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## A Low rainfall livestock option: analysis of fat tail sheep in the system

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## Farming Systems Investigation Report

# A Low Rainfall Livestock Option: Analysis of Fat Tail Sheep in the System



# **A Low Rainfall Livestock Option: Analysis of Fat Tail Sheep in the System**

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## Introduction

This paper aims to briefly:

- investigate farming systems issues in the medium and low rainfall regions of the South West Land Division of Western Australia;
- identify options and opportunities for the fat tailed sheep breeds
- capture some research about the tail; and
- investigate market options surrounding the fat tailed sheep breeds.

This analysis will provide a brief understanding of the scale of the fat tailed sheep breeds within Western Australia and provide a brief overview of products of the sheep highlighting potential opportunities.

## Fat Tailed Sheep Breed

As an agency, we have an understanding of the Merino sheep and their role in the Western Australian sheep industry, along with the British Breeds and their role in prime lamb development. Currently, we have limited knowledge about fat tailed sheep breeds. The fat tailed sheep breeds that are present within Western Australia are:

- Awassi;
- Afrikaner;
- Namaqua;
- Damara; and
- Karakul.

## Animal behaviour

It has been reported anecdotally that fat tailed sheep behave in a manner unlike other known breeds of sheep in Australia. It has also been said that transport companies do not like to transport these breeds due to their behaviour. An understanding of animal behaviour is important for managing stock and allows for a safer and calmer working environment: as an example it is reported anecdotally that Damara sheep have a tighter flocking instinct, which can make them more difficult to load and unload.

## Population

We do not have a good understanding of the numbers of the fat tail sheep from the five breeds or their distribution. Western Australia's sheep population was estimated at around 23 million in 2001 (ABS Census 2002). In 2001, the 'pure' fat tailed sheep accounted for just over 64,000 sheep (Young *et al.* 2002), or about 0.3% of the State's sheep, it is anticipated that numbers have increased (raw numbers) since this time.

The cross bred (exotic) population is much larger totalling about 750,000 head (Young *et al.* 2002), this equates to about 3.3% of the State's flock.

## Distribution

It is currently known that the breeds are stocked on stud-breeding properties, broad acre properties and in the rangelands. However, sheep numbers by region or shire have not been defined. It is estimated that breeds other than merinos as pure or cross bred account for about 22% of farm flocks (Curtis, K. 2004).

## Fibre products

Fibre contamination is still an issue within the white wool industry; there has been much research into this situation. Careful management of flocks should be observed to minimise any possibility of contamination.

## Tail products

The tail is a unique attribute of the fat tail breeds and may provide some unique value adding opportunities. Some basic research into the use of the fat of the fat tailed breeds within Turkey (see abstracts in Appendix 1) shows that tails can have a commercial purpose in the food industry. Provided the breeds in Australia demonstrate the same qualities as the international breeds, the question arises as to how we capitalise upon this potential market if they are to be slaughtered in Australia. Butchers in the Eastern Wheatbelt have stated that they have used the fat of the tail from Damara sheep in the manufacturing of products such as sausages as it is a sweeter fat (Menegola pers. comm.).

There has been expressions of interest from Japan into the tail fat and the availability of tail fat. This may lead to trade opportunities if sufficient numbers of the animals can be slaughtered in Australia and an efficient extraction and/or packing process of tail fats/oils can be designed that appeals to clients. "One Japanese company is looking for sheep tail fat from WA. As pointed out, we don't have enough Damara Sheep tails to fill up a sea container. We would also have to develop its meat market to make the fat available. Currently they are mainly exported live" (Yamamoto pers. comm.).

There are 5 fat tailed sheep breeds within Western Australia; research may lead to a value adding opportunity for the fats/oils contained with the tails of one or more of these breeds. Research needs to be undertaken to determine the market value of the tail fats and oils; this may have an influence on the value chain analysis and the tails place in a market.

## Producer associations

Within WA there are three known producer associations that include fat tail sheep:

- United Livestock Producers Association (ULPA);
- Damara Breeders Group (Damara Sheep Company); and
- Wheatbelt Damara Grower Group (WDGG).

