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An economic analysis of sheep flock structures for mixed enterprise Australian farm businesses

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Introduction

Farming systems can be complex, sometimes involving large areas with a range of soil types, and several crop, pasture, and livestock enterprise choices. The complexity of farming systems complicates decision-making, and even with access to data and information, decision-making remains a challenge. Industry tends to use simple decision-making tools such as whole-farm budgets, partial-farm budgets, and gross margins. These techniques offer quick and affordable ways to evaluate farm strategies and plans, but they often fail to accurately capture important aspects, such as biological interactions between enterprises and technical details such as soil type. An alternative to the simple appraisal techniques used by many farm management advisers is to opt for detailed whole-farm optimisation modelling. Whole-farm

modelling provides a detailed representation of the whole-farm system, including its various resources of finance, soils, labour, machinery, livestock, crops, and pastures. This allows farmers to identify what areas of the farm system are current and potential drivers of profit, and how they should be managed to maximise whole-farm profit.

Aims

To help address the question of ‘what structure and size of sheep flock can best serve the profit interests of mixed enterprise farms in Australia?’, this study applies whole-farm bioeconomic modelling in a study region in the southwest of the Western Australian grain belt. We examine how different sheep flock structures and sizes of the sheep flock affect farm profitability, farm management and business strategy. Using whole-farm bioeconomic modelling and wide-ranging sensitivity analyses, we test the hypothesis that whole-farm profit is sensitive to flock structure.

Methods

Whole-farm bioeconomic modelling, combined with broad-ranging sensitivity analysis, is used to examine the profitability of different sheep flock structures and sizes.

The whole-farm model employed in this analysis is known as Model of an Integrated Dryland Agricultural System (MIDAS). MIDAS is a whole-farm linear programming model with a joint emphasis on biology and economics. It can evaluate the economic significance of alternative farm strategies, in a steady-state format, by revealing farm management decisions that maximise whole-farm profit under a given set of constraints, with a range of production possibilities and enterprise interactions that typify the strategy being examined.

The Great Southern regional version suite of MIDAS was used, this version represents an average farm in the Great Southern region of Western Australia. In this study, the model was also tailored to represent a larger farm business in the South-west of Western Australia using the key characteristics listed in Table 1. Table 2 lists the sheep flock structures analysed in this study. These different systems range from wool-focused production to specialist meat production and a mix of both meat and wool production.

Table 1. Summary of the farm's key characteristics

Farm size (ha)	6380
Area of crop (%)	59
Number of land management units (LMU's)	4
Average canola yield (t/ha)	2.2
Average barley yield (t/ha)	3.4
Average oat yield (t/ha)	3.8
Average wheat yield (t/ha)	3.1
Average hay yield (t/ha)	5.7
Labour (FTE)	8.1
Number of harvesters	1 (12.2 m front)
Seeding gear complements	1 (12.2 m width)

Note: *Yields presented above are the average across all the of rotations

Table 2. A description of flock types included in this analysis

Flock	Description
Store	A self-replacing Merino flock with emphasis on wool production. Wethers are sold as store lambs to other farmers (6 months)
Export wether (Shipper)	A self-replacing Merino flock with emphasis on wool production. Wethers are sold as shippers (18 months or older)
Merino prime lamb (MPL)	A self-replacing Merino flock with emphasis on wool and meat production. Includes all selling options contained in the preceding two flock options plus the additional option of selling finished Merino lambs (10 months)
Trade Wether	Buy in store wethers, sell them later as shippers (18 months or older). Emphasis on wool production
Self-replacing crossbred lamb (SRF-MTS)	A self-replacing Merino flock utilising surplus ewes (cast for age or surplus ewe hoggets) for first-cross lamb production sold as suckers (4.5 months). Merino wethers can be sold as Merino prime lamb or as shippers. The emphasis is on meat and wool production
Specialised crossbred lamb production (Specialist-MTS)	Replacement Merino ewes are bought in. All ewes are mated to produce first-cross lambs sold as suckers (4.5 months). The emphasis is on meat and wool production
Composite	Composite ewes are mated to composite rams to produce composite lambs. Wethers are sold as suckers (4 months), and the emphasis is on meat production

Results & Discussion

Flock comparison and flock structure choice

Whole-farm profitability varied by \$630 000 per year (or \$99/ha) between the least and most profitable flock structures evaluated. The most profitable structure was the Specialist-MTS flock, generating \$1 266 000 farm profit, almost double the least profitable flock. The least profitable flock was Trade Wether which generated \$636 000. This finding provides evidence to support the hypothesis that whole-farm profit in mixed enterprise farms in Australia currently is highly sensitive to flock structure.

Flocks based on Merino ewes and selling finished Merino or first-cross lambs were the most profitable (Specialist-MTS, SRF-MTS, MPL), being over 20% more profitable than flocks that retained wethers (Figure 1). A related main finding was that the longer the wethers were retained, the lower the farm profit. However, the Composite flock was less profitable because the composite genotype did not produce the quality and quantity of wool of the pure Merino genotype, and the Store flock was less profitable because its lambs were sold at a lighter weight, thereby generating less sales income. Within the Merino flocks that sold finished lambs, revenue was increased by including terminal sires. Mating all Merino ewes to a terminal sire (Specialist-MTS) increased profit by 9% compared to mating only surplus ewes (SRF-MTS), and increased profit by 15% compared to not mating any ewes to terminal sires (MPL).

Flocks selling finished lambs were more profitable than flocks selling store lambs or export wether hoggets. This is because these flocks produced large amounts of high-quality wool from the Merino ewes, valuable at current wool prices, whilst also turning off large quantities of high-quality finished lamb. However, to achieve high profits required very sound sheep management, as indicated by the higher stocking rates (Table 3) and greater sensitivity to weaning weights.

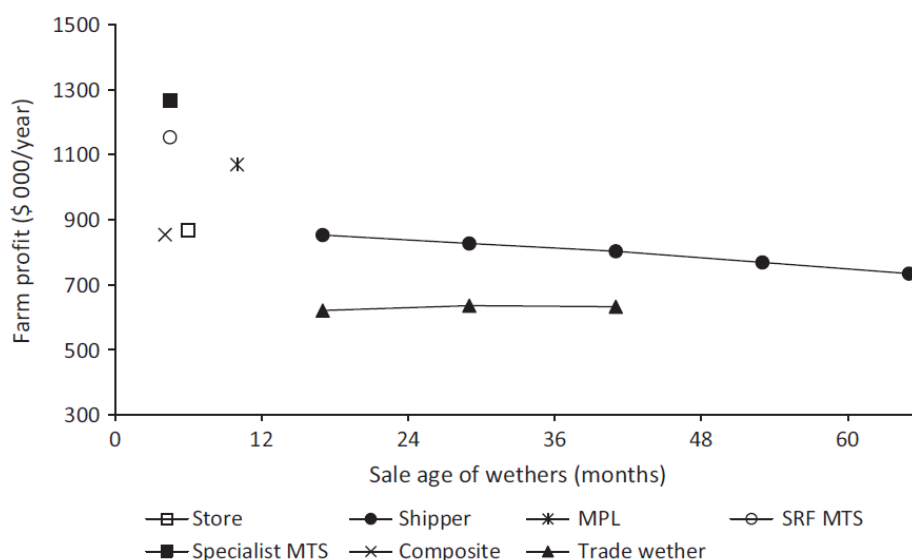


Figure 1. Whole-farm profit for each flock structure in this analysis

Optimal farm management varied for the different flocks. Generally, the longer the wethers were retained, the lower the proportion of ewes in the flock. As the proportion of ewes in the flock decreased, the stocking rate and supplementary feed also decreased. Flocks selling first-cross lambs had the highest stocking rates and supplementary feed requirements (Table 3).

Table 3. The profit and production associated with the optimal farm plan for each flock structure, under baseline price conditions

	Profit (\$ 000)	Ewe percentage (Ewe DSE/total DSE as a percentage)	Stocking Rate (DSE/ha)	Supplement feeding (t)	Supplementary feed per DSE (kg/DSE)
Store	867	80	10.4	957	35
Shipper	853	67	10.1	857	32
MPL	1070	86	10.0	1822	69
Trade Wether	636	0	8.5	207	9
SRF-MTS	1153	88	12.0	2193	70
Specialist-MTS	1266	100	13.7	2831	79
Composite	854	76	12.8	12 101	36
Note: DSE, dry sheep equivalent					

Weaning weight had a large impact on the profitability of Composite and MTS flocks (Figure 2). These flocks had a greater focus on meat production and the lambs were sold at 4–4.5 months of age, so they required extra grain feeding to reach finishing weights if they were weaned at a lower weight. A 5% reduction in weaning weight reduced the profit of the Specialist-MTS flock by as much as \$104 000 (8%). However, profit reduced by <1% for flocks that retained wethers older than 17 months of age.

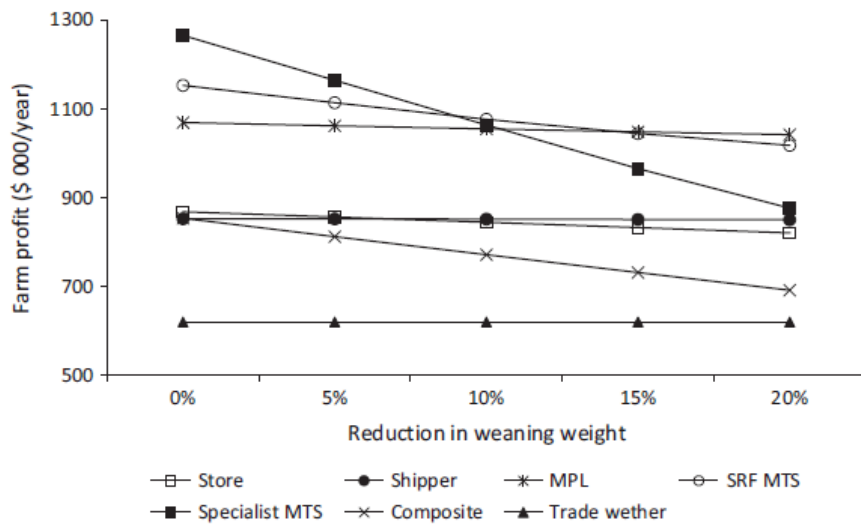


Figure 2. Whole-farm profit for each flock when lamb weaning weights were reduced

Changing the stocking rate by 10% from the optimum reduced the profit by as little as 2% for the first 10% change, but up to 10% as the stocking rate moved further from the optimum. This pattern and the magnitudes of reductions in profit were very similar for each flock structure (Figure 3).

