Sheep Updates 2005 - Part 6

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New annual pastures - quality and quantity for fodder conservation?

Sarah Pugh and Giles Glasson, Department of Agriculture WA, Northam

ABSTRACT

Annual pasture legumes were sown at three locations in the wheatbelt of WA in 2004. Quantity and quality analysis of the pastures was determined. At all locations arrowleaf clover and crimson clover were amongst the best producing varieties. Purple clover also performed well at Northam, while rose clover and lathyrus performed well at Badgingarra and Beaufort River.

AIMS

To compare the production and quality of different annual pasture legumes for their potential as fodder crops (i.e. conserved as hay and silage)

METHOD

Three field trials were established in 2004, which included one replicated trial and two on-farm trials that were unreplicated.

The replicated trial was established at Northam (Muresk farm – red loam soil). Twelve treatments were evaluated using a Latinised randomised block design with three replicates. Plots were 7.2m by 20m in size and were sown on 24th May 2004.

The two on-farm trials were established at Badgingarra (sand) and Beaufort River (gravely sand) with 11 treatments at Badgingarra and 12 treatments at Beaufort River. Cadiz French serradella was used as a control and was replicated three times. All other treatments had only one replicate. Treatments, including the controls, were randomised at each site.

Table 1: Varieties used at each site

<table>
<thead>
<tr>
<th>Treatment (seeding rate)</th>
<th>Replicated trial (3 reps)</th>
<th>On-farm trial (1 rep each)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Northam</td>
<td>Badgingarra</td>
</tr>
<tr>
<td>Arrowleaf clover (15 kg/ha)</td>
<td>Cefalu</td>
<td>Cefalu</td>
</tr>
<tr>
<td>Balansa clover (15 kg/ha)</td>
<td>Paradana</td>
<td>--</td>
</tr>
<tr>
<td>Crimson clover (15 kg/ha)</td>
<td>Caprera</td>
<td>Caprera</td>
</tr>
<tr>
<td>Biserrula (15 kg/ha)</td>
<td>Casbah</td>
<td>Casbah</td>
</tr>
<tr>
<td>French serradella (30kg/ha)</td>
<td>Cadiz</td>
<td>Cadiz(^1)</td>
</tr>
<tr>
<td>Lathyrus (60 kg/ha)</td>
<td>Chalus</td>
<td>Chalus</td>
</tr>
<tr>
<td>Oat (120 kg/ha)</td>
<td>Carallup</td>
<td>Carallup</td>
</tr>
<tr>
<td>Persian clover (15 kg/ha)</td>
<td>Lightning</td>
<td>Lightning</td>
</tr>
<tr>
<td>Purple clover (15 kg/ha)</td>
<td>Mixed line</td>
<td>Mixed line</td>
</tr>
<tr>
<td>Rose clover (15 kg/ha)</td>
<td>Hykon</td>
<td>Hykon</td>
</tr>
<tr>
<td>Subclover (15 kg/ha)</td>
<td>Dalkeith</td>
<td>Dalkeith</td>
</tr>
<tr>
<td>Sulla (15 kg/ha)</td>
<td>Breeding Line</td>
<td>Breeding Line</td>
</tr>
</tbody>
</table>

\(^1\) Varieties in bold were used as control varieties and replicated three times at the on-farm site where they were grown.

Large plots were established at each of the on-farm sites being 18 x 200 m at Badgingarra and 9 x 100 m at Beaufort River. Plots were sown on 3rd June 2004 at Badgingarra and 11th June 2004 at...
Beaufort River. Pasture legumes were sown at 15 kg/ha, except Cadiz French serradella, which was sown at 30 kg/ha pod segments. Oats were sown at 120 kg/ha. The sites were fertilised at time of seeding with 3:2 Super Potash (5% P and 20% K) which was applied at 150 kg/ha at Northam and Badgingarra and 165 kg/ha at Beaufort River. The oats plot were also topdressed with 100 kg/ha of Urea (46% N).

At the Northam site samples were taken 6 times over the growing period to estimate biomass production. Samples were also taken at the on-farm trials but only at flowering and senescence. Four 100cm by 50cm quadrats were sampled from each plot, two were dried to estimate dry matter production and two were made into silage. Both the dried and silage samples will be analysed for crude protein content, metabolisable energy and other quality indicators (data not yet available).

RESULTS
The pasture legume species at Northam that produced the greatest biomass were arrowleaf clover, crimson clover and purple clover. Arrowleaf clover and crimson clover also performed well at Beaufort River, while French serradella, lathyrus and subclover performed well at Badgingarra. Surprisingly, one species that performed well at all three sites was rose clover. However, even the best pasture treatment (arrowleaf clover, 5.65 t/ha) did not produce as much biomass as the oats (over 10 t/ha at Northam). Oat production at Badgingarra does not reflect the production potential at this site due to an early cut and the remaining crop being harvested for hay before further biomass measurements were taken.