These producer associations are vital links for information gathering and dissemination.

## The Production Systems

Sheep within the system are in two forms:

- Broad acre or extensive; and
- Intensive.

Both methods are used to generate a cash flow. This cash flow maybe monthly or it may be particular to certain months; this depends on the system being operated by the manager.

### Cashflow generation

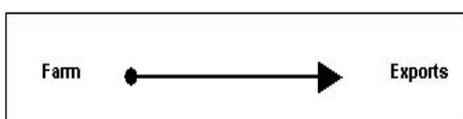
Cash flow can be generated from two statistical classes:

- Livestock; and
- Animal products (ABS Census 2002).

These two classes can be broken down into sub classes such as:

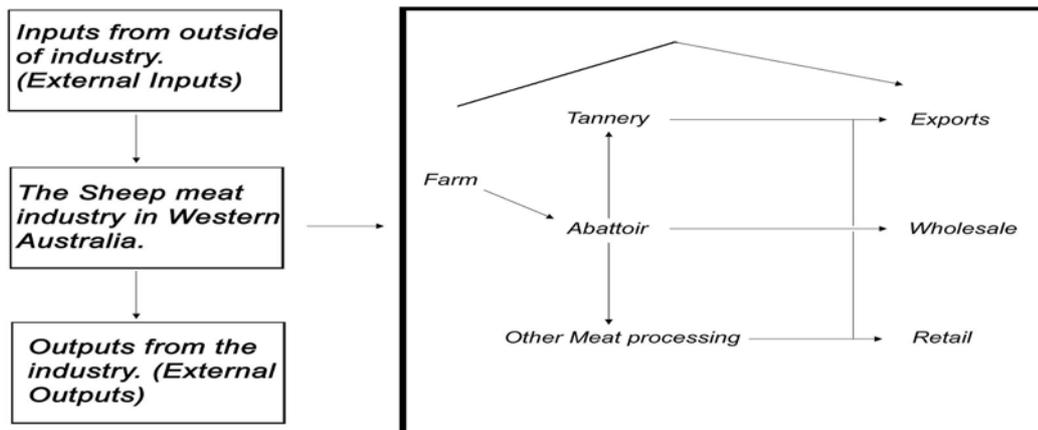
- Livestock
  - Live for domestic consumption
  - Live for export consumption
- Animal Products
  - Fibre
  - Meat
    - Whole carcasses and specific portions
  - Skins
  - Other meat products
  - Offals

The sub classes may or may not be available to producers depending upon their relationship with the supply chain. If we look at the sheep meat supply chains as they operate currently for fat tail sheep, we can see there is a large potential for significant value adding between Figure 1 and Figure 2. The supply as it is measured through the value chain which, in Figure 1, is short with little value adding occurring within Australia, more specifically within Western Australia.



**Figure 1. Supply and value chain.**

Other sheep breeds have a more complex supply and value chain, see Figure 2 below. It remains to be determined whether the fat tail breeds can fit into such a complex supply and value chain; however, the Wheatbelt Damara Grower Group is actively pursuing a domestic meat market. The group has undertaken a census and is determining minimum numbers that can be supplied on a regular basis for domestic meat consumption.



**Figure 2. Overview of the sheep meat value chain.**

Source: Islam 1997

Different breeds perform differently and their products attract different premiums. However, the fat tailed sheep breeds are currently sold predominantly for the live export trade.

If the fat tail breeds can fit into this more complex supply chain as detailed in Figure 2, two issues need to be explored:

- Is this the most profitable method of disposal for the producer; and
- Is this the most profitable sector for the breeds.

Once an answer is determined, market penetration issues need to be explored. It is likely that with greater marketing options for producers, as described in Figure 2, greater value is likely to be added to animals through specific and targeted marketing opportunities. Coupled with this is the need to determine and meet market standards along the processing line. It is thought that these animals have leaner carcasses with the majority of fat being contained within the tail.

The Wheatbelt Damara Grower Group is in the process of establishing a domestic meat market. Eastern Districts Abattoirs will process the animals whilst a butcher has agreed to sell the cuts of meat. There has also been interest expressed from Dewsons supermarket in Merredin to sell some meat. Dewsons are interested in the fat and oil component of the tail and further research into the meat science (Blom pers. comm.).

## Economics - Approximations

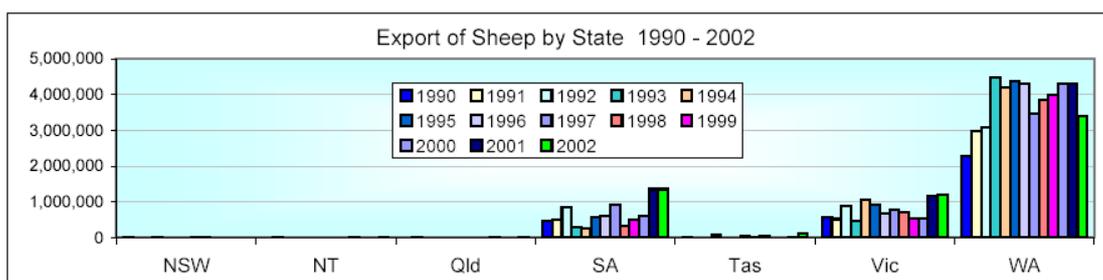
Table 1 describes the approximate value and volume of fat tailed breeds, pure and crossbred, for live export. The majority of lambs exported are ram lambs, this is what the market requires.

**Table 1. Volume and value of fat tailed lambs exported**

Sector – Fat tails	\$/head average <sup>A</sup>	Numbers	Farm gate value
Export	63.12	375,000*	\$23,670,000

\* This is half the rate of natural increase for the period assuming the breeds only lambed once during the year and excluding twins. This represents the sale of ram lambs. Some of these breeds are poly-oestrous and will lamb three times in two years.

In 2002 the Australian live sheep export sector exported 4,409,611 head for a total worth of over \$316.40 million until the end of November (Livecorp 2003). As a percentage of the total sheep value exported the fat tail sheep contributed about 5.5%.

**Figure 3. Export of live sheep by State - all breeds.**

Source: [www.livecorp.com.au/download/Sheep%20State%202003.pdf](http://www.livecorp.com.au/download/Sheep%20State%202003.pdf).

Western Australia is the largest single State exporter of livestock. These fat tailed breeds have had an export orientation. A single market orientation can lead to deficiencies in research, part of this deficiency may be due to the relatively low stock numbers, of which WA has the largest proportion see the report by Young *et al.* (2002). At producer group meetings it has become evident that producers, are seeking knowledge and new market opportunities for the breeds.

## Implications

- At the present time in Western Australia we do not have:
  - a) a good understanding of the breed's distribution;
  - b) a good knowledge of the numbers generally or by purity, purity is important if a breed is to be scaled up to 'pure'; and
  - c) a good understanding of the animals physiology.

We only have a general understanding at the present time.
- These breeds are one-dimensional and rely upon the export market, the export market has a preference for young ram lambs, *where are the young females being disposed of?* Producers are concerned about the reliance upon a single market.

<sup>A</sup> Average price of export weathers at the Midland saleyards, this excludes any premiums due to selling direct and for breed recognition. Source: AAACWA Outlook Seminar 2003. Sheep meat - where to for the industry in 2004 John Edwards, AI Mukairish Australia Pty Ltd slide 6.

- It is thought the females are being retained on farm in breeding flocks. Each year the numbers of breeding sheep has the potential to increase by 50%<sup>B</sup>. A critical mass of numbers approaching saturation point of these breeds must be approaching as there is no known market for large quantities of female, cull and cast for age sheep. This can be measured using the supply chain.
- Wheatbelt Damara Grower Group is asking for supply chain assistance.
- Are the fat tailed sheep breeds contributing the greatest possible rewards to the economy? This can only be known after investigating the supply chain interactions and measured through the value chain.
- Climatic variables - due to the animal’s originating environment they are thought to perform better in hotter and drier condition than Merinos.
- The metabolism of these breeds is not well known, it is thought their dietary requirements and ability to metabolise feed is different. This can have impacts on dietary requirements for broad acre grazing and feedlotting. Anecdotal evidence suggests Damaras can utilise poorer quality pasture, hence their role in the farming system maybe significant in terms of cleaning up weedy paddocks, consuming ‘wasted’ biomass from pasture paddocks in summer, etc.
- Pilot research into farming systems feedlotting as shown in Table 2 showed large discrepancies when producers were trying to finish a fat tailed breed to meet live export market specification. It is not fully understood why this occurred, the producers thought (when reviewing the data as a group) that the diets were not well suited to the animal’s requirements.

**Table 2. Feedlotting Damara sheep for a market specification**

	<b>Feedlot 1</b>	<b>Feedlot 2</b>	<b>Feedlot 3</b>
<b>Diet</b>	‘Finisher’ pellet DMD = 73% CP = 14.4% ME = 10.5 MJ/kg	Lupins:Oats (30:70) and Wheaten Hay grain portion: DMD = 80% CP = 19.5% ME = 11.6 MJ/kg	Lupins and Oaten Hay grain portion: DMD = 94% CP = 39% ME =13.9 MJ/kg
<b>Feed conversion</b>	6:1	10:1	11:1
<b>Growth rate (g/h/d)</b>	235	187	170

(Kilminster, T. and Burt, E. 2003)

Also the poster paper highlights ‘Points to note’:

- Good diet, poor performance.
- What are the protein and energy requirements?
- What is the performance potential of the Damara?
- Some of the breeds do not have performance ranking criteria such as Lambplan to assist with producers’ on-farm decision making.
- What is the potential of these breeds in the domestic meat market?

<sup>B</sup> Assumes one lamb per year with a 1:1 male to female ratio excluding twinning, where the females are retained on farm.

- What is the potential of these breeds in the domestic and/or international chilled meat market?
- Animal behaviour is not understood and producer / transportation education should be explored.

## Intellectual property

Potentially significant intellectual property could be generated through:

- Research into tail fat properties;
- Research into packaging of fats and oils;
- Brand names;
- Trademarks;
- Research into processing and refining techniques;
- Market access and penetration of fibres; and
- Other yet to be identified advancements.

## Options and recommendations

It is recommended that further research be undertaken. Producers are asking for strategic assistance to help make their farming systems more profitable and productive. Some of the issues highlighted show that further research is necessary.

- Develop a domestic meat market to assist with the profitable disposal of stock into various markets. Understand which characteristics are suitable for which market.
- Explore animal behaviour and the need to understand handling differences between fat tailed sheep breeds and other breeds leading to a handling guide for the fat tailed sheep breeds.
- Identify opportunities to procure external funds to assist with research.
  - Meat and Livestock Australia (MLA), National Food Industry Strategy (NFIS) and Sheep Cooperative Research Centre are possible funding organisations.
- Identify opportunities for honours/masters/PhD students to undertake and work collaboratively with research organisations.
- Undertake initial analysis of the fat from tails of a fat tailed breed of differing purity to determine if they have any value adding potential. There is international interest in the fat from the tail, why is this the case and does the tail fat contain properties that can be value added to?
- Strengthen linkages with grower groups.
- Undertake trials at the Merredin Research Station with a variety of compositions of exotic breeds.
- Undertake supply chain analysis to determine if there are more valuable markets other than the live export trade.
- Assist grower groups with strategic information.
- Investigate the economic returns from selling bales of coloured and medullated fibres; determine the supply chain if possible. It is unknown if this will be an ongoing disposal problem once the breed's purity has been scaled up.

## Current activities

- A proposal is being written to submit to MLA regarding supply chain management. This has been initiated by industry.
- Investigative research is being undertaken re: the tail fat. This may involve NFIS working collaboratively with the Department of Agriculture and a food processing industry, investing in new technologies or commercial challenges within the food processing sector such as an abattoir, if the fats and oils prove to have commercially valuable properties.

What are the barriers to the economic disposal of fat tailed fibres:

- Is it distance to market for small sale lots?
- Is it continuity of supply?
- Is the correct market being targeted?

## Opportunities for projects

There is great scope for projects and external funding opportunities. These should be pursued.

- A pilot study to examine improved lamb quality and weights at the Merredin Research Station (MRS) through better ewe nutrition. F<sup>1</sup> Damara, F<sup>1</sup>Dorper and Merino ewes will be involved in this study.

**Table 3. Opportunities for research**

Title	Organisation	Progress
Supply chain	Project proposal to MLA/Dept. of Agriculture	Proposal being negotiated
Tail fat	Tails to Animal Laboratories Dept. of Agriculture	Procuring tail fat
Pilot study	Dept. of Agriculture	Arrive MRS January 2004
Marketing medullated fibres	?	Identified
Physiology	?	Yet to be Identified
Animal behaviour	?	Yet to be Identified

There is further scope for research and some of this hinges on or revolves around the supply chain analysis of a domestic meat market.

## Concluding remarks

The total volume of these sheep breeds has been small in the past. They are breeds with an unknown potential due to their physiological differences. These differences provide significant research opportunities and these opportunities will determine the economic capacity of these breeds and the level of value adding that can be contributed to the State of Western Australia.

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National Food Industry Strategy

## Appendix 1

Abstracts regarding tail fat of the fat tail breeds. It is anticipated that the fat tailed breeds within Australia may have similar properties.

**Title:** Basic Chemical Characteristics of Fresh, Non-Packed and Vacuum-Packed Sheep-Tail and Tail-Fat Stored Frozen for Different Periods

**Authors:** Ünsal, M.<sup>a</sup>; Gökalp, H.Y.<sup>a</sup>; Nas, S.<sup>a</sup>

**Affiliations:** a. Department of Food Science and Technology, Agricultural College, Atatürk University, 25240 TR Erzurum, Turkey

**Abstract:** Fatty tails were obtained after the slaughter of Morkaraman sheep, which are a common breed of fatty-tailed sheep in Turkey. Fat obtained from sheep tails, (called tail-fat) is used either in fresh condition or after frozen storage. This fat is commonly used as a food source in many countries in which fat-tail sheep breeds are raised; but there has been no detailed research on fatty tails or the tail-fat.

In this work some quality criteria such as water, fat and nitrogen content, 2-thiobarbituric acid and peroxide numbers, free fatty acids, melting point, iodine and saponification numbers were studied in sheep tails and sheep tail-fat, both in the fresh condition and after storage at  $-18 \pm 1^\circ\text{C}$  for up to 60 days. The effect of vacuum packaging versus storage in netting bags (no-protection, non-packed), was also determined. The fat content of the tails was around 94%. Thus, the tail is a concentrated fat source. Some quality criteria of the tail and the tail-fat were determined and are given in the text. Overall results indicated that both the tail and the tail-fat can be effectively used in various types of food and food processing, especially after performing some technological and refining processing. If the fatty tail has to be stored, it should be vacuum packed and stored frozen. At  $-18^\circ\text{C}$ , vacuum-packed tail samples could be stored around 45 days, but in the netting bags, this storage period should not exceed 30 days.

(Ünsal *et al.* 1995)

**Title:** Fractionation and characterisation of edible sheep tail fat

**Authors:** Ünsal, Mahmut<sup>a</sup>; Aktas, Nesimi<sup>a</sup>

**Affiliations:** a. Food Engineering Department, Agriculture College, Atatürk University, 25240, Erzurum, Turkey

**Keywords:** Sheep tail fat; Fractionation; Fatty acid composition; Gas chromatography; Differential scanning calorimetry

**Abstract:** Edible sheep tail fat was effectively fractionated by an acetone crystallisation. Each of the fractions and filtrates were analysed for melting point, refractive index, iodine value, fatty acid composition, and characterised by differential scanning calorimetry. Fatty acid analysis indicated that as the fractionation temperature decreased, the concentration of unsaturated fatty acids in the fractions increased. The liquid fraction had a differential scanning calorimetry melting curve similar to commercial salad oil and the curve of one of the filtrates resembled that of cocoa butter.

(Ünsal *et al.* 2003)