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# Sheep Updates 2003 - Economics

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# Sheep Updates 2003

## Burping sheep are warming the planet

**Anne Bennett**, Department of Agriculture, Western Australia

### KEY MESSAGES

- Sheep are a major contributor to total farm greenhouse gas emissions for Western Australian farms.
- More efficient use of feeds by sheep reduces greenhouse gas emissions.

### AIMS

- To provide example emission profiles for farms across several regions to demonstrate the contribution of sheep to whole farm emissions.
- To outline how reductions in greenhouse gas emissions may be achieved.

### METHOD

Using PlanFarm data and a spreadsheet developed by the Department of Agriculture based on figures used in the National Greenhouse Gas Inventory (NGGI), farm emission profiles were developed for three PlanFarm regions. The PlanFarm regions are based on the Department of Agriculture rainfall regions. Sheep emissions considered are from enteric fermentation and manure.

### RESULTS

According to the NGGI sheep contribute about 7% of Western Australia's total greenhouse gas emissions, the majority from methane gas when burping. However at a whole farm level sheep greenhouse gas emissions are more significant, and increase as sheep numbers increase. This is shown in Figures 1, 2 and 3 with the proportion of sheep emissions increasing as farms increase sheep numbers.

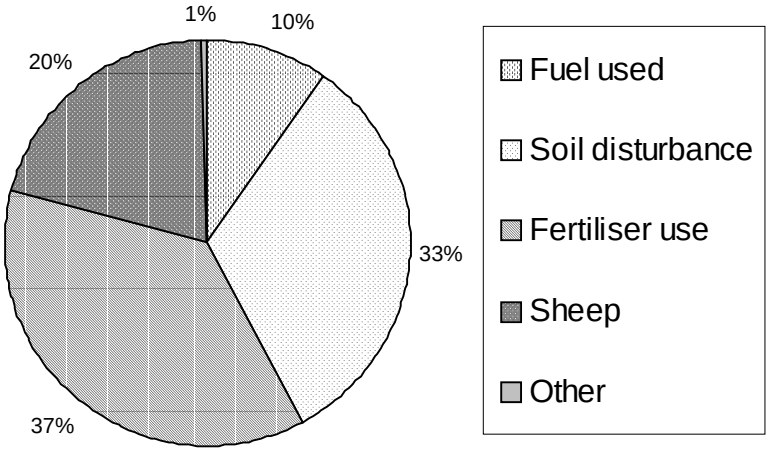


**Figure 1. Greenhouse gas emission profile for the PlanFarm low rainfall region (L1, L2, L3 and L4). Estimated annual total farm emissions are 1174 tonnes of carbon dioxide equivalents.**

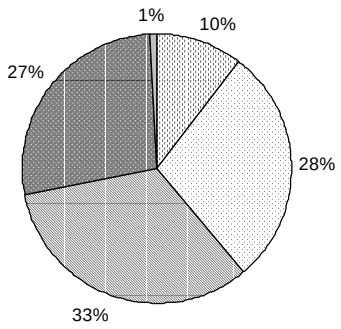


**Figure 2. Greenhouse gas emissions for the PlanFarm medium rainfall north region (M1 and M2). Estimated annual total farm emissions are 1732 tonnes of carbon dioxide equivalents.**

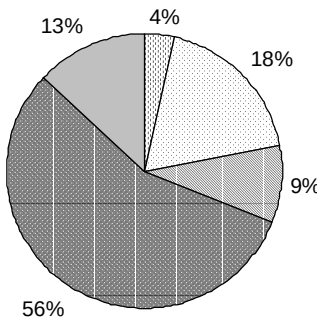


**Figure 3. Greenhouse gas emissions for the PlanFarm high rainfall south region (H3 and H4). Estimated total annual farm emissions are 1259 tonnes of carbon dioxide equivalents.**

## CONCLUSIONS

It is expected State and Federal Governments will implement a whole farm emissions policy to provide incentives to minimise emissions from agriculture. When this will be implemented and how it will look is unknown. However because agriculture is 20% of Australia's emissions there will be pressures for farms to reduce emissions.

CSIRO are developing an anti-methanogen vaccination that is said to reduce sheep emissions by 20% and possibly increase animal production [1]. The vaccine is being commercially developed. For each farmer the value of the vaccine will need to be weighed up against its cost of purchase. The following management practices have also been suggested as ways of limiting farm greenhouse gas emissions [2].

- Shorter stock finishing time.
- Improved digestibility of pastures.
- Improving nitrogen fertiliser use efficiency, and placement.
- Improve drainage in waterlogged soils.
- Minimising and reducing soil structural decline and compaction.
- Reducing fuel use.
- Minimum tillage practices.

## KEY WORDS

methane, greenhouse gas

## ACKNOWLEDGMENTS

Robin Nussey for creating the whole farm emissions spreadsheet.

**Paper reviewed by:** Ross George; Ross Kingwell

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Department of Agriculture

# Sheep Updates 2003

SHEEP UPDATES

## When will the family owned farm make the Endangered Species List?

**Steve Dilley**, 2001 Nuffield Farming Scholar, Donnybrook apple and beef producer

### KEY MESSAGES

Unless a sustainable percentage of the consumer dollar starts to make its way down the supply chain to the primary producer, then there could well be a future need to register family owned farms on the endangered species list!

Further investigation is warranted to develop a mechanism that would directly link or index farm gate prices to retail prices.

### INTRODUCTION

Arguably the biggest contributing factor in the decline of rural communities around Australia has been the falling percentage of the retail price that farmers receive. Is it simply just the law of supply and demand or are there other forces at work? To maintain farm viability in the face of that trend, primary producers have had to improve productivity, reduce input costs, and/or get bigger to achieve economy of scale and better utilisation of capital. However there have been many casualties along the way with a dramatic reduction in the number of family farms from 202,800 in 1960-61, to just 114,785 in 1999-00 [1]. Unless a solution can be found to arrest farmers' declining percentage of the consumer dollar, the future looks grim for large numbers of family farms and the rural communities they provide the economic foundation for.

### REVIEW

Without doubt, one of the greatest events to affect modern agriculture around the world has been the emergence and now dominance of retail supermarket chains. That evolution has irreversibly changed the bargaining dynamics of almost every supply chain, for almost every product you can think of. Gone forever are the days where primary producers were well matched in terms of bargaining power with small green grocers, butchers, etc. The vast majority of modern supply chains now see most farmers with a massive imbalance in countervailing power, with that inherent price taking weakness easily exploited by those higher up the chain. The processing and retail sectors have also undergone massive rationalisation as a result of the same drive for efficiency with many mergers, acquisitions and business failures.

This leaves the majority of primary producers in the invidious position of having to negotiate with a handful of very large and extremely powerful processor/retailers. The harsh reality of that imbalance in bargaining power is the unchecked ability to dictate price and any other terms deemed appropriate! This imbalance in countervailing power has seen inquiry after government inquiry all around the world, with no effective solutions yet found, other than some very soft requirements such as voluntary retail codes of conduct.

### *Solutions*

One of the most controversial responses to the decline in farmer's terms of trade arose in the Canadian Province (State) of Ontario. In 2000 the Odyssey Report was presented, outlining the future for Agriculture in the Province with an option being the application of a food levy/tax at the processing and/or retail points of the supply chain. The money would be collected and used as a safety net for the farmers who supplied the primary product.

The British National Farmers Union (NFU) current response to farmers' declining share of the consumer's dollar has been to expose the issue to the general public. The NFU's 'Farming Counts' campaign is aimed at the deeper issue of the wider population's general disconnection with agriculture, but at the same time highlighting just how little of the retail dollar a farmer receives. The launch of the program saw

the NFU setting up a stall outside their London Headquarters and selling food direct to the public at farm gate prices. The objective of this campaign was to capture and sustain enough publicity so that supermarket chains would be embarrassed into paying farmers more!

Another interesting solution to farmer's declining terms of trade was trialled in France during 2000. The French Minister for Agriculture reacted to calls from fruit and vegetable growers about supermarkets applying huge mark ups to their produce by forcing retailers to display the price they paid the farmer on the same ticket that the consumer price appeared. At first it was thought this complete transparency was the answer to all growers problems, however the trial fell away mainly due to issues of commercial confidentiality between retailers and between preferred suppliers. Sadly a case of unexpected consequences from well intended regulation!

## CONCLUSION

There are no regulatory solutions on the horizon that will address the downward spiral of farmers' share of the consumer dollar. Even if one could be developed, it must accommodate the law of supply and demand otherwise it would be doomed to failure from the beginning. The complexity of such a mechanism would also be enormous, with potential international impediments such as the WTO to also overcome. Assuming for a moment that a regulatory mechanism could be developed that would account for the myriad of practicalities within modern supply chains, would it be possible to gain passage of the legislation through the Federal Parliament for it to become enabled? With the trade off ultimately being slightly higher food prices for the sake of sustainable family farms and rural communities, bi-partisan support would be highly unlikely.

Ultimately, family farms will continue to be subjected to the 'economic law of the jungle' with only the strongest and most adaptable surviving the challenges of globalisation. With a lack of political will on all fronts to address more equitable farm gate returns in the short term, primary producers will continue to be left to fend for themselves. In the absence of a regulatory 'silver bullet', it would appear that the most appropriate response to the ongoing consolidation of the processing/retailing sectors and subsequent lack of countervailing power is for farmers to fight fire with fire. A legislative impediment in the form of the Trade Practices Act currently discourages such initiatives, however a simplified 'Collective Bargaining' process that was recently recommended by the Dawson inquiry should make that process easier.

Despite the absence of an effective regulatory solution, further investigation is warranted to develop a mechanism that would directly link or index farm gate prices to retail prices. Although complex, it would accommodate the crucial market forces of supply and demand, unlike other options such as production subsidies or reserve pricing.

In summary, unless a sustainable percentage of the consumer dollar starts to make its way down the supply chain to the primary producer, then there could well be a future need to register family owned farms on the endangered species list!


## KEY WORDS

farm gate, diminishing returns

## ACKNOWLEDGMENTS

A special thank you to the Australian Nuffield Farming Scholars Association and my sponsors: The Grain Pool of WA, Co-operative Bulk Handling and CSBP, for providing me with the opportunity to study a subject I am very passionate about.

**Paper reviewed by:** Tony Seymour - Chairman, WA Nuffield Farming Scholars Association


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Department of Agriculture

# Sheep Updates 2003

SHEEP UPDATES

## Recent trends and future climate in WA

**Ian Foster**, Department of Agriculture

### KEY MESSAGES

- Global climate is variable and has changed for natural reasons in the past.
- Recent changes in atmospheric composition has led to the possibility of anthropogenic-induced climate change being added to natural processes of change.
- Current projections for future climate for WA suggest declining growing season rainfall, and increasing temperatures and evaporation.
- Projected trends have been similar in some respects to the rainfall decline already experienced over southern WA since the mid-1970s.
- The accumulation of heat during the growing season has increased since the 1960s.
- Observed trends and projections of future climate has wide implications for agriculture, including crop and pasture production, variety selection, on- and off-farm water supplies, animal husbandry, insect and plant disease activity, and economic impacts.

### AIMS

The prospect of changing global and regional climate is becoming increasingly important to land-managers, as it has the potential to significantly alter traditional farming systems and practices. This paper discusses current climate change projections for WA, recent climate trends and what implications they may have on farming practices in Western Australia.

### METHOD

Basic climate observations for WA in this paper come from the Patched Point Database, which comprises original Bureau of Meteorology data that have been re-processed by the Queensland Department of Natural Resources to fill missing observations. Climate change projections for WA were generated by CSIRO in 2001 using the Mk 3 global climate model. Analyses of recent climate trends in WA have been conducted as part of research carried out for the Indian Ocean Climate Initiative.

### RESULTS

CSIRO has simulated Australian climate patterns under conditions of increased $CO_2$ concentrations using its own global climate model and compared results with a range of international models. The current scenario for Australia was released by the CSIRO Division of Atmospheric Research in May 2001. The results may be summarised as:

- Average annual temperatures are projected to rise by 0.4 to 2.0$^{o}$C by 2030 over most of Australia, with slightly less warming in coastal regions. By 2070, the increase would be from 1.0 to 6.0$^{o}$C. The range of warming is greatest in spring and least in winter. The northern region of WA has potential to warm even further.
- Autumn rainfall shows a projected decline of up to 20% over southwest and southern WA, and southern SA and Victoria. Winter rainfall decreases by up to 20% over much of southern WA. This pattern continues into spring. Thus rainfall is projected to decline over WA from autumn to spring. The geographical consistency of the rainfall changes suggests a weakening or lower frequency of

cold fronts. Summer rainfall for most of Australia shows no clear trend, ranging from -20% to +20% by 2030.

- Evaporation rates are expected to increase with temperature. This produces a decline in moisture balance over all of Australia.

The predicted scenario needs to be considered in light of significant climate change that has occurred over the past three decades in WA. They include:

- Greatest rainfall decline has occurred since the 1970s along the lower West Coast, with decreases also observed in agricultural districts. Rainfall decline has been strongest early in the growing season (May-July). Trends in late season rainfall (Aug.-Oct.) have been small.
- There have been fewer rain days in general, with a stronger decline in rainfall per rain-day. Less rain comes from heavier daily rainfall amounts. This runs counter to projections from climate models, which predict heavier daily rainfall events.
- Atmospheric pressure has increased, and there have been more El Nino events over the past 30 years, but these changes do not explain all of the observed rainfall decline.
- The frequency of cold fronts has decreased, and the incidence of high-pressure cells has increased during winter. The lower atmosphere has become drier as a consequence.
- These changes are related to changes in large-scale pressure patterns (such as the Semi-Annual Oscillation) over the Southern Hemisphere, so the WA drying trend is part of a larger picture.
- There has been little trend in daily maximum temperatures, but there is a slight positive trend in daily minimum temperatures. Accumulation of chilling units is declining, while accumulation of heat units is increasing. However, seasonal temperatures still exhibit notable variability from year to year.

These events are broadly consistent with the current climate change scenario. The rainfall decline is of similar magnitude but the timing is not, with the decline predicted to occur towards the middle of the 21$^{st}$ Century, not at the end of the 20$^{th}$. It is also uncertain whether the predicted changes are additive to those that have already occurred.

## CONCLUSION

The climate projections outlined above clearly have major implications for WA agriculture. Rainfall changes are of particular concern because of the consistency among models in projecting a decline. The expected decline occurs from winter to spring, suggesting that the models are identifying real changes to the atmospheric circulation that are physically consistent. Observational studies support the physical reasoning behind climate change in WA.

A wide range of impacts on agricultural industries is possible, from changes to the productive base, variety selection, water supply, pest and disease activity, and changes to economic conditions both domestically and internationally. More detailed studies of potential impacts is clearly needed.

## KEY WORDS

climate, change, trends, impacts

**Paper reviewed by:** Ross George

Sheep Updates 2003

# Profitability of sheep systems in WA's South Coast for various commodity price scenarios

**Emma Kopke[1], John Young[2] and Ross Kingwell[1]**

[1]Department of Agriculture, Western Australia
[2]Farming Systems Analysis Service

## KEY MESSAGES

- The optimal proportion of farmland in pasture for a farming system on the South Coast of Western Australia ranges from 35% to 65% for various commodity price scenarios.
- The most robust flock type is a self-replacing flock utilising surplus ewes for carryover crossbred lamb production.

## AIM

- To examine the profitability of a range of sheep systems, for current and alternative commodity price scenarios for a representative farm in Western Australia's South Coast.

## METHOD

The South Coast farming system model (MIDAS - SCM) was used to conduct this analysis. MIDAS is a whole-farm, profit maximizing programming model that calculates optimal farm management practices, given a set of production relationships provided by the user. Optimal combinations of enterprises are found through using detailed biological, technical and financial information to compare the relative profitability of various enterprise combinations.