Table 2: Biomass production (t/ha)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Replicated trial (3 reps)</th>
<th>On-farm trial (1 rep each)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Northam</td>
<td>Badgingarra</td>
</tr>
<tr>
<td>Arrowleaf clover</td>
<td>5.65</td>
<td>3.24</td>
</tr>
<tr>
<td>Balansa clover</td>
<td>4.29</td>
<td>--</td>
</tr>
<tr>
<td>Crimson clover</td>
<td>5.54</td>
<td>3.03</td>
</tr>
<tr>
<td>Biserrula</td>
<td>4.54</td>
<td>2.60</td>
</tr>
<tr>
<td>French serradella</td>
<td>2.95</td>
<td><strong>4.08</strong> (0.30)</td>
</tr>
<tr>
<td>Lathyrus</td>
<td>4.50</td>
<td>4.28</td>
</tr>
<tr>
<td>Oat</td>
<td>10.1</td>
<td>2.86</td>
</tr>
<tr>
<td>Persian clover</td>
<td>4.65</td>
<td>2.38</td>
</tr>
<tr>
<td>Purple clover</td>
<td>5.26</td>
<td>1.97</td>
</tr>
<tr>
<td>Rose clover</td>
<td>4.45</td>
<td>3.92</td>
</tr>
<tr>
<td>Subclover</td>
<td>2.62</td>
<td>4.99</td>
</tr>
<tr>
<td>Sulla</td>
<td>2.72</td>
<td>0.92</td>
</tr>
</tbody>
</table>

† Varieties in bold were used as control varieties and replicated three times at the on-farm site where they were grown. Number in parenthesis indicates s.e. of the control variety.

CONCLUSION
Biomass production varied between species and between locations. Arrowleaf clover, crimson clover, rose clover and lathyrus were consistently the most productive species. We believe there is potential to grow a mixture of pasture legume and oats together to gain the best combination of biomass and quality – this is the subject of work in 2005.

KEY WORDS
Pasture legumes, fodder crop, feed quality, biomass production.
ACKNOWLEDGMENTS

This research is supported by the Rural Industries Research and Development Corporation (RIRDC). We acknowledge Curtin University for the use of land at Muresk. We also acknowledge the experimental support from Badgingarra Research Station and the Beaufort River Farm Improvement Group.

Paper reviewed by: Dr Clinton Revell
Saltbush Pastures: Dispelling some Myths

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2. CSIRO Livestock Industries, Floreat, WA, 6014
3. CRC for Plant-based Management of Dryland Salinity
4. Saltland Pastures Association

ABSTRACT
Saltbush-based saltland pastures have been subject to bad press over the last decade. This paper refutes four of the ‘myths’ associated with saltbush.

AIMS
Two years of research results are now available from the Sustainable Grazing on Saline Lands initiative in WA. These and other data are enabling us to reject four myths that have developed regarding saltbush-based pastures.

REVIEW

Myth 1. Saltbushes are no use as a feed for sheep
This is false. Saltbush has strengths and weaknesses as a livestock feed. However, its role in increasing the productivity of saline land and as a source of autumn feed has been demonstrated. Saltbushes have some of the highest crude protein concentrations available to grazing animals in autumn in Mediterranean farming systems. Values have been reported of up to 17% dry weight and values of 13% are common\textsuperscript{(1)}. However they also have high salt concentrations in the leaves, which limit their intake by sheep. Ash concentrations have been reported of up to 39% dry weight and values of 20% are common\textsuperscript{(2,3)}. Feeding saltbush only will generally not meet the total nutritional requirements of sheep, and they should be supplemented with low-salt alternatives such as an understorey of annual legumes and grasses, or with hay or small amounts of grain to achieve the desired level of production. Saltbushes also contain high concentrations (more than 100 mg/kg dry matter)\textsuperscript{(4)} of Vitamin E, which is often limiting in dry pastures. Experiments at Yealering have shown that old man saltbush supplemented with small amounts of barley grain (175 g/head/day) will maintain sheep for 50-60 days in autumn (Norman \textit{et al.} unpublished). Weaners grazed on saltbush for 14 weeks in autumn had nearly twice the Vitamin E concentration in the eye muscle and more than 6-times the Vitamin E concentration in the liver compared with animals on dry pastures\textsuperscript{(4)}.

Myth 2. Saltbushes use trivial amounts of water
This is false for non-acid groundwater at salinities up to ~80% seawater beneath sands and loams in the wheatbelt of WA. Neutron moisture data from a commercially managed stand of saltbush at Lake Grace growing over groundwater with a salinity of ~90% seawater showed that the saltbushes could access soil moisture to depths of about 2 m and dry soil profiles by about 140 mm (Barrett-Lennard and Altman, unpublished).