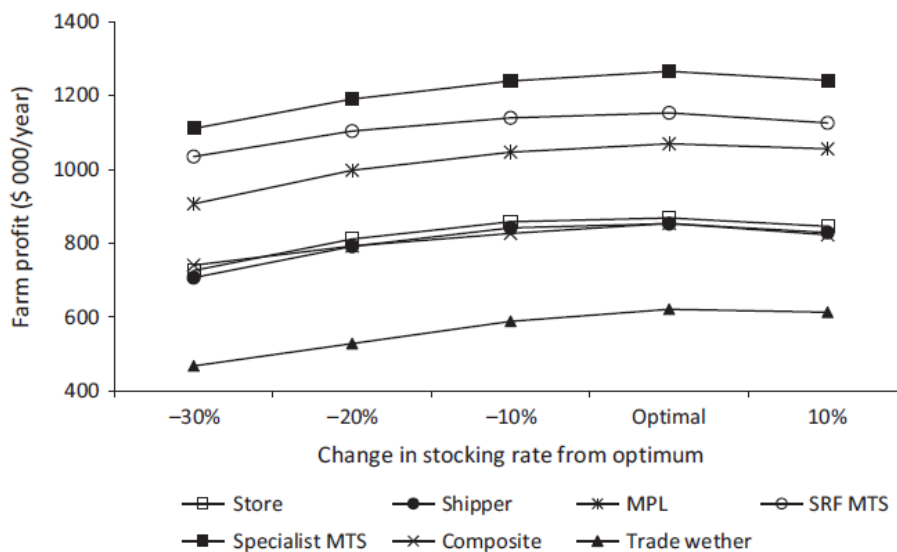


Figure 3. Farm profit when stocking rate of each flock was altered from the optimum

The stocking rates indicated to be feasible and optimal in this study are higher than commonly observed on farms. For example, in the study region, in the production year of 2018 when close to average annual rainfall was received, the average stocking rate was 7.4 DSE/ha and the top 25% of farms, ranked by operating surplus/ha/mm of growing season rainfall, recorded an average stocking rate of 8.5 DSE/ha (Planfarm 2019). This study's results indicated that altering the stocking rate away from the optimum reduced farm profit. However, most importantly, the relative profitability between the different flock structures was not altered. Hence, if farmers selected to be, for example, 20% below the optimum identified in this study, there was no change in the optimal flock structure. These results provide farmers, at least those in the region investigated, with confidence regarding the optimal flock structure, even if these farmers are risk averse or reliant on imperfect information that leads to a reduction in their farm's stocking rate.

Crop management

The optimal cropping proportion for the farm was between 40% and 60%, depending on the particular flock structure selected. Cropping proportions as low as 20% and as high as 80% remained economically viable (Figure 4). The ranking of flock structures was the same at all cropping levels, with Merino flocks selling finished lambs being the most profitable. A key finding was that, within 30–70% cropping, farm profit was affected more by selecting the optimal flock than altering crop allocation. Interestingly, rotation choice was independent of flock structure, with the optimal rotation on each land management unit being the same for all flock structures.

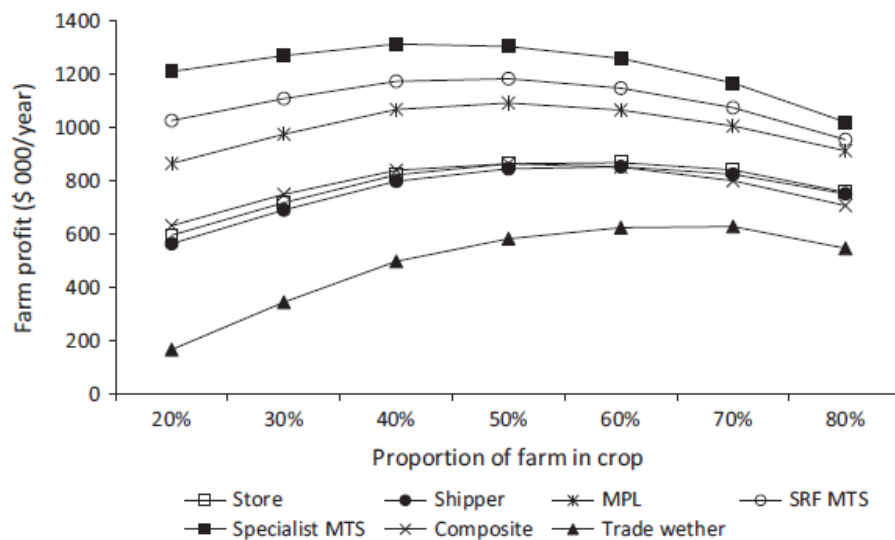


Figure 4. Farm profit for each flock structure option over a range of cropping proportions

Selecting the correct rotation for each soil type was important. It was most profitable to have continuous pasture on the less productive soils and continuous crop with complementary smaller areas of continuous pasture on the more productive soils. Continuous cropping on the poor soil reduced farm profit by \$80/ha, and a pasture crop rotation also reduced farm profit by \$69/ha. Conversely, continuous pasture on the best soil reduced farm profits by \$170/ha, and on the same soil, a pasture crop rotation reduced farm profit by \$66/ha.