The farm model represents a 2500 ha mixed crop and livestock farming system, in the region north of Albany to east of Esperance (medium rainfall zone: 400-500 mm). Soils of the Fitzgerald region are used to represent the main soil types of the South Coast region.

Pure Merino flocks and flocks with Merino ewes producing first cross prime lambs (Table 1) were analysed across a range of commodity price scenarios (Table 2).

**Table 1. A description of the flock types examined in this analysis**

| Flock | Description |
|---|---|
| Specialist Merino wool[1] *(Wool)* | Emphasis is on wool production. Wethers can be sold as lambs to other graziers or as shippers (18 months or older). |
| Wool and Merino prime lamb[1] *(Wool & MPL)* | Emphasis is on wool production. Similar to specialist wool producer except a draft (33%) of wether lambs is sold as Merino prime lambs. |
| Specialist Merino prime lamb[1] *(MPL)* | Emphasis is on Merino prime lamb. All wether lambs are sold. |
| Specialist Merino shipper[1] (*Shipper)* | A self-replacing Merino flock. All wethers are sold as hoggets or as older shippers or as cast-for-age mutton. |
| Specialist crossbred - carryover[1,2] *(XB Co)* | Emphasis is on Merino ewes producing crossbred carryover lambs. Replacement ewes are bought in. |
| Specialist crossbred - sucker[1,3] *(XB Su)* | Emphasis is on Merino ewes producing crossbred sucker lambs. Replacement ewes are bought in. |
| Self replacing crossbred carryover[1,2] *(XB Co SRF)* | A self-replacing Merino flock utilising surplus ewes (cast for age or surplus ewe hoggets) for crossbred lamb production. Merino wethers can be sold as lambs to other graziers or as shippers (18 months or older). |

[1] The Merino flock lambs in late July and August and is shorn in January. Merino ewes producing crossbred lambs lamb in May and are shorn in September.

[2] Carryover lambs are sold in January/February with a carcase weight of 20.2 kg.

[3] Sucker lambs are sold in September/October with a carcase weight of 18.8 kg.

**Table 2. Low (L), standard( S) and high (H) commodity price scenarios**

| | Crop price | | | | | | Wool price | | Sheep price | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Wheat[1] $/t | Barley[2] $/t | Oats[3] $/t | Canola[4] $/t | Lupin[5] $/t | | Wool[6] (c/kg) | | Lamb[7] $/kg | Shipper[8] $/hd | Ewe[9] $/hd |
| **L** | 156 | 160 | 112 | 300 | 160 | | 750 | | 1.50 | 30 | 25 |
| **S** | **195** | **200** | **140** | **375** | **200** | | **900** | | **3.00** | **50** | **45** |
| **H** | 234 | 240 | 168 | 450 | 240 | | 1,050 | | 4.50 | 70 | 65 |

[1] Price for wheat APW 10% ($45/t freight, handling charges and levies to be removed).

[2] Pool price for malt barley ($38/t freight, handling charges and levies to be removed).

[3] Price of milling oats net at port ($17/t freight to be removed).

[4] Price for canola with 42% oil ($44/t freight, handling charges and levies to be removed).

[5] Price for lupin ($45/t freight, handling charges and levies to be removed).

[6] Western Market Indicator (c/kg clean).

[7] Sale yard price of Merino lamb sold in January. Crossbred lamb sold in January is 20¢/kg higher and crossbred lamb sold in September is 20¢/kg lower.

[8] Price landed Perth (Commission and freight to be removed).

[9] Saleyard price for 5½ yo ewes. 1½ yo ewes assumed to be $3/hd higher. 6½ yo ewes assumed to be $5/hd lower. Purchase price for ewe replacements is $2/hd higher (transport costs).

## RESULTS AND DISCUSSION

### *Flock robustness*

With standard prices, a self-replacing flock utilising surplus ewes for carryover crossbred lamb production is most profitable (Table 3). A self replacing crossbred carryover flock is the most robust of the flock structures analysed, ranking first to third in profitability for all price scenarios (Table 3).

**Table 3. Ranking of flock structure (profitability) for a range of commodity price scenarios**

| Flock type[a] | Crop price / Wool price / Sheep price | | | | | | | | | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | L/H/H | L/S/S | L/L/L | S/H/H | S/S/S | S/L/L | H/H/H | H/S/S | H/L/L | |
| **XB Co SRF** | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | **1** |
| **Wool + MPL** | 2 | 2 | 4 | 3 | 3 | 4 | 3 | 2 | 2 | **2** |
| **Wool** | 4 | 3 | 2 | 4 | 4 | 2 | 5 | 3 | 3 | **3** |
| **XB Co** | 1 | 4 | 6 | 1 | 2 | 6 | 1 | 4 | 6 | **4** |
| **Shipper** | 7 | 7 | 2 | 7 | 6 | 2 | 7 | 6 | 3 | **5** |
| **MPL** | 6 | 5 | 5 | 6 | 5 | 5 | 6 | 5 | 5 | **6** |
| **XB Su** | 5 | 6 | 7 | 5 | 7 | 7 | 4 | 7 | 7 | **7** |

[a] See Table 1 for description L = Low, S = Standard, H = High

## *Relative flock profitability*

A specialist crossbred carryover flock (buying in ewes) is more profitable than a self replacing flock producing some crossbred carryover lambs when carryover lamb price is above $3.20/kg (all other prices standard). This is because the number of lambs produced in a self replacing flock is limited by the number of ewes in the flock. Buying in ewes removes this constraint enabling more crossbred prime lambs to be produced, in this instance over 2½ times more.

As the cost of replacement ewes rises, the profitability of a specialist crossbred carryover flock decreases whereas the profitability of a self replacing crossbred carryover flock increases. When 5½ year old ewes cost more than $44/hd and 1½ year old ewes cost more than $47/hd (all other prices standard) it is more profitable to breed ewes. The breakeven price for ewes increases as lamb price increases.[1]

As sheep prices fall the profitability of all flocks decline, however the decline is greatest for specialist lamb producers (XB Co, XB Su). A flock selling shipper wethers is least profitable when sheep prices are at standard levels or higher. However when sheep prices are low, selling shippers has similar profitability to a self replacing flock utilising surplus ewes for crossbred carryover production. At low sheep prices the specialist lamb producing flocks are less profitable than the other flocks.

## *Sheep numbers and proportion of farmland in pasture*

Results show that both Australian Merino and dual-purpose flocks are important for optimising profit on a South Coast farming system. The optimal proportion of farmland in pasture for the most robust flock type, a self replacing crossbred carryover flock, varies between 35% and 65% (6000 to 15000 winter grazed DSE) across the commodity price scenarios (Table 4).

**Table 4. Optimal winter DSE and proportion of farmland in pasture for a self replacing crossbred carryover flock across a range of sheep and wool prices (standard crop prices)**

| | | Lamb price / Shipper price/ Ewe Price | | | | | |
|---|---|---|---|---|---|---|---|
| | | $1.50/$30/$25[1] | | $3/$50/$45 | | $4.50/$70/$65 | |
| | | DSE | Past | DSE | Past | DSE | Past |
| Wool price[2] | **750** | 5,529 | 36% | 7,078 | 36% | 14,883 | 64% |
| | **900** | 6,280 | 36% | 9,273 | 47% | 15,402 | 62% |
| | **1050** | 6,714 | 36% | 12,806 | 58% | 16,337 | 66% |

[1] Lamb price ($/kg) / Shipper price ($/hd) / Ewe price ($/hd).

[2] Wool Price: WMI, cents/kg clean.

At standard prices it is optimal to include around 45% of land in pasture and to run approximately 9000 DSE (winter) (Table 4). As prices for sheep and/or wool increase (crop prices standard) optimal farm plans include more land in pasture and higher stocking rates. This is because additional supplementary feed costs incurred through running higher stocking rates are recouped through higher wool and sheep receipts.

Changes to optimal sheep DSE are equally sensitive to changes in sheep and wool price with standard crop prices. For an additional 4000 DSE to be optimal, wool price needs to increase by 20% (profitability

up 26%). Similarly, sheep prices need to increase by 20% to achieve the same DSE gain (profitability up 24%).

### *Low crop prices*

At low crop prices (other prices standard), it is optimal to run 70% of farmland in pasture with approximately 16,000 DSE (winter). Because the optimal winter grazed DSE numbers associated with this price scenario are already high, increasing wool and sheep prices has minimal impact on changes to optimal sheep numbers and the proportion of farmland in pasture[1].

## CONCLUSION

A self-replacing flock utilising surplus ewes for carryover crossbred lamb production is the most robust flock structure for a farming system on the South Coast of WA. The optimal proportion of farmland in pasture for this flock type ranges between 35% and 65% (6,000 to 15,000 winter grazed DSE) across a range of commodity price scenarios. This emphasises the importance of Australian Merino and dual purpose flocks for optimising profits on farming systems in WA's South Coast.


## KEY WORDS

comparative profitability, Merino, dual purpose, South Coast

## ACKNOWLEDGMENTS

Thanks to Mike O'Connell for the excellent management of South Coast MIDAS.

**Paper reviewed by:** Allan Herbert




[1] These results are not shown but are available on request from Emma Kopke.

Sheep Updates 2003

# Driving and motivational factors for producing wool: Views from selected WA wool producers

**Mohammad Quaddus[1], Nazrul Islam[2]** and **John Stanton[1, 2]**

[1]Curtin University; Perth, Western Australia

[2]Department of Agriculture Western Australia, Perth

## KEY MESSAGES

Profit or generating income is not the only motivating factors for the wool producers to remain in the business. A long list of non-monetary factors such as country life style, personal goal, fascination with wool and so on are also extremely important. Policy formulation should therefore take a balanced approach to stimulate both financial and non-financial factors.

## INTRODUCTION

Wool contributes significantly to national as well as to Western Australian economies. However, little is known about the drivers and motivating factors of wool farmers to stay in this business and the ultimate outcomes that the farmers look for. In this paper these factors are identified based on the views of three groups of selected WA wool producers. The Group Support System (GSS) technology at Curtin Graduate School of Business's Strategic Communication (STRATCOM) facility was used to compile and analyse the views. The GSS results reveal that although the 'profitability' factor ranked highest with almost no variance, six other unique factors are also highly considered responsible as motivating and driving forces for producing wool. Implications and future directions are highlighted.

## AIMS

Wool production is one of Australia's major agricultural industries. Despite its steady decline in the 1990s, the wool industry remains a significant contributor to Australian agricultural output and exports. It accounts for around 7% of the gross value of agricultural production and $3 billion in export earnings in 1999-2000 (ABARE 2001). Wool is even more important for Western Australia. It is the second largest agricultural industry in Western Australia. The collapse of the reserve price scheme and the declining world price for wool have negative impact on the wool producers income in period 1991-2001 (Richardson, 2001). For much of the 1990s wool producers have experienced relatively low prices for wool and subsequent hardship. Some in the wool industry have questioned its future and predicted an irreversible decline. Profitability levels for wool producers have been poor, with average farm business profit declining to $A16,077 in 1998-99 for specialist wool producers (Shafron *et al*. 2001). The value of wool exported has also declined from $A3.33 billion in 1992-93 to $A2.95 in 1999-2000.

Despite the above, by and large, the wool producers remained in the business, although some structural changes have taken place in the industry. The obvious question is what motivates them to remain in the business? While wool contributes significantly to Western Australia's economy little is known about the drivers and motivating factors of wool producers and the ultimate outcomes that the producers look for. Is it the profit? Life style? Tradition? Unless it is known what motivates and drives the wool producers little can be done in terms of policy formulation to improve the state of wool industry in WA. This paper shed some light on these questions.

The aims of this paper are therefore as follows:

- To explore and identify the outcomes of WA wool producers to stay in wool business.
- To explore and identify the drivers and motivating factors in order to achieve these outcome(s); and

- To explore and identify the mediating factors, if any, in order to achieve the outcome(s).

**METHOD**

Figure 1 shows the research model which guides this study in order to achieve the above research objectives.

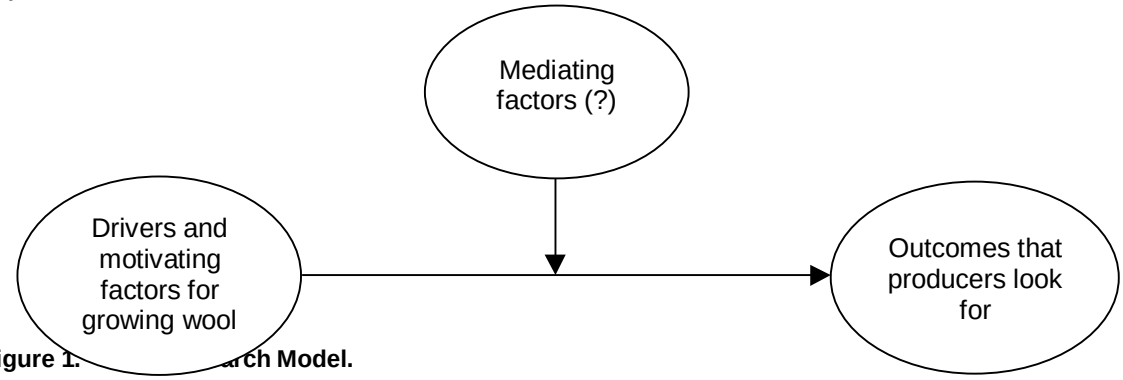


**Figure 1. [illegible]arch Model.**

It is hypothesised that the producers have some specific 'operational' outcomes (for example, income, profit, and export income) that they want to achieve a number of drivers and motivating factors drive the producers to achieve these outcomes and stay in the wool business. These drivers could be the 'behavioural' reasons of various kinds (life style, family tradition, etc.). Some mediating factors (govt. policy, etc.) can then stimulate the achievement of the outcomes.

The research for this project is carried out in two stages as follows:

*Stage 1 - Focus groups (exploratory):*

In this stage three focus group sessions are conducted in order to find the drivers, motivating factors, and outcomes that the wool producers look for. Each group size is planned to be between 8-10, and the group members are selected at random. The three groups are also selected based on a stratified sampling procedure.

The focus group sessions are conducted using the Group Support System (GSS) technology at Curtin Graduate School of Business (GSB). The Strategic Communication (STRATCOM) facility of Curtin GSB is equipped with a GSS technology called MeetingWorks (http://www.entsol.com/). GSS is a computer-based system used to support goal directed task of a group of people. A GSS session is facilitated by a team of two persons: a facilitator and a chauffeur who runs the computer system. Using GSS the drivers, motivating factors, mediating factors and outcomes of the wool farmers are *generated*, *discussed*, and *evaluated* in a group environment.

*Stage 2 - Survey (confirmatory):*

It is noted that the first stage of the research has been completed. Preparations are now underway to conduct the second stage of the research.

In second stage of the research a survey is planned to be conducted among the wool producers via a structured questionnaire. The questionnaire is being developed based on the findings of stage 1 and the research model of Figure 1. A random sample of five hundred farmers will be selected for the survey. It is necessary to get responses from at least two hundred farmers. Structural equation modelling (SEM) approach will be used to test the model of Figure 1. A tested and validated model will confirm the findings of stage 1 of the research. The Wool Service Desk at the Department of Agriculture WA (DAWA) will facilitate the survey among the wool producers. This paper presents the results of the findings of stage 1 of the research project.

*Research design of stage 1*

The Wool Service Desk of DAWA selected three groups of wool producers who were willing to come to Perth and participate in the focus group sessions. It is noted that a team of two (husband/wife/partner) were invited from research participating wool producing farm. All the logistics with respect to the producers' travel to Perth and participation in the group sessions were facilitated by the Wool Service Desk. The group sessions were conducted in January/February 2003. Before the wool producers came

to Perth they were briefed on the aims and objectives of the research project. Each groups sessions was conducted as follows:

- The facilitator (one of the authors of this paper) welcomed the participants in the focus group session and highlighted the aims/objectives of the session and the script/procedure of the group session. The facilitator also discussed the overarching question of the group session, which was '*What are your drivers and motivational factors for growing wool?'* It was highlighted that the participants should provide both 'operational' and 'behavioural' factors to produce wool.
- The chauffer (an outside consultant) briefly highlighted the technology side of the session.
- The group session started with *electronic brainstorming* - a module of the GSS technology which facilitates the computer aided brainstorming. Each participant (in this case a team of two) used a laptop to enter their ideas into the GSS. From time to time the list of ideas were displayed in the common screen for everybody to have a look in order to generate more ideas. This phase of the group session was completely anonymous.
- After electronic brainstorming was completed the *discuss/organise* module of GSS was invoked. This module facilitates an open discussion on the brainstorming items of step (iii). In this step each item of step (iii) was discussed by the participants, similar items were grouped together (giving a new name, if necessary), and comments/discussions of the participants were captured by the chauffer into the GSS. The primary objective of this module is to come up with an agreed upon unique set of idea items in a group environment.
- Finally, the *evaluate* module of GSS was used in order to evaluate the unique items of step (iv) in a group environment. In this module each participant rate the items in a scale of 1 (lowest rating) to 10 (highest rating). The GSS produces the average rating of each item along with the variance (a measure of disagreement) of the rating.

## RESULTS

As mentioned earlier this paper presents results of the stage 1 of the research project. The results are presented separately for each of the group session. Finally an attempt is made to combine the results, which will form the basis of stage 2 of the project.

### *Results of the First Group Session*

A group of 10 wool producers (5 teams of husband/wife/partner) participated in the first group session. The research design, as presented earlier, was strictly followed to conduct the group session. The group first used the *electronic brainstorming* module of the GSS. In half an hour they came up with a list of 29 drivers/motivating factors/outcomes of producing wool. The raw data is shown in Appendix I. The group then *discussed and organised* 29 items and came up with 11 unique themes as shown in Table 1. Appendix II shows the full blown raw data of discuss/organise session for the first group session.

**Table 1. Organised themes of drivers/motivating factors/outcomes of producing wool (First group session)**

| Average rating | Variance | Factor No. | Themes |
|---|---|---|---|
| 10.0 | 0% | 1 | Profitability with sustainability |
| 9.5 | 19% | 2 | To generate income |
| 9.3 | 18% | 3 | Prefer wool growing to cropping |
| 8.8 | 18% | 4 | To adapt into practice the latest scientific and technological tools |
| 8.4 | 26% | 5 | Personal goal to grow wool |
| 8.3 | 45% | 6 | Personal ambition to own property and farm |
| 8.0 | 47% | 7 | Present free market with no restriction on production or sheep meat |
| 8.0 | 41% | 8 | Previous experience and knowledge in wool growing |
| 7.5 | 40% | 9 | We grow wool because it is a unique natural fibre |
| 7.5 | 36% | 10 | Fascination with fine wool |
| 6.0 | 68% | 11 | The property we purchased was set up to produce wool |

Table 1 reveals a number of factors which drive and motivate the wool producers to produce wool. There are mix of both operational outcomes and behavioural reasons. For example, 'profitability' and 'generating income' are of operational types. While, 'personal goal to grow wool', 'prefer wool growing to cropping' are of behavioural types.

The group then *evaluated* the themes/factors of Table 1 as per the research design using a scale of 1 (lowest) to 10 (highest). Figure 1 presents the results. The first column of Table 1 also reveals the average rating of the factors, with the variance reported in column 2. It is noted that 'profitability with sustainability' has the highest rating of 10 with 0 variance. This means that everybody in the group rates this factor as being of utmost importance. Other figures in the first two columns can be interpreted similarly. Ideally, the variance in column 2 should be less than 30%. However, no re-rating was conducted to reduce the variance for some of the factors as the group felt that it was not worthwhile. It is noted that a number of non-financial factors or behavioural factors are also rated very highly, which drive the wool producers to remain in the business. Among them, 'prefer wool growing to cropping', 'personal goal to grow wool', 'personal ambition to own property and farm' are worth highlighting.

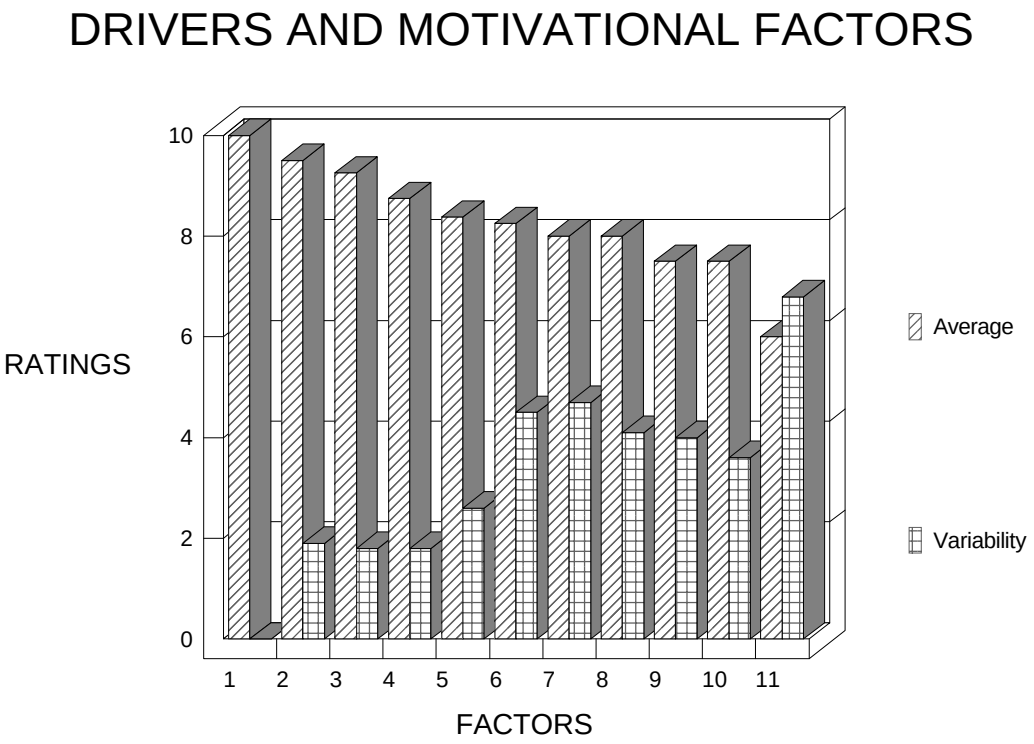


**Figure 1. Evaluation of the unique factors of the first group (refer to Table 1 for the factors).**

*Results of the second group session*

A group of eight wool producers (four teams of husband/wife/partner) participated in the second group session. The session was again conducted by strictly following the earlier script. The group eventually came up with 11 unique factors of drivers/motivating factors/outcomes which are shown in Table 2. To save space the raw data are not presented which are available from the authors.

Figure 2 and the first two columns of Table 2 also present the group evaluation of the factors. It is interesting to note that some of the results are very similar to that of the first group. However, there are also some differences.