Myth 3. Saltbush plants are all the same
This is false. There is huge genetic diversity within saltbush species for a variety of traits including those associated growth and nutritive value (salt and fibre concentrations in the leaves). At Yealering major differences in sheep performance on two different saltbush species (river and old man saltbush) appeared to be associated with differences in the acid and neutral detergent fibre concentrations of the material. We believe it will be possible to select and breed premium saltbush cultivars with high nutritive value characteristics.
Myth 4. Set stocking is the best saltbush use strategy

This is false when saltbush is present with a substantial palatable under-storey. Intensification of grazing presents a means by which sheep eat the preferred and less preferred components of the pasture over a shorter period of time, creating more uniform grazing and longer rest periods. Research at Lake Grace suggests that with set stocking, sheep eat the more palatable understorey species (especially balansa clover and capeweed) before they eat much of the saltbush (1). In a grazing management study at Lake Grace where saltbush was grown in alleys with an under-storey of annual legumes and grasses, we had 50-60% more meat and wool production per hectare when the animals were rotationally grazed than when set-stocked. Based on commodity prices for November 2004, we estimate that the rotationally grazed pastures netted $140 per hectare more than the set-stocked paddock.

CONCLUSION

Western Australia faces a huge problem of present salinity and future salinity risk in the broad valley floors of the wheatbelt. The incorporation of saltbushes into farming systems will improve farm profitability and sustainability in these areas.

KEY WORDS

saltland-pasture, nutritive-value, water-use, grazing-management

ACKNOWLEDGMENTS

We are grateful for the support of our farmer collaborators. Our research is financially supported by the Land Water and Wool Program’s Sustainable Grazing on Saline Lands initiative.

Paper reviewed by: Dr Dean Thomas, CSIRO Livestock Industries.

REFERENCES


Pastures: Putting profit back into sandplain

Nadine Eva, Department of Agriculture

ABSTRACT

Introducing pasture in to the rotation as an option to manage herbicide resistance has the potential to maintain the profitability of the sandplain farming system.

The reduction of lupin yields due to herbicide resistance has a major effect on farm profit on the medium rainfall sandplain farm.

AIMS

The wheat-lupin (WL) rotation has been a very profitable rotation on the sandplain soils of the Northern Agricultural Region. The rotation has been dependent on the use of selective herbicides for in-crop weed control. Annual ryegrass and wild radish are rapidly developing a resistance to the major herbicide groups. Management options need to be implemented to maintain the profitability of this system. The release and introduction of several new pasture species, together with higher livestock prices, may encourage growers to re-examine the place of pasture in the system. This analysis evaluated several rotations that included pastures to find a profitable alternative in the face of resistance.

METHOD

The analysis of different rotations was carried out over a 10 year period using the STEP (simulated transitional economic planning) model. Fully established systems were compared. The transition costs between systems will need further evaluation.

The farm used in the model is representative of a Northern Wheatbelt sandplain farm. It consists of 3000 ha yellow sand, which was generally cropped to wheat and lupins, and 500 ha grey sand, which was mainly kept as volunteer pasture and ran a small self replacing ewe flock of 1000 plus their lambs. Average yields used were Wheat 2.5 t/ha, Lupins 1.7 t/ha and Canola 1.2 t/ha. These yields increased at 2% per annum. To simulate terms of trade, costs increased at 3% per annum and returns increased at 2% per annum.

Seventeen rotations of varying lengths and complexity were included in the analysis. From these initial results further analysis is being undertaken on the most promising rotations. One of the main assumptions made in the analysis was introducing pastures into the rotation maintained crop yields due to the reduced impact of herbicide resistance on crop yield. A self replacing merino flock was the only livestock included in the analysis.

RESULTS

Analysis of the Net Present Value (NPV) of the cumulative financial position after 10 years of WL rotation on the representative sandplain farm clearly indicates that herbicide resistance impacts heavily on the financial position of the farm. After 10 years, the NPV of the WL rotation was $834,660. When lupin yields were reduced by 20% through herbicide resistance, this dropped to $141,902. Similarly when lupin yields reduced by 40%, the NPV dropped again to $425,505.

These figures were derived from average grain prices of wheat $166/t and lupins $163/t with lambs grossing $40/head.

Introducing a pasture into the rotation would clearly make more money than a failing WL rotation with minimal resistance levels.

One of the most promising alternative rotations was a sacrificial hard seeded french serradella (fs) Erica and Margarita mix system (WLW fs fs), where a high seeding rate of farmer grown serradella pod is broadcast with fertiliser at seeding in the second wheat year and germination in that year is sprayed. Alternatively the pod is sown directly after harvest of the wheat crop. Due to the hard seeded nature of the seed, it is expected that the seed will germinate for the following two years, without an additional seeding or the pasture being allowed to set pod. A hay freeze technique can be used to prevent weed seed set. The appearance of resistant radish in the system may require a three
years of pasture to regain control of radish numbers. A three year hard seeded french serradella phase followed by a WCWLW phase also looks very promising. Another promising rotation was to replace the last two years of lupins with hard seeded yellow serradella (hss) for a WLW hss W hss. The serradella is only established once and regenerates.

Table 1. The NPV adjusted cumulative financial position of the current system and other pasture based rotations after 10 years.

<table>
<thead>
<tr>
<th>Rotation</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL 80% lupin yield</td>
<td>$169,675</td>
</tr>
<tr>
<td>WL 100% lupin yield</td>
<td>$834,660</td>
</tr>
<tr>
<td>Fs fs fs WCWLW</td>
<td>$799,930</td>
</tr>
<tr>
<td>WLW hss W hss</td>
<td>$712,146</td>
</tr>
<tr>
<td>WLW fs fs (sacrificial)</td>
<td>$600,102</td>
</tr>
</tbody>
</table>

Table 2 shows that where a three year french serradella phase is required to manage resistant weeds, profitability of this system is still greater than the current system where lupins yields decline. Even when lamb prices are low, this pasture rotation is still significantly more profitable than the W: L rotation with resistance. Winter stocking rates with this system were 5 dse (approx 5000 ewes and their lambs).

Table 2. 10 year NPV comparison of current system where resistant weeds reduced lupin yield by 20% (1.36 t/ha) to a system with 3 year french serradella phase followed by WCWLW where lupin yields are maintained (1.7 t/ha)

<table>
<thead>
<tr>
<th>Lamb price</th>
<th>High grain price</th>
<th>Average grain price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current system</td>
<td>3 year pasture phase</td>
</tr>
<tr>
<td>$25</td>
<td>$1,023,314</td>
<td>$1,114,446</td>
</tr>
<tr>
<td>$40</td>
<td>$1,067,165</td>
<td>$1,496,039</td>
</tr>
<tr>
<td>$60</td>
<td>$1,125,633</td>
<td>$2,004,831</td>
</tr>
</tbody>
</table>

The results presented in this paper are the initial analysis. Further sensitivity analysis exploring the interactions between stocking rate, lambing % and price are being undertaken.

CONCLUSION

Introducing pasture into the rotation to help manage herbicide resistance has the potential to maintain the profitability of the sandplain farming system. Initial analyses indicate that if a pasture phase is used to manage herbicide resistance the profitability of the sandplain system may be maintained. Further sensitivity analysis will likely reveal that if higher stocking rates can be achieved, the profit will rival that of the WL system before resistance (at the average $40 lamb price).

However, their profitability relies on good sheep and pasture management and the ability of the sandplain to carry large numbers of sheep without causing environmental problems such as wind erosion. Managing large numbers of sheep may not appeal to all growers.

The sandplain farming system project will continue to analyse these systems. An analysis of alternative options which include the use of shield spray technology and other management techniques is also being developed.

KEY WORDS
Pastures, sustainability, herbicide resistance

ACKNOWLEDGMENTS

Caroline Peek’s knowledge of STEP and the WL system was invaluable.

Paper reviewed by: Caroline Peek
Pasture from Space® – Can be used to make profitable strategic and tactical management decisions on farm

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ABSTRACT
Pastures from Space®, a collaborative project between CSIRO Livestock Industries and the Western Australian Departments of Agriculture and Land Information, has developed the capacity to measure both the biomass and growth rate of annual pasture in the winter rainfall regions of southern Australia using remote sensing. This paper describes a case study on how the technology has been used to make strategic and tactical decisions on farm. The types of decisions for which the technology has been used include; the potential stocking rate for the farm, stocking rate for a particular season, grazing and pasture management practices and fertiliser applications. An economic analysis demonstrates an increase in gross margin per winter grazed hectare of $53 from $314 to $367 as a result of an increase in stocking rate from 12 to 16 DSE.

INTRODUCTION
Brad and Tracy Wooldridge farm 510 arable hectares at Arthur River, approximately 180 km southeast of Perth. Approximately 60% of the arable area is planted to crops. Traditionally they have run a winter stocking rate of 12 Dry Sheep Equivalents (DSE)/ha. The annual rainfall ranges from 320 to 500 mm.

Recognizing the small scale of their operation and the need to maximize returns, their aim is to utilize as much of the pasture grown as possible. To do this they have moved from set stocking to rotational grazing and have been able to achieve higher stocking rates and make more informed decisions because of the satellite-based information on pasture growth rate (PGR®) (1) delivered via a farmer friendly tool “Pasture Watch™” (2).

They have been involved with the Pastures from Space® project for the past three years and have used the weekly average PGR and 7-day forecast PGR information to make major stocking rate, grazing systems and pasture management decisions on their farm. Their aim is to increase stocking rate by better matching total animal requirements to total pasture production and therefore maximizing the productivity and profitability of their sheep enterprise.

REVIEW
Management
The first significant change came through the use of the Pastures from Space historical PGR data over the past 5 years to determine the potential stocking rate for their property (3). The potential stocking rate is calculated by the formula \( [(\text{pasture grown} - 1500 \text{ kg DM/ha})/500 \text{ kg DM/ha}] \), where 1500 kgDM/ha accounts for losses from trampling and residues left on the ground for soil stabilisation and 500 kgDM/ha is the annual pasture allowance for a DSE.

May 20 is the “average” date of break against which they traditionally set the annual base stocking rate of 12 DSE/winter grazed hectare (wgha) for their property. For each week the season breaks prior to the 20 May they increase their stocking rate by 1 DSE/wgha to a maximum of 19 DSE/wgha up to the 1 April. Conversely, their stocking rate is reduced by 1 DSE/wgha for each week the season breaks after 20 May. The change in stocking rate is achieved by increasing the area sown to canola in an early break or reducing the area sown to canola in a late break. They also look at the opportunity to agist sheep off-farm in a late break if economically viable. These strategies allow them to better...
match animal demand to the biomass produced, maximizing their pasture utilization in a good year and minimizing the risk of being overstocked in a poor year.

Once the season has broken they enter the weekly PGR’s into a spreadsheet to determine the length of deferment of pasture paddocks. Usually it is around 4 weeks before the stock enter the first paddock, which means it is around 7 weeks before they move into the last of the six pasture paddocks. During the season, they plot their stock requirements per hectare per day against the weekly average and 7-day forecast PGR for their farm to check if they are accumulating or depleting their green feed reserves. A forecast depletion of green feed reserves will trigger tactical decisions such as, nitrogen application, supplementary feeding, or if severe enough, agistment of stock.

By August, when the farm average PGR’s exceed the DM removed by the stock, the focus changed from optimising PGR, to increasing the feed intake per head and production per head. For this the grazing period is reduced from 3 - 4 days to 1 - 2 days. The aim is to graze the top third of the sward (A horizon) only, as these are the most digestible. Consequently the regrowth period is reduced from 21 to 8 days. The regrowth period should be of sufficient length to allow the growth of a new A horizon to meet the intake requirements of the animals. In addition, the shorter grazing period reduces pasture fouling normally associated with high stocking rates, which may limit intake. Brad and Tracy’s aim is to grow as much wool and meat as possible during this period of high pasture growth.

By September, when the PGR’s hit a level where some paddocks are growing at a faster rate than the mob of sheep can consume, the length of the rotation is once again increased. The paddocks that are grazed the longest are the ones that will be cropped the following year; resulting in a reduction in seed set, which is beneficial to the subsequent crop. The remaining paddocks are managed for pasture accumulation in preparation for grazing by weaner lambs or allowed to maximize seed set for the following year.

Benchmarking Pasture Production and Utilisation

The availability of individual paddock PGR’s allows comparisons of total dry matter production to be undertaken from the same paddocks between years and between paddocks within years. Feed deficit issues were identified from a) 1st year paddocks out of crop relative to established pastures and b) PGR responses to tactical nitrogen use, which produced increased feed production to make up the deficit. New pasture species can be monitored to quantify any production advantage and nitrogen applications checked for response to timing and rate.

By subtracting the satellite-predicted feed on offer values from the total biomass produced (as displayed in Pasture Watch™) it is possible for Brad to calculate the percentage pasture utilisation for individual paddocks and the whole farm. The calculation of pasture utilisation provides a measure of the efficiency of the farming system and highlights opportunities for further improvement in on-farm productivity.

CONCLUSION

The provision of timely, reliable and accurate PGR information has resulted in a significant increase in the profitability of their sheep enterprise. Economic analyses demonstrate an increase in gross margin of $53 /wgha from $314 to $367 due to an increase in stocking rate from 12 to 16 DSE while optimizing production per head.

KEY WORDS
Pastures from Space, pasture growth rate, satellite, sheep, management, profits

ACKNOWLEDGMENTS

The authors acknowledge the investment of CSIRO Livestock Industries and the Departments of Agriculture and of Land Information in the ‘Pastures from Space’ project and funding from AWI for the 7-day forecast PGR. In addition, the consortium (CSIRO, DAWA and DLi) is highly indebted to the 45 co-operating woolproducers for their generous contribution; an integral and vital part of this project.

Paper reviewed by: Dr Chris Oldham, Senior Research Officer, Department of Agriculture WA.
REFERENCES

Are new farming systems based on perennial pastures in south west Australia more profitable?

P. Sanford¹ and J. Young², ¹West Australian Department of Agriculture and CRC for Plant-based Management of Dryland Salinity, ²Farm Systems Analysis.

ABSTRACT

Farming systems based on annual pastures use insufficient water which leads to salinisation. Summer active perennial species significantly reduce this risk, but are they more profitable as well as sustainable? Simulation models were used to explore the economic and hydrological implications of varying the proportion of a farm under various perennial options. Results indicate there is a substantial decrease in the leakage of water below the root zone (69 to 23 mm) as the area of the farm under perennials increased from 0 to 70%. Encouragingly, profit from a prime lamb enterprise increased ($32 to $104 per ha per yr) as leakage decreased. Increased profit was driven by higher pasture yield, superior feed quality in summer and autumn, reduced supplementary feed and higher stocking rates.

AIMS

To use simulation models to determine farming systems that would increase farm profit and decrease groundwater recharge as Part of the development of the EverGraze – More Meat from Perennial$ project within the CRC for Plant-Based Management of Dryland Salinity

METHOD

A model of the farming system known as MIDAS was used to undertake this analysis (1). The model was paramatised with a representative 2000 ha farm in the Albany Eastern Hinterland catchment receiving 600 mm annual rainfall and comprising of three soil types, deep sand, shallow sand over clay and deep sand over clay. Livestock enterprise was a self replacing Merino flock utilising surplus ewes for crossbred lamb production. Three different systems were analysed:

1. Traditional farming system - 30% crop, 70% annual pasture subterranean clover (Trifolium subterraneum) based, stocked at 8.5 dse/ha.
2. Current best practice - 30% crop, 23% annual pasture subterranean clover based, 47% perennial pasture either lucerne (Medicago sativa) alone or kikuyu (Pennisetum clandestinum)-subterranean clover, stocked at 10 dse/ha.
3. Future farming system - 30% crop, 70% perennial pasture either lucerne alone or kikuyu-subterranean clover or tall fescue (Festuca arundinacea)-subterranean clover, stocked at 12 dse/ha.

Leakage values were estimated using a farm scale hydrologic model (2).

RESULTS

Farm profit and leakage results are presented in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Traditional farming system</th>
<th>Current best practice</th>
<th>Future farming system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm profit ($/ha/yr)</td>
<td>$32</td>
<td>$69</td>
<td>$104</td>
</tr>
</tbody>
</table>

Table 1 Estimated farm profit ($/ha/yr) and leakage (mm) beneath contrasting farm systems
As expected there is a substantial decrease in the leakage of water below the root zone (69 to 23 mm) as the area of the farm under perennials increased from 0 to 70%. Encouragingly farm profit increased ($32 to $104 per ha per yr) as leakage decreased. Increased profit was driven by higher pasture yield, superior feed quality in summer and autumn, reduced supplementary feed and higher stocking rates. The optimum area of the farm under varying perennial options is presented in Figure 1. With only one perennial option, in this case lucerne, the optimum proportion of the farm is around 25% (500 ha) in terms of profit. If another perennial option with a different growth pattern such as kikuyu is added, the optimum increases to about 50% (1000 ha) and with a third the optimum reaches to 75% (1500 ha). This result is quite promising as large areas of the landscape need to be planted to perennials to minimise the impact of salinisation.

![Figure 1](image_url)

**Figure 1** The effect of varying the area of perennials on farm profit

**CONCLUSION**

This analysis suggests that it is possible for farmers to substantially increase farm profit while reducing the risk of salinisation through planting a high proportion of their farm to perennial pastures. The Evergraze – *More Meat from Perennial*$ project will now test this system on-farm in the Albany Eastern Hinterland Catchment.

**KEY WORDS**

Summer-active perennials, whole farm profit, salinity, prime lamb.

**ACKNOWLEDGMENTS**

We thank Craig Beverly for running the hydrologic simulations.

**Paper reviewed by:** Lucy Anderton

**REFERENCES**


Sown fodders, rotational grazing and Merinos make money in a drought

Tim Wiley, Department of Agriculture and Richard Quinlan, Planfarm, Geraldton

ABSTRACT
A farmer at east Binnu has compared the carrying capacity of grazing oats and improved ryegrass varieties under rotational grazing against annual pastures grazed traditionally. The paddocks used were yellow sand plain. The average rainfall is 300mm but only 191mm fell during 2004.

Three varieties of oats and three varieties of ryegrass were sown as blocks in a paddock. Measurements of early feed production showed that the grazing oats where most productive. The intensively grazed fodder paddocks carried 7 DSE/ha while the volunteer pasture under low grazing pressure only carried 0.4 DSE/ha. The volunteer pasture only had 8% ground cover by the following April while the ryegrass ground cover was 33% and the grazing oats 71%. By sowing pastures and rotationally grazing it is possible to substantially increase carrying capacity and reduce land degradation from erosion.

