	17	*0*
L6	145	62	*0*	43	38	*0*
L7	0	35	*10*	24	21	*0*
L8	0	45	*0*	32	13	*0*
L9	0	58	*0*	31	14	*0*
L10	138	158	*0*	144	58	*0*
L11	136	34	*45*	45	30	*141*
L12	40	83	*102*	17	72	*136*
L13	33	116	*59*	15	96	*97*
L14	40	62	*103*	40	46	*120*
L15	13	24	*54*	12	19	*59*
L16	0	44	*136*	17	37	*126*
L17	19	35	*126*	0	31	*149*
L18	0	32	*39*	0	29	*42*

(c) GSM July Lambing

	Hire labour			Owner only		
Labour Period	Crop	Sheep	Unused	Crop	Sheep	Unused
L1	0	71	*164*	0	148	*173*
L2	14	63	*0*	13	135	*0*
L3	40	64	*0*	40	133	*91*
L4	66	59	*66*	66	124	*156*
L5	12	7	*31*	12	16	*60*
L6	157	22	*10*	155	49	*145*
L7	0	7	*38*	0	15	*68*
L8	0	7	*38*	0	15	*68*
L9	0	8	*37*	0	16	*67*
L10	7	50	*63*	8	83	*122*
L11	39	84	*93*	37	138	*200*
L12	24	66	*137*	25	118	*246*
L13	3	49	*158*	3	81	*282*
L14	20	65	*123*	20	113	*235*
L15	20	85	*111*	20	162	*217*
L16	70	20	*0*	101	38	*28*
L17	110	58	*0*	210	111	*0*
L18	41	11	*0*	67	21	*0*

(d) GSM May Lambing

	Hire labour			Owner only		
Labour Period	Crop	Sheep	Unused	Crop	Sheep	Unused
L1	0	50	*186*	0	114	*206*
L2	19	58	*0*	19	128	*0*
L3	40	64	*0*	40	161	*63*
L4	66	83	*41*	66	188	*92*
L5	16	20	*15*	16	45	*26*
L6	124	65	*0*	162	144	*42*
L7	4	14	*26*	0	32	*51*
L8	0	13	*32*	0	30	*53*
L9	0	14	*31*	0	32	*51*
L10	5	27	*88*	5	58	*150*
L11	34	28	*152*	34	63	*278*
L12	13	45	*170*	13	96	*279*
L13	3	82	*125*	3	155	*208*
L14	20	40	*148*	20	63	*286*
L15	20	61	*135*	20	130	*249*
L16	3	34	*53*	3	78	*85*
L17	95	73	*0*	152	169	*0*
L18	19	33	*0*	13	75	*0*

Hamilton September

Labour Period	Hire labour Crop	Hire labour Sheep	Hire labour Unused	Owner only Crop	Owner only Sheep	Owner only Unused
L1	19	69	*68*	0	173	*223*
L2	6	98	*136*	0	123	*122*
L3	103	89	*0*	92	122	*168*
L4	110	72	*69*	0	106	*161*
L5	78	60	*8*	37	80	*137*
L6	117	23	*0*	0	8	*75*
L7	34	16	*0*	0	8	*75*
L8	0	16	*34*	0	8	*75*
L9	163	16	*0*	0	8	*75*
L10	17	48	*109*	0	46	*95*
L11	53	51	*164*	14	52	*309*
L12	18	101	*160*	3	95	*293*
L13	0	104	*156*	3	130	*181*
L14	97	149	*13*	0	86	*249*
L15	3	15	*72*	0	11	*155*
L16	12	29	*139*	0	87	*242*
L17	0	29	*151*	0	2	*14*
L18	0	48	*42*	0	218	*158*

(e) Hamilton Nov

Labour Period	Hire labour Crop	Hire labour Sheep	Hire labour Unused	Owner only Crop	Owner only Sheep	Owner only Unused
L1		143	*93*		107	*128*
L2		167	*0*		136	*2*
L3		190	*31*		159	*62*
L4		185	*0*		140	*10*
L5		181	*0*		142	*0*
L6		14	*31*		10	*35*
L7		21	*24*		18	*27*
L8		7	*38*		5	*40*
L9		7	*38*		5	*40*
L10		17	*62*		13	*66*
L11		59	*156*		48	*167*
L12		56	*175*		46	*186*
L13		50	*110*		43	*116*
L14		60	*151*		52	*159*
L15		30	*60*		24	*66*
L16		72	*104*		57	*119*
L17		3	*6*		2	*7*
L18		164	*57*		129	*93*