**Table 2. Organised themes of drivers/motivating factors/outcomes of producing wool (Second Group Session)**

| Average rating | Variance | Factor No. | Themes |
|---|---|---|---|
| 10.0 | 0% | 1 | Income |
| 9.0 | 15% | 2 | A viable form of landuse that is long term, is profitable and sustainable |
| 9.0 | 27% | 3 | Lifestyle factors - e.g. living in the country |
| 8.3 | 24% | 4 | Overall we enjoy the challenges that present themselves |
| 8.0 | 22% | 5 | We have also developed an intimate and enjoyable interest in growing wool |
| 7.8 | 9% | 6 | We enjoy the interaction of like-minded people |
| 7.5 | 19% | 7 | complementary land uses (symbiosis) |
| 7.5 | 19% | 8 | The sheep enterprise is more than just wool |
| 7.5 | 24% | 9 | Woolgrowing is a relatively low cost business to establish - less capital infrastructure (e.g. lower capital costs than some other farming enterprises) |
| 7.0 | 15% | 10 | It is good to present the consumer with the option of a natural fibre |
| 6.5 | 19% | 11 | We feel that we are making a worthy contribution to the Australian economy, export income, local and national employment, etc. |

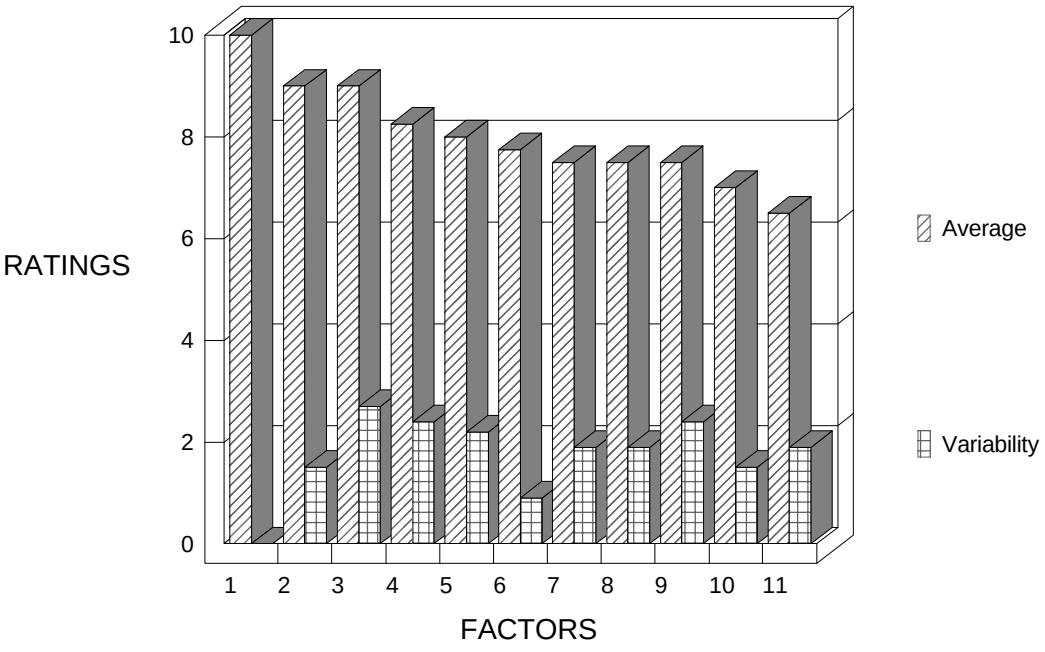


**Figure 2. Evaluation of the unique factors of the second group (refer to Table 2 for the factors).**

The 'income' and 'sustainable profit' ranked numbers 1 and 2 with low variances (0 and 15% respectively; see Table 2). However, the next 6 factors (items 3-8; see Table 2) are of behavioural types with relatively low variances, i.e. their rankings have relatively low disagreements among the group members. This result highlights that it's not only money that the wool-growers look for. There are also a number of non-financial behavioural factors that are also important drivers and motivators to stay in wool producing business.

*Results of the third group session*

A group of eight wool producers (four teams of husband/wife/partner) participated in the third group session. The session was again conducted by strictly following the earlier script. The group eventually came up with nine unique factors of drivers/motivating factors/outcomes, which are shown in Table 3. Again, to save space the raw data are not presented here which are available from the authors.

**Table 3. Organised themes of drivers/motivating factors/outcomes of producing wool (Third Group Session)**

| Average rating | Variance | Factor No. | Themes |
|---|---|---|---|
| 9.5 | 11% | 1 | Earn a living |
| 9.3 | 18% | 2 | Future of wool growing seems to have some real gains to be made on the technology side and production |
| 8.8 | 28% | 3 | Lower production risk |
| 8.3 | 24% | 4 | Climate suits growing of wool |
| 7.8 | 24% | 5 | Past experience with the wool industry |
| 6.5 | 33% | 6 | Enjoy working with sheep |
| 4.0 | 56% | 7 | Labour availability |
| 4.0 | 56% | 8 | Inherited the business |
| 3.3 | 50% | 9 | Strongly influenced by consultants preference and expertise |

Figure 3 and the first two columns of Table 3 present the group evaluation of the factors. It is interesting to note that some of the results are very similar to the first two groups. However, some new factors also emerged.

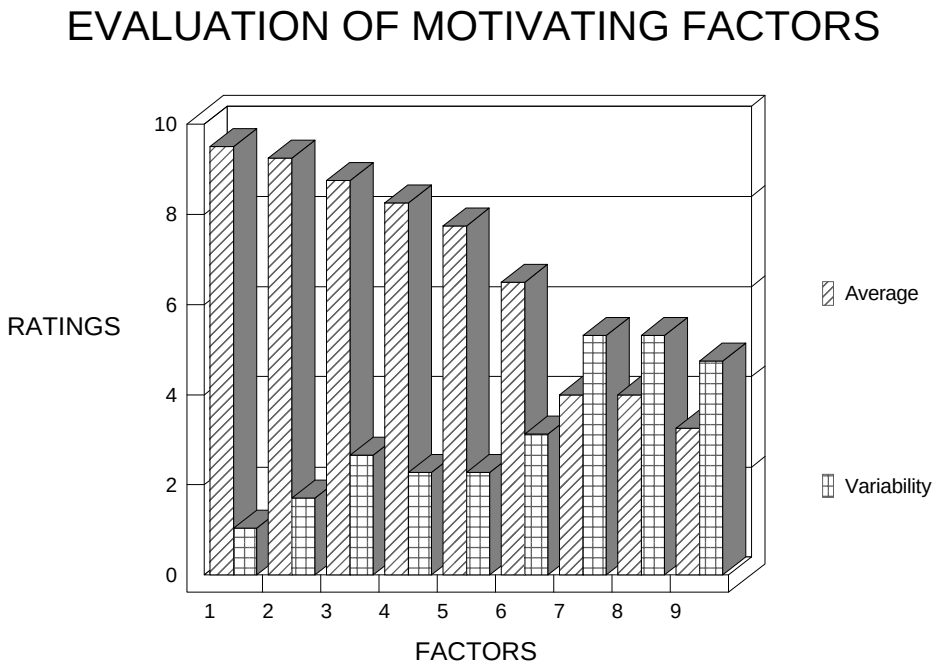


**Figure 3. Evaluation of the unique factors of the third group (refer to Table 3 for the factors).**

As before, 'Earn a living' (income, profitability, etc.) was rated number one by the group. However, as seen in Table 3 some non-financial factors were also rated highly.

*Synthesis of the results*

We now present synthesis of the three results. After analysing the Tables 1-3 and the corresponding raw data the common themes are presented in Table 4 in random order.

**Table 4. Common themes of drivers/motivating factors/outcomes**

| |
|---|
| Generating income |
| Profitability with sustainability |
| Living in the country |
| Past experience with wool |
| Personal interest to produce wool |
| Property set-up to produce wool |
| Wool is a unique natural fibre |
| Use of latest science and technology |

It is interesting to note that only two out of the eight factors in Table 4 are of financial types. These are 'Income' and 'Profitability with sustainability'. In 'Profitability with sustainability' the groups unanimously indicated that while they would expect profit but would not go all the way for it in expense of sustainability of the farm and the environment. The remaining six factors of Table 4 are of behavioural types. This highlights the fact that money is not the only factor for the wool producers to remain in the wool business. A number of non-financial factors are also extremely important and the respective authority should take that into account to formulate appropriate policies.

Table 5 presents the combined set of factors/themes derived from Tables 1-3 and the respective raw data. It is noted that these factors will form the basis of developing the questionnaire to conduct 2$^{nd}$ stage of the research.