Economic analysis showed that while the sown fodders with the rotational grazing was expensive to set up. However the intensive system produced a net income of $97.33/ha compared to only $2.71/ha from the low input conventional paddock.

AIMS
To test the value of intensive rotational grazing and sown fodders against conventional grazing of a self regenerating annual pasture on the carrying capacity, early winter feed supply, summer ground cover and profitability of Merino sheep in the low rain fall NE wheat belt.

METHOD
The 2004 season east of Binnu was exceptionally dry with only 191 mm of rain falling. The average rainfall for this region is 300 mm. This trial was conducted on yellow sand plain soils.

The farmer sowed a paddock as a trial with individual blocks of 3 grazing oats and 3 ryegrass varieties on 4 May 2004. This 115 ha paddock and an adjoining 71 ha paddock were strip grazed by sheep from the 11 June 2004. The strip grazing was done using a ‘wrappa’ portable electric fence. The sheep were moved every 3 to 8 days. The ryegrass and sown oats received two applications of Urea.

Records were kept of the class and numbers of animals in the mob and the date of the moves. Carrying capacity for the year from 31 March 2004 to 31 March 2005 was calculated as Dry Sheep Equivalents (DSE) per hectare. Grazings days were also kept from an adjoining self regenerating pasture that was grazed normally (i.e. low stocking pressures for extended periods). A comparison of Net Income of the intensive versus conventional paddock was conducted based on the actual grazing days of the paddocks, but the cost and income figures used were whole farm averages.

RESULTS
The oats produced more early winter feed than the ryegrasses. Measurements were taken of the growth of pasture from the ryegrass and grazing oat varieties 30 days after germination. Dry matter production 30 days after germination were 624 kg/ha Taipan oats, 506 kg/ha Grazer 50 oats, 604 kg/ha Pallinup aots, 270 kg/ha Safeguard ryegrass, 330 kg/ha Warrior ryegrass and 350 kg/ha Drummer ryegrass.
The intensively grazed sown fodders carried more stock than a traditional pasture being grazed. There was more summer ground cover with the intensive grazing and sown fodders despite the very high stocking rates. The amount of ground cover was assessed in autumn 2005 (21 March). The normally grazed annual paddock was almost completely bare (9% ground cover) and suffering from wind erosion despite carrying only 0.4 DSE/ha. The grazing oats still had more than enough ground cover (77%) to prevent erosion even though it had carried 7.2 DSE/ha or 18 times as many sheep.

Table 2; Carrying capacity and summer ground cover with normal pasture and intense grazed fodders

<table>
<thead>
<tr>
<th>Pasture</th>
<th>Grazing</th>
<th>Total DSE grazing days/ha</th>
<th>DSE/ha/year</th>
<th>% ground cover on 21/3/2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self regenerating annuals</td>
<td>Whole paddock</td>
<td>141</td>
<td>0.4</td>
<td>9%</td>
</tr>
<tr>
<td>Sown ryegrass &amp; grazing oats</td>
<td>Strip grazing</td>
<td>2,617</td>
<td>7.2</td>
<td>71% (Oats) 33% (Ryegrass)</td>
</tr>
</tbody>
</table>

Profitability

The Net Income for the intensive paddock was $97.33 /ha compared to only $2.71 /ha from the low input conventional paddock.

These figures are based on the average meat and wool figures of the whole farm. It assumes that there is no difference in animal performance between the different pastures systems. Wool income is based on 6 kg/head greasy at $4.04/kg. Meat prices are based on $55.00/head for hoggets and $35.00/head for old ewes.

Table 3; Income, costs and Net income with normal pasture and intense grazed fodders

<table>
<thead>
<tr>
<th>Carrying capacity</th>
<th>Conventional grazing + low input pasture</th>
<th>Intensive rotational grazing + sown pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>-Wool $9.74/ha</td>
<td>-Wool $173.80/ha</td>
</tr>
<tr>
<td></td>
<td>-Meat $8.84/ha</td>
<td>-Meat $159.08/ha</td>
</tr>
<tr>
<td>Total income</td>
<td>$18.58/ha</td>
<td>$332.88/ha</td>
</tr>
<tr>
<td>Costs</td>
<td>-Sheep $5.87/ha</td>
<td>-Sheep $104.68/ha</td>
</tr>
<tr>
<td></td>
<td>-Pasture &amp; fencing $10.00/ha</td>
<td>-Pasture &amp; fencing $130.86/ha</td>
</tr>
<tr>
<td>Total costs</td>
<td>$15.87/ha</td>
<td>$235.54/ha</td>
</tr>
<tr>
<td>Net income</td>
<td>$2.71/ha</td>
<td>$97.33/ha</td>
</tr>
</tbody>
</table>

CONCLUSION

In a very dry year spending money on sowing fodder crops and intensively grazing them at high stocking rates was profitable. This more intensive system substantially reduced the risk of erosion in summer. This finding challenges the widely held belief that running more sheep must lead to soil erosion. The oats were more productive, and gave better protection to the soil, than the rye grasses.
KEY WORDS
Grazing oats, ryegrass, intensive grazing, wrappa fencing, ground cover, profitability

ACKNOWLEDGMENTS
This trial was set up and managed by Don Nairn and his family.