Although there are many interactions between cropping and livestock operations, rotation selection and crop allocation did not affect the choice of flock structure and vice versa. This means farmers can independently alter their flock structure and crop management, which provides confidence in the flexibility of the mixed farm system.

Price sensitivity and variation

Increasing the carcass weight price of lamb, as expected, increased the profit of flocks turning off finished lambs, whilst decreasing the carcass weight price of lamb had the opposite effect. In contrast, increasing the wool price increased the profit of the flocks retaining wethers, whilst decreasing the wool price had the opposite impact. However, a 20% increase or decrease in the carcass weight price of lamb or wool prices was not enough to alter the optimal flock structure.

A 20% increase in grain prices shifted the optimal cropping proportion towards 70% and increased farm profit by up to 18%. At crop levels below 20% however, the increase in profit was minimal because the cost of supplementary feed increased reducing the profit of the sheep enterprise, and the volume of grain sold at the higher prices was small. In addition, the increase in supplementary feed costs was not enough to change the optimal flock structure. Merino flocks turning off finished lambs were still the most profitable (Figure 5).

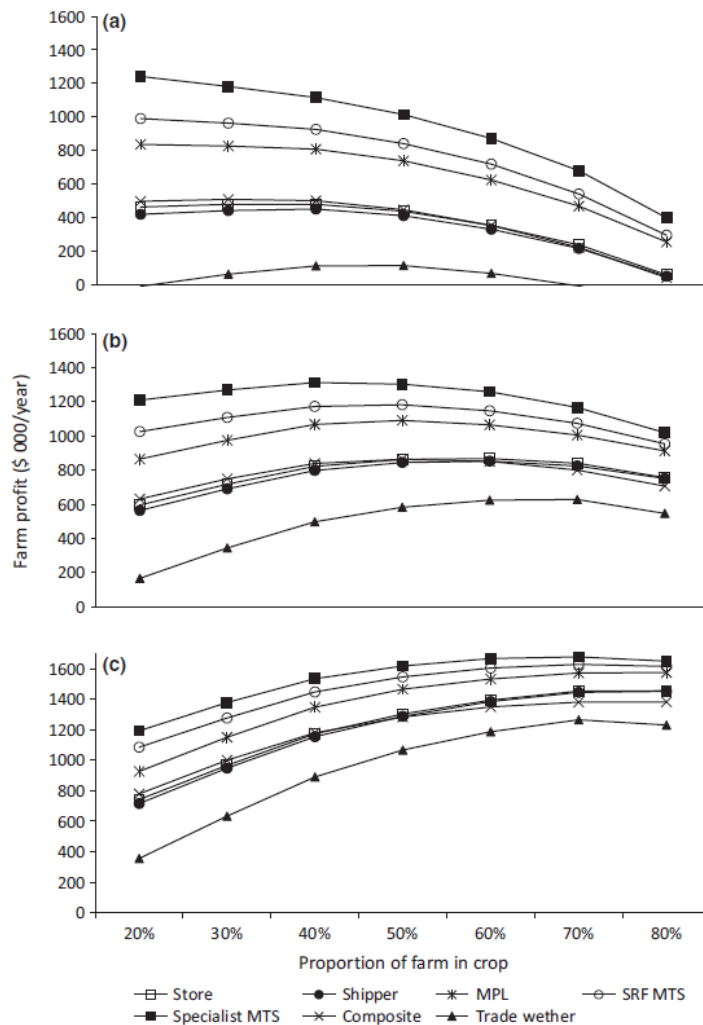


Figure 5. Farm profit for each flock structure at a range of cropping proportions when grain prices were (a) 20% less, (b) unchanged, (c) 20% more

Altering the price of labour affected whole-farm profit. Reducing the labour price by 20% increased farm profit by \$170 000 per year, and the same percentage increase in the labour price had the opposite impact. Changing the labour price affected each flock structure similarly and therefore had no impact on a farmer's choice of flock structure.

Flocks that produced a balanced mix of wool and sheep for sale were less exposed to separate changes in wool or sheep meat prices. Price variation had the greatest impact on the profitability of flocks based on either a composite genotype (meat emphasis) or a Merino flock dominated by wethers (wool emphasis). However, the choice of the optimal flock structure was robust to price changes as large as 20%.

Flock structure also was robust to price changes in key inputs such as supplementary feed and labour. However, the profitability of flocks purchasing sheep, such as the Specialist-MTS and trade wether flocks, was affected differently if specific classes of sheep sufficiently changed in price. For example, an increase in the price of ewes reduced the profitability of the Specialist-MTS flock. However, ewe prices needed to increase by over 35% before switching to a self-replacing flock became more profitable. Similarly, the price of store lambs had to drop by over 35% before farmers would consider a trade wether flock, which is unlikely given that the price of store lambs is driven by the demand for lambs to feedlot; therefore, the lack of demand from store wether buyers is unlikely to drive down the price.

Selection of a Merino flock that turned off finished lambs also helped mitigate risks associated with variation in grain prices. This flock structure depended on supplementary feed, so if grain

prices dropped, then the loss of crop income could be offset by cheaper sheep feed. In general, farmers can be confident with their choice of flock structure in the face of market uncertainty.