**Table 5. Combined set of themes of drivers/motivating factors/outcomes**

| |
|---|
| Profitability with sustainability |
| Generate income |
| Prefer wool growing to cropping |
| To practice the latest scientific and technological tools |
| Personal goal to grow wool |
| Personal ambition to own property and farm |
| Present free market with no restriction on production or sheep meat |
| Previous experience and knowledge in wool growing |
| We grow wool because it is a unique natural fibre |
| Fascination with fine wool |
| The property we purchased was set up to produce wool |
| Lifestyle factors - e.g. living in the country |
| Overall we enjoy the challenges that present themselves |
| Developed an intimate and enjoyable interest in growing wool |
| Enjoy the interaction of like-minded people |
| Complementary land uses (symbiosis) |
| The sheep enterprise is more than just wool |
| Woolgrowing is a relatively low cost business to establish - less capital infrastructure (e.g. lower capital costs than some other farming enterprises) |
| It is good to present the consumer with the option of a natural fibre |
| We feel that we are making a worthy contribution to the Australian economy, export income, local and national employment, etc. |
| Lower production risk |
| Climate suits growing of wool |
| Enjoy working with sheep |
| Labour availability |
| Inherited the business |
| Strongly influenced by consultants preference and expertise |

## CONCLUSION

This paper presents the results of three focus group sessions carried out with the selected WA wool producers in order to identify the driving and motivational factors and operational outcomes that the producers look for to remain in the wool business. Computer aided Group Support Systems (GSS) is used for the group sessions, which are conducted at the Graduate School of Business, Curtin University of Technology.

The result suggest that while two financial factors are most important, six other non-financial factors are also extremely important to motivate the wool producers to remain in the business. Overall, there are overwhelmingly more non-financial factors discovered in this research. Respective authority should take this into consideration to formulate any future policies.

Our immediate future goal is to conduct a questionnaire based survey to confirm our findings via quantitative research.


## KEY WORDS

wool producers, driving and motivational factors, group support systems, electronic brainstorming

## ACKNOWLEDGMENTS

The authors greatly appreciate the time and effort of the wool producers who took part in this study. Special acknowledgment is also made of the Wool Service Desk who facilitated this study.

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**APPENDIX I. List of brainstorming items of the first group session (raw data as entered by the wool producers)**

1. To generate income.
2. The property we purchased was set up to produce wool.
3. We grow wool because it is a unique natural fibre.
4. Previous experience and knowledge in wool growing.
5. Country type dictates sheep and wool production.
6. Prefer wool growing to cropping, having a duel purpose sheep [wool and meat] through genetics, also hopping to improve lambing %.
7. To achieve a 16 micron, 40 nk, 16 cv, 90 mm average adult wool clip.
8. The Merino is well suited to our environment - we want to improve its performance to achieve maximum returns.
9. Being in a 500 mm rainfall I still believe wool growing duel purpose sheep is more of a safe options where with cropping you have to worry about rainfall, frost damage, waterlogging and drought.
10. We believe it is possible to achieve our goals (i.e. the desired wool characteristics).
11. Profitability with sustainability (i.e improving land quality as well as increasing production.
12. The challenge is to maintain wool cut and micron while improving lambing % from 80% to about 130%. This will have a major impact on our viability, and lifestyle.
13. Personal ambition to own property and farm.
14. In my area it is a low cost enterprise.
15. Unique life style.
16. To get a profitable return using environmentally sustainable practices.
17. It is my life style and to my younger generations.
18. The practical and physical aspects of the work are appealing.
19. To adapt into practice the latest scientific and technological tools.
20. I grew into the wool industry and low cost - low risk area of 600-650 mL rainfall safe and assured production.
21. To leave the farm better set up with shelter belts etc than when I took over.
22. To develop an asset that can be used by the next generation.
23. Very easy to manage below average season.
24. We are developing dual-purpose highly profitable merino sheep.
25. Benchmarking the sheep and wool production, e.g. Yardstick site evaluation.
26. To sustainability and environmentally improve my farming system.
27. Easy to adopt genetic materials available.
28. To establish a best practice approach to wool growing in our region.
29. Present free market with no restriction on production or sheep meat.

**APPENDIX II. Discussion mode results of the first group session**

**1. To generate income**

1.1 The Merino is well suited to our environment - we want to improve its performance to achieve maximum returns.

**2. The property we purchased was set up to produce wool**

2.1 Not always an alternative because of the area.

2.2 Ownership of property is leasehold.

2.3 Determined by area.

2.4 Country type dictates sheep and wool production.

2.5 Certain soil types dictate what can be grown - not always suitable for crops.

2.6 The Merino is well suited to our environment - we want to improve its performance to achieve maximum returns.

**3. Personal goal to grow wool**

**4. We grow wool because it is a unique natural fibre**

4.1 Like the fibre - all we have to do is harvest it - not manufactured.

4.2 Natural is nice - doesn't need altering too much - it is not the money side of it.

4.2.1 There will always be a market for it.

**5. Previous experience and knowledge in wool growing**

5.1 Made it easier to go into it because of the background.

5.2 This motivated us to start, but not why we do it now.

5.3 Grew up on family farm and grew up with it.

5.4 Degree with animal production as part of it.

5.5 Stick at it until I have to get out of it.

5.6 Got the knowledge and experience it is easy and comfortable to go into it.

5.6.1 Silly not to use this asset.

5.7 Started shearing and developed interest in wool growing.

5.7.1 I grew into the wool industry and low cost - low risk area of 600-650 mL rainfall safe and assured production.

5.7.2 Know where the profit comes from.

**6. Prefer wool growing to cropping**

6.1 Scope is huge because of genetics.

6.2 Product gives you the opportunity to earn an income more than once.

6.3 Lifestyle thing - prefer sheep to tractors.

6.4 More risk involved in cropping enterprise - more control in wool as it goes along - can adapt more with wool production.

6.4.1 In my area it is a low cost enterprise.

6.5 Can get away with a smaller size operation in wool than cropping.

6.6 Less infrastructure required for wool growing.

6.7 If it doesn't rain the sheep still stays alive.

6.8 Having a duel purpose sheep [wool and meat] through genetics, also hoping to improve lambing %.

6.9 Being in a 500 mm rainfall I still believe wool growing duel purpose sheep is more of a safe options where with cropping you have to worry about rainfall, frost damage, waterlogging and drought.

**7. Fascination with fine wool**

7.1 To achieve a 16 micron, 40 nk, 16 cv, 90 mm average adult wool clip.

7.1.1 We believe it is possible to achieve our goals (i.e. the desired wool characteristics).

7.2 Improvement on your wool that you produce.

7.3 Like armfuls of it (quantity) - silkworks don't produce the lambs.

7.3.1 Genetics are available to change over.

7.4 This is governed by the country type and season.

**8. Profitability with sustainability**

8.1 i.e. Improving land quality as well as increasing production.

8.2 Pressure increasing on pastoral leases.

8.3 Environmental sustainability is hugely important.

8.4 Still take some risks.

8.5 The challenge is to maintain wool cut and micron while improving lambing % from 80% to about 130%. This will have a major impact on our viability, and lifestyle.

8.6 In my area it is a low cost enterprise.

8.7 To get a profitable return using environmentally sustainable practices.

8.8 To leave the farm better set up with shelter belts, etc. than when I took over.

8.9 To sustainability and environmentally improve my farming system.

8.10 To establish a best practice approach to wool growing in our region.

8.10.1 Works for us so well - don't find it is a driver for most people, but it is for us.

8.10.2 More knockers waiting for you to fall down - offered it all to other people, but some don't want to know about it.

8.10.3 Some of the knockers are not there any more. They have been taken over.

8.10.4 People coming in and out are more ready to take in new things. Ones who have been established for generations are not so open to change.

8.10.5 Smaller battlers have to take notice of benchmarks.

8.11 People who have stayed in wool consistently even through bad times are still there. The ones who have gone in an out according to the type of season and market and no longer there.