Paper reviewed by: Renaye Horne


**Lifetime Wool – The ‘best bet’ optimum condition score profile for Merino ewes lambing in winter**

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**ABSTRACT**

Draft guidelines for the ‘optimum nutritional management’ of ewes have been developed from response curves for the clean fleece weight and fibre diameter of ewes to varying levels of green pasture from mid pregnancy to weaning. Response curves were also defined for the mortality, clean fleece weight and fibre diameter of the progeny at their hogget shearing. The guidelines are defined in terms of the annual condition score profile required to achieve a performance by ewes and their progeny that will deliver approximately 90% of the maximum production for each of these key drivers of whole-farm profitability. It is further proposed that flocks managed to the ‘optimum’ condition score profile will achieve pasture utilisation/carrying capacity/ha that is approximately 90% of the theoretical maximum based on the duration of growing season and soil fertility. In 2005, the draft guidelines are being ‘road-tested’ by 100 woolproducers across southern Australia.

**AIM**

To draft nutritional guidelines for the management of ewes based on critical condition score targets.

**METHOD**

Response curves - defined in plot-scale experiments conducted by *Lifetime Wool* (1, 2) - to increasing availability of green feed from day 90 of pregnancy for the key drivers of whole-farm profitability were used to develop optimum condition score profiles for merino ewes lambing in late winter.

The weight and mean fibre diameter of wool produced by ewes increased to a plateau between 1500 and 2000 kg/ha of green dry matter on offer (FOO; Figure 1a). Similarly the mortality to 48 hr, and to weaning, of their twin progeny in particular also reached a minimum at a FOO of 1500 to 2000 (Figure 1b) as did the quantity and quality of wool produced by the progeny over their lifetime (Figures 1c and d).

The optimum economic solution for each dose response shown in Figure 1 is where the marginal cost of extra FOO is equal to the marginal return from extra product. This is approximately 90% of the maximum response (Ross Kingwell pers.comm.) and somewhere between 1500 and 2000 kg/ha of green FOO during late pregnancy and lactation for the relationships shown in Figures 1a, b, c and d. Similarly, the whole-farm analysis presented by John Young at last year’s Sheep Updates (1) strongly suggested that the maximum profit was generated when ewes were fed to follow the liveweight profile associated with a FOO of around 1500/ha.
RESULTS AND DISCUSSION

Only 25 ewes need to be assessed for condition score to have the same precision as weighing 50 ewes when estimating flock means. In addition, assessing changes in the liveweights of ewes is complicated by wool and fetal growth. Hence, the guidelines shown in Figure 2 are defined in terms of the annual condition score profile required to achieve a performance by ewes and their progeny that will deliver approximately 90% of the maximum production for each of the key drivers of whole-farm profitability shown in Figure 1. It is further proposed that flocks managed to the ‘optimum’ condition score profile shown in Figure 2 will achieve pasture utilisation/carrying capacity/ha that is approximately 90% of the theoretical maximum based on duration of growing season and soil fertility (3).

Figure 1. The responses to increasing levels of green feed on offer (FOO) from day 90 of pregnancy to weaning of ewes clean fleece weight (CFW) and mean fibre diameter (FD) (a) and progeny mortality (b) CFW at hogget shearing (c) FD at hogget shearing (d). The graphs are for treatment means ± sem for 2 sites and 2 years (n = 20 to 30 pregnant ewes and the progeny by 2 or 3 reps).

Figure 2. A schematic of the draft Lifetime Wool guidelines defined in terms of the condition score targets from joining (1) to the next joining (2) for single (●) and twin (■) bearing ewes with a winter/spring lambing. The periods of dry ( ), break-of-season ( ) and spring feed ( ) are shown on the x axis.
In 2005, the draft guidelines are being ‘road-tested’ by 100 woolproducers across southern Australia.

KEY WORDS
Guidelines, optimum-nutrition, ewes, condition score-targets

ACKNOWLEDGMENTS
Lifetime Wool is a national project funded by AWI, DAWA, DPI VIC, NSW DPI, SARDI and TAS DPI with the active cooperation of 100 wool producers across southern Australia.

Paper reviewed by: Rob Kelly, Keith Croker and Beth Paganoni

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