Conclusion

This study assessed the role and profitability of different flock structures in a mixed enterprise farm business in the grainbelt region of Western Australia. We found that farm profit was greater when a Merino flock turning off finished lambs was selected. These flocks remained the most profitable among a range of flock options, even if key input prices and commodity prices were subject to moderate change. However, to achieve the maximum profit, these flocks required more attention to sheep management.

Choice of flock structure had a larger impact on profit than moderate changes in land allocation to cropping. Selection of the most profitable flock structure generated double the farm profit from that of the least profitable flock structure. More conservatively, a farm plan based on cropping and a self-replacing Merino flock using surplus ewes for first-cross, meat lamb production earned 33% more profit than a farm plan based on a traditional self-replacing Merino flock that emphasised wool production. An additional feature of optimal farm plans was to commit to continuous pasture on all the poor soils whilst continuously cropping the more productive soils, with some complementary areas of permanent pasture.

Key Messages

- The most profitable flock structure were flocks based on Merino ewes and selling finished Merino or first-cross lambs. These were over 20% more profitable than flocks that retained wethers.
- Choice of flock structure had a larger impact on profit than moderate changes in land allocation to cropping. Additionally, rotation selection and crop allocation did not affect the choice of flock structure and vice versa.
- Flocks that produced a balanced mix of wool and sheep for sale were less exposed to separate changes in wool or sheep meat prices.

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MLA Teder a Demonstration 2020-2023

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Introduction

This Producer Demonstration Site (PDS), run by the Moora Miling Pasture Improvement Group, is evaluating animal performance from four commercial stands of the new perennial legume pasture Teder a in the Central Midlands of WA. The sites, located at Strathmore (Dandaragan), Pankee (Walebing) and Cranmore (Walebing) were sown in June 2020 and first grazed in May and June 2021. The four demonstration sites were grazed for the second time in October, November and December 2021. Another site will be brought into the project in 2022 and monitored from 2023 onwards.

Recently weaned Merino lambs were used at all four sites as these were the highest priority class of stock on the farm at the time. Lambs were weighed at the start and end of grazing. At each site, one large pre-existing mob of lambs was split; with some lambs grazing Teder a and the remaining lambs grazing control pastures consisting of annual pastures and crop stubbles. Sheep were supplementary fed as required.

Results

At the Strathmore (Dandaragan) site, 600 Merino lambs grazed the 12ha Teder a pasture for 57 days from 14 October 2021 to 10 December 2021. The Feed on Offer (FOO) of the Teder a at the start of grazing was 11 400kg DM/ha. The other 986 lambs of the mob grazed a 100ha annual pasture containing mostly serradella and annual ryegrass. The FOO of the annual pasture at the start of grazing was 3300kg DM/ha. Neither mob was supplementary fed during this period. The Teder a lambs had a slightly lower average daily live weight gain at 114g/hd/day than the control lambs at 125g/hd/day. However, the Teder a lambs had a 500% higher stocking rate at 50 lambs/ha compared to the control at 10 lambs/ha and produced significantly more lamb liveweight per hectare (325 kg/ha) than the control (70 kg/ha) over the same 57 day period. When the Dry Sheep Equivalent (DSE) grazing days from the autumn and spring grazing are added together, the Strathmore Teder a site carried 13.5 DSE/ha in 2021. This is well above the farm and district average.

At the Pankee (Walebing) site, 230 Merino lambs grazed the 20ha Teder a pasture for 48 days from the 4 November 2021 to 22 December 2021. The FOO of the Teder a at the start of grazing was 2200kg DM/ha. The other 665 lambs of the mob grazed a 54ha annual pasture containing mostly poor quality senesced annual grasses. The FOO of the annual pasture at the start of grazing was approximately 1500kg DM/ha. The control mob grazing annual pastures were supplementary fed 50g/hd/day of lupins. The average daily liveweight gain of the Teder a lambs was 117g/hd/day; a gain of 5.6kg over 48 days while the control lambs lost 11g/hd/day; a loss of 0.5kg over 48 days. The stocking rate of both pastures was similar (11.5 vs 12.3 lambs/ha).

The Teder a pasture produced 64kg/ha of lamb liveweight gain while the control pasture lost 7 kg/ha of lamb liveweight. The control pasture also incurred approximately \$1 per lamb of supplementary feeding cost. When the DSE grazing days from the autumn and spring grazing, plus some limited winter grazing by rams are added together, the Pankee Teder a site carried approximately 4 DSE/ha in 2021. This is below the farm and district average, but the grazing was in the more valuable shoulder season by high priority classes of stock including twin bearing ewes and light weight weaners. It is also worth noting that there was a significant

amount of leaf drop in the Tedera towards the end of the spring grazing as temperatures rose. With an earlier or shorter spring grazing period, some of this leaf drop could potentially have been converted into animal production.

At the Cranmore (Walebing) site, 200 Merino lambs grazed the 36ha Tedera pasture comprised of two 18ha paddocks for 25 days from 18 November 2021 to 13 December 2021. The FOO of the Tedera at the start of the grazing was 1100kg DM/ha. The other 1525 lambs of the mob grazed 100ha of oaten hay stubble. The FOO at the start of the grazing was approximately 1000kg DM/ha. The control mob grazing stubble were supplementary fed 100g/hd/day of lupins. The average daily liveweight gain of the Tedera lambs was 134g/hd/day; a gain of 3.4kg over 25 days, while the average daily live weight gain of the lambs grazing oaten hay stubble was 84g/hd/day; a gain of 2.1kg over 25 days. The Tedera pasture produced 19kg/ha of lamb live weight gain compared to 32kg/ha in the control crop stubble. The control stubble incurred approximately \$1 per lamb of supplementary feeding costs. When the DSE grazing days from the autumn and spring grazing, plus some extra early spring grazing by hoggets are added together, the Cranmore Tedera site carried approximately 2.1 DSE/ha in 2021. This is below the farm and district average. However, it should be noted that the visually assessed plant density of these two Tedera paddocks is less than ideal. The visual productivity of each individual Tedera plant has been lower at this site. This is most likely due to the heavy, shallow compacted soils.

Table 1. Summary of 2021 Tedera Producer Demonstration Site results

Site	Pasture	FOO (kg/ha)	Lambs/ha	Weight gain			Grain fed (\$/hd)
				g/hd/day	kg/hd	kg/ha	
Strathmore	Tedera	11 400	50	114	6.5	325	0
Strathmore	Control	3300	10	125	7.1	70	0
Pankee	Tedera	2200	12	117	5.6	64	0
Pankee	Control	1500	12	-11	-0.5	-7	1
Cranmore	Tedera	1100	6	134	3.4	19	0
Cranmore	Control	1000	15	84	2.1	32	1



Thanks to MLA for funding and to Moore Catchment Council for administering the project.

Using scanned fetal numbers to inform reproduction trait performance in the MERINOSELECT evaluation

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Introduction

Reproduction rates in wool sheep are an important contributor to profit, particularly in recent years where high returns have been received for lamb and sheep meat. Interest in improving sheep reproductive rates is widespread, not only through improved nutrition and innovations in general management, but also from genetic improvement programs.

To achieve effective genetic gain in reproductive rates requires accurate recording of reproductive performance for individual ewes. This normally includes records on lambs born alive and dead, collected at lambing time, pedigree information, and records of failure of individual ewes to conceive. However, the majority of Merino breeders have traditionally not collected much or any of this information. While other methods of collecting pedigree information are used, such as mothering up lambs in yards after lambing, using DNA testing or electronic systems to associate lambs with their dams, these generally are not able to capture any information on lamb losses when used in isolation, which invariably occur either at birth or within the first 3 days after birth. Further, a ewe's failure to conceive must be actively recorded.

Pregnancy scanning data can help

In addition to data on lambs, Sheep Genetics use pregnancy scanning data submitted by breeders to inform conception and litter size traits in the MERINOSELECT and LAMBPLAN analyses where birth data is not available. Pregnancy scanning identifies which ewes did or didn't conceive, and the fetal count at scanning. The fetal count represents the litter size. This data is used in the calculation of Australian Sheep Breeding Values (ASBVs) for conception (CON) and litter size (LS), whilst data on the proportion of the litter weaned informs ewe rearing ability (ERA). Together these component traits of reproduction (CON, LS and ERA) make up the weaning rate (WR) ASBV.

How does it work?

Pregnancy scanning records detailing the number of fetuses present per ewe are submitted by the breeder or their service provider to Sheep Genetics, alongside a mating record for individual ewes. This means scanning data can be used to evaluate conception outcomes and litter size. Recording performance for ewe rearing ability (the proportion of lambs born which are reared) is not possible using pregnancy scan data alone. However, breeders can use pregnancy scanning in combination with pedigree methods such as DNA parentage data to inform the Sheep Genetics database of lamb losses. With this information, Sheep Genetics generates ASBVs for the component reproduction traits (CON, LS and ERA) as well as the combined weaning rate (WR) ASBV.

Accuracy of pregnancy scanning for genetic evaluation

The agreement between litter size (lambs born per ewe) assessed by pregnancy scanning and litter size reported by mothering up at birth was investigated in a study of data submitted by ram breeder flocks (approximately 66 000 adult ewe records) to MERINOSELECT, the national genetic evaluation scheme for wool sheep. This study was part of the MLA/AWI-funded project L.LSM.0021 'Increasing lambing percentages through better use of pregnancy scanning technology'. Results are shown in Figure 1.

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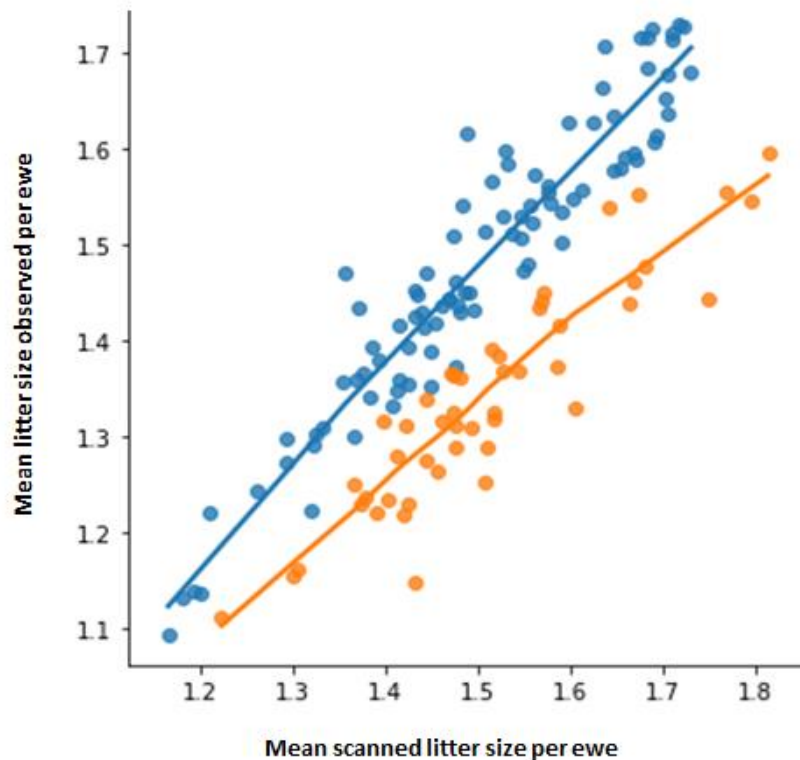


Figure 1. Mean litter size observed at birth or afterwards vs. mean scanned litter size

Many breeders do not mother up at birth, and therefore lambs observed are typically lower than lambs scanned due to lamb losses after birth. When the difference in means for scan count versus lamb count is >0.1 , we know from other research activities that this exceeds expected lamb losses post birth. The blue dots in Figure 1 represent situations where this is not the case, and there is very good agreement in means for scans vs lambs. In contrast, the orange dots demonstrate that for every lamb scanned, on average 0.8 lambs are observed at weaning, which is typical of overall mortality rates.

This study demonstrates that scanned litter size data is a very good indicator of the reproductive rate of ewes, when account is taken of lamb losses, and can make a valuable contribution to the genetic evaluation of sheep for reproductive traits.

Further information

For more information on recording reproduction or MERINOSELECT visit the Sheep Genetics website <https://www.sheepgenetics.org.au/> or phone +61(0)2 8055 1818.

Funding for the L.LSM.0021 Project 'Increasing lambing percentages through better use of pregnancy scanning technology' was provided by Meat and Livestock Australia and Australian Wool Innovation Limited.

Pain relief at lamb marking

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DPIRD recommends that producers use pain relief when mulesing, tail docking and castrating lambs at marking time. Provision of pain relief to animals enhances their ability to cope with the painful procedure, while also promoting healing by alleviation of tissue trauma and inflammatory processes.

There are several pain relief products registered for use on lambs:

- Meloxicam is a long-acting non-steroidal anti-inflammatory drug (NSAID) commonly used in humans and animals. It is available for use in lambs in two forms; an injection applied under the skin high on the neck (Metacam® and other brands) or an oral gel applied inside the cheek (Buccalgesic®). Meloxicam is effective after 10 to 15 minutes and provides systemic (whole-body) pain relief for 10 to 15 hours.
- Tri-Solfen® is a short-acting topical spray containing two local anaesthetics: short-acting lignocaine and longer-acting bupivacaine. It also contains adrenalin to constrict blood vessels and cetrimide as an antiseptic. The spray must be applied directly onto an open wound; therefore, it is not suitable if using hot gas knife for tail docking, or rubber rings for castration and tail docking. It provides pain relief to the area within minutes, lasting 3 to 4 hours.
- NumOcaine® is a short-acting topical pain relief injection containing the anaesthetic lignocaine, which is injected into the scrotum or tail by the specialised NumNuts® applicator with a ring. It provides pain relief to the area within minutes, lasting up to 45 minutes.

Painful husbandry procedures, such as mulesing, castration, tail docking, ear marking or ear tagging, may be performed at the same time. In this situation, the best pain relief strategy is to use a 'multi-modal' approach to relieve both the immediate pain associated with the procedure, as well as longer lasting pain associated with inflammation and healing. For example, Tri-Solfen® or NumOcaine® administered together with an NSAID such as Buccalgesic® or Metacam® (or another injectable meloxicam brand) is an effective method to alleviate both the immediate and longer lasting pain. It is important to note that Metacam® or other injectable meloxicam brands cannot be used in combination with Buccalgesic® as they are the same drug, just in different forms.

Products should be applied according to the manufacturer's recommendations, either before, during, or immediately after the painful procedure. Tri-Solfen® is a Schedule 5 (S5) product, available over the counter at agricultural re-sellers. NumOcaine®, Buccalgesic® and Metacam® (or other injectable meloxicam brands) are Schedule 4 (S4) and must be prescribed and dispensed by a vet with a bona fide professional relationship with the producer. As with all veterinary chemical use, the Withholding Period (WHP) and Export Slaughter Interval (ESI) must be adhered to, and they are outlined for each product in Table 1 below, along with the painful husbandry procedure that each can be used for.

Table 1. Pain relief products, their withholding period (WHP), export slaughter interval (ESI) and application.

Product	WHP & ESI	Mulesing	Tail docking with hot gas knife	Tail docking with cold knife	Tail docking with rings	Castration with knife	Castration with rings	Veterinary prescription needed
Tri-Solfen® S5	90 days	✓	✗	✓	✗	✓	✗	✗
Buccalgesic® S4	10 days	✓	✓	✓	✓	✓	✓	✓
Meloxicam S4 Several generic brands including Metacam®	11 days	✓	✓	✓	✓	✓	✓	✓
NumOcaine® used with NumNuts® ring applicator system S4	0 days *ESI (see note)	✗	✗	✗	✓	✗	✓	✓

Adapted from Australian Wool Innovation Ltd Factsheet: *Anaesthetics and Analgesics at Lamb Marking*.

*An Export Slaughter Interval (ESI) has not been established for NumOcaine®. The manufacturer's advice should be sought before using this product.

For more detailed information, please visit the department's 'Best practice marking of lambs' webpage www.agric.wa.gov.au/management-reproduction/best-practice-marking-lambs

Pastures from Space is back and better than ever

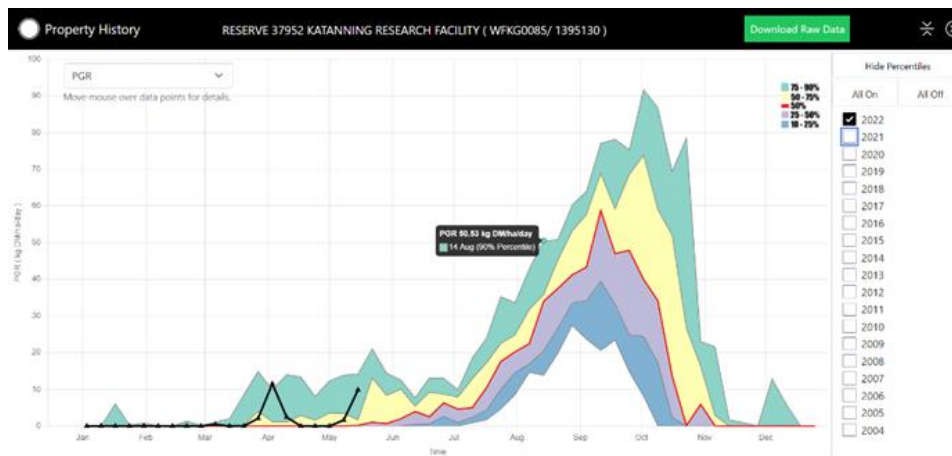
Livestock producers can now better understand pasture growth on their properties through the revamped Pastures from Space™ online mapping service.

The tool, a partnership between the Department of Primary Industries and Regional Development (DPIRD), Landgate and CSIRO, now provides more features for producers to measure and compare pasture growth across seasons.

The new service allows producers to drill down to their property plus pixels within their property to see Pasture Growth Rate (PGR), Feed on Offer (FOO) and cumulative PGR over each growing season from 2004. The data can be viewed for any combination of years including the latest week in the current growing season plotted against the median, 75 and 25 percentiles to help understand how the season is progressing in comparison to other years. The map can also be used to view FOO and PGR for the whole South West agricultural region on a weekly basis, including the last seven years of data. All the data can be downloaded to Microsoft Excel.

The estimates of FOO use technology that has been developed and calibrated from 1995, based on the relationship between normalised difference vegetation index (NDVI) and ground-truthed data to example seasonal response patterns. FOO is the above-ground green pasture biomass expressed as kg DM/ha and PGR is the current rate of pasture growth in kg/ha/day. The cumulative PGR or total dry matter is the sum of the weekly PGR multiplied by 7 days and is expressed as kg DM/ha.

The primary information for this application comes from the MODIS satellite. This satellite passes over Western Australia at least 14 times a week at a resolution of 250m by 250m or 6.25 ha. Although Sentinel satellites can provide more detailed data (10x10m), it is affected by cloud cover and has limited value during our wet and cloudy winter days.



The service is free and brought to you by DPIRD and Landgate, building on the extensive ground truthing done over the years in the broadacre areas of WA by CSIRO, DPIRD and Landgate.

Visit the Pastures from Space website: www.agric.wa.gov.au/pastures-from-space-wa



Calling WA sheep producers – Last chance

Are you a sheep producer in WA with more than 500 sheep in the past year? If so, we want to hear from ewe!

The Department of Primary Industries and Regional Development (DPIRD) is conducting the 4-yearly Western Australian Sheep Producer Survey to give a fresh snapshot of the State's billion dollar industry.

This is the fourth survey of its kind conducted by DPIRD and aims to capture an overview of flock dynamics, along with understanding producer intentions and practice change over time. This information is vital in guiding future research and development programs to help support a progressive and thriving sheep industry.

Survey questions relate to general flock demographics, breeding and selection, reproductive rates, use of labour-saving devices, participation in capability building activities and changes in management practices including carbon accounting.

The survey should take about 25 minutes to complete. All information will remain anonymous, and a summary report of survey results will be provided. Completed surveys will also go in the draw to win one of five \$100 fuel vouchers.

The survey is being conducted via telephone and online. You may be contacted by an independent marketing company, Ipsos, to complete a phone survey or you may receive an email link via DPIRD. You can also complete the survey now and view previous reports by visiting www.agric.wa.gov.au/sheep-survey.

Online survey closes 30 June 2022.



Department of
**Primary Industries and
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