8.11.1 Need to be in for the long haul. Sacrificing long term goals for short term profitability.

8.11.2 We shop around to see how to sell our wool each year - actively market it - don't send it to auction.

8.11.3 Need to concentrate on the core industry.

**9. Personal ambition to own property and farm**

9.1 Unique life style.

9.1.1 The practical and physical aspects of the work are appealing.

9.2 Buying security.

9.3 It is my life style and hand on to my younger generations.

9.3.1 To develop an asset that can be used by the next generation.

**10. To adapt into practice the latest scientific and technological tools**

10.1 Prove or disprove them.

10.2 Taking on new things improve motivation and interest.

10.3 Up to us to try out the new things.

10.4 We ask for things to be done, but because they don't get done we have to do them ourselves.

10.4.1 Motivates us to improve on what we do.

10.5 Very easy to manage below average season.

10.5.1 Easier to anticipate season and adapt - scenario planning.

10.5.1.1 Using rainfall data as markers.

10.6 We are developing dual-purpose highly profitable merino sheep.

10.7 Benchmarking the sheep and wool production, e.g. Yardstick sire evaluation.

10.8 Easy to adopt genetic materials available.

10.9 To establish a best practice approach to wool growing in our region.

**11. Present free market with no restriction on production or sheep meat**

11.1 No quotas at the moment.

11.2 Without reliance on chemicals.

11.3 Clean green image.

Department of Agriculture

# Sheep Updates 2003

SHEEP UPDATES

## How profitable are your pasture systems - Take the STEP to find out

**Caroline Peek**, Department of Agriculture Geraldton

### KEY MESSAGES

The STEP (Simulated Transitional Economic Planning) decision tool can be used to simulate the financial viability of different farming systems over time. It also has the ability to assess whether the farm business can afford to make the transition to the new system. Sensitivity of the systems to price and production levels can also be analysed.

### AIMS

Farmers sometimes have to consider making changes to their farming systems. The aim of this study was to demonstrate the use of the STEP tool. Farmers in the West Midlands are interested in the use of perennial pastures to increase water use and profitability. STEP was used to look at the financial viability of introducing perennials on to a standard farm in the Badgingarra area.

### METHOD

A standard farm with a total of 1830 ha arable was created in STEP using information from farmers, agronomists and Bankwest benchmarks. The whole farm analysis of the current annual and future perennial system ran over a nine year period. Each system was run as a fully established system. A transition analysis from the current to the future system was also assessed. Costs were increased by 3% per annum and returns increased by 2% per annum to simulate decreasing terms of trade.

Rotations of three to four year lucerne phases followed by three years of crops replaced the more traditional annual pasture crop rotations on the suitable soil types (Table 1). On areas of weak sand or waterlogging, blue lupin and volunteer pastures were replaced with perennial grasses or tagasaste. Crop yields and costs were the same following a lucerne phase or an annual pasture phase.

**Table 1. The comparison of the standard farm set up as the current annual system and the future perennial system: Average annual area and DSE for the 9 year study period**

| | Crop area (ha) | Annual pasture (ha) | Established perennial pasture (ha) | First year lucerne (ha) | Tagasaste (ha) | Winter DSE | Summer DSE |
|---|---|---|---|---|---|---|---|
| Current annual system | 550 | 1180 | | | 100 | 7500 | 4600 |
| Future perennial system | 550 | 200 | 480 | 200 | 400 | 7900 | 5200 |

**Table 2. Average gross stock prices that were used in the analysis over the 9 year period**

| Cull ewes sale price | Lambs sale price | Summer traders purchase price | Summer trader sale price | Cattle purchase price | Cattle sale price | Greasy wool price |
|---|---|---|---|---|---|---|
| $20/head | $50/head | $20/head | $45/head | $300/head | $600/head | $5.00/kg |

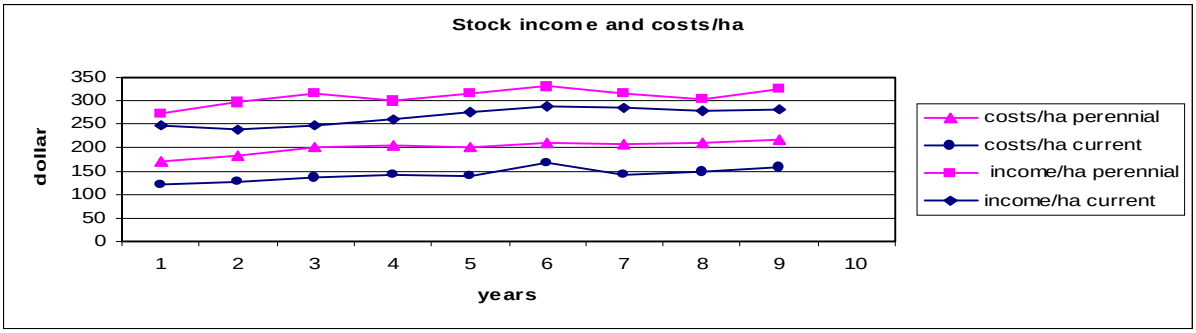
## RESULTS

The main difference was the ability of the farm with perennials to finish stock out of season. Sheep were purchased at the end of winter and finished off over the summer period (summer traders). Turnover of summer traders averaged 500 per year and no wool was cut off them. Cattle numbers increased from an average of 50 head to an average 125 head due to increased tagasaste area.

Table 3 shows that the current system has a higher nine year cumulative profit. Graph 1 shows that although the livestock income is higher for the future perennial system, the costs are higher. This is due to re-establishment of lucerne, maintenance costs of the perennials and livestock purchases.

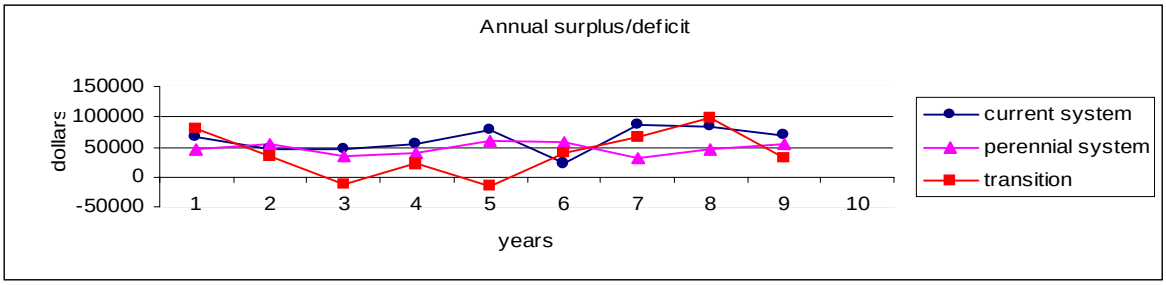
**Table 3. Comparisons of the nine year cumulative profits for the current, future and transition systems. The sensitivity of the future system to summer trade sheep sale price is also shown**

| | Current system | Future system traders $45/hd | Future system traders $65/hd | Transition system traders $45/hd |
|---|---|---|---|---|
| Nine year cumulative profit $ | 877,800 | 717,841 | 807,312 | 596,112 |




**Graph 1. Total stock income/ha and variable stock costs/ha for the current (annual) and future (perennial) systems. The future perennial system is at summer trade sheep price $45/hd.**

Decreasing terms of trade mean that higher cost systems need to be more productive and attract good prices. The annual surplus or deficits are also tracked over time. Graph 2 shows the years of deficit in the transition period due to establishment of tagasaste, perennial grass and increasing stock numbers.




**Graph 2. Annual surplus/deficit of the current and future perennial systems and the transition between the two. The future perennial system is at summer trade sheep price $45/hd.**

## CONCLUSION

The STEP tool has shown that the use of perennials in this particular scenario was reasonably competitive with the current system, if sheep can be finished out of season and fetch at least $65/hd. The transition between the systems will cost profit over the nine year changeover period. The effects of these systems on salinity and longer-term financial viability could be looked at in further analyses.

**KEYWORDS**
STEP tool, farming systems, profit, transition

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