



# final report

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## Identifying live animal condition scoring systems for the Australian livestock export industry

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## Identifying condition scoring systems for the Australian livestock export industry

### **Abstract**

The livestock export industry needs to be able to recognise animals too lean or too fat to travel. A review of available condition scoring systems identified simple, well-described 5-score systems suitable for deer, alpacas, goats, camels and buffaloes which are suitable for the purpose.

For the three most important species, cattle and sheep and goats, Australia is committed to using AUS-MEAT live animal fat scores rather than condition scores, because they are universally used and connect directly to the carcass fat depth specification language. Fat scores are generally interchangeable with condition scores except in cattle, where many suitable export animals have very little subcutaneous fat, and a fat score is not suitable for the industry's task of describing the lower limit of acceptable condition.

It is proposed that for cattle, the minimum level of condition acceptable for live export should be agreed between AQIS and the industry and described directly, using photographs and written descriptions. The AUS-MEAT live cattle language may then continue to be used for other purposes such as marketing and general description.

Implementation of standards in all species should be based on widespread distribution of high quality visual-based printed material, supported by practical training days and information meetings for the industry. Formal accreditation in selection of livestock for export, including condition score limits, should be required of front line AQIS staff and made available to industry participants.

### Executive summary and recommendations

Under the Australian Livestock Export Standards (2004), the livestock export sector requires simple and consistent methods for describing the condition of beef cattle, dairy cattle, buffaloes, sheep, goats, alpacas, camels and deer. The particular need is to improve the welfare of animals by identifying those that are too lean or too fat for export before they are exposed to welfare risks in the export chain.

The Australian livestock industry uses a variety of formal and informal methods for describing the condition of animals. There are formal condition score description systems for most species but they are not uniform and not necessarily suitable for the live export trade. For example:

Dairy farmers use condition scoring extensively to manage nutrition and production of cows. They mainly use the “Condition Magician” 1-8 system with detail in the middle score ranges where they need it. The supporting material does not describe the extreme scores in detail, because they are outside the range seen in productive farm animals.

The official AUS-MEAT live cattle language for describing beef cattle does not describe condition specifically; it uses fat scores based only on subcutaneous fat depth. This facilitates trading links with the meat industry and is widely used for market reporting of live cattle, but does not adequately describe condition, especially in very lean cattle.

A review was carried out to identify the systems used around the world and find the most appropriate systems for the Australian industry. A large number was discovered for dairy and beef cattle, but very few exist for most of the other species.

Condition scores have been used extensively in beef and dairy cattle research, where detailed scoring systems have been developed, usually with 8 or 9 scores. Some even have additional half scores. Some of these systems are being used in Australian research and although they may be technically accurate for their purpose, the detail is quite unnecessary for the live export trade.

All species have at least one simple system based on 5 condition scores and this is the simplest and most practical approach for the livestock export industry. It is easy to use by people such as exporters who may be working with a number of species, and fits directly into the Heat Stress risk assessment process required for shipments to the Middle East.

For the cattle industry, it is evident that the existing AUS-MEAT live cattle description language based on carcass fat depth is not adequate for describing minimum condition, particularly in tropical breeds, but it is necessary to use these languages to retain compatibility with the rest of Australian livestock and meat sectors.

It is proposed that for cattle, the appropriate cut-off points for live export be defined independently of the arbitrary scores, using photographs, diagrams and clear descriptions to support decisions at the extremes of the acceptable range.

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### Recommendations

1. For **marketing, communication and general use** in each of the species in the livestock export industry, the following description systems are recommended:
  - 1.1. BEEF: The beef cattle industry should use the AUS-MEAT live cattle language for animals deemed suitable for the trade, maintaining the industry's strong commitment to it through national market reporting and links to carcase and meat description.
  - 1.2. DAIRY: Dairy cattle should be described in the same way as beef cattle, using the AUS-MEAT live cattle language.
  - 1.3. SHEEP and GOAT: The sheep and goat industries should use the AUS-MEAT sheepmeat/goat language, with fine-tuning for fat-tail breeds of sheep that may need additional description.
  - 1.4. BUFFALO: The buffalo industry should adopt the Sri Lankan 1-5 system.
  - 1.5. DEER, ALPACA and CAMEL: The deer, alpaca and camel industries have developed their own 1-5 description systems in Australia. It is recommended that these systems are adopted for use by the livestock export trade.
  
2. For **defining the minimum and maximum boundaries of acceptable condition for live export**, the condition scoring systems in all species other than cattle are adequate. The AUS-MEAT live cattle language is not discriminating enough to describe the boundary for very lean cattle. It is recommended that:
  - 2.1. For buffaloes, sheep, goats, alpacas, camels and deer, Scores 1 and 5 in the recommended condition scoring systems should be adopted for describing the extreme condition scores unacceptable for live export.
  - 2.2. For beef and dairy cattle, the cut-off points for cattle too lean and too fat for export should be described specifically, independently of any condition score description system, using photographs and descriptions.
  - 2.3. Descriptions, diagrams, and, where possible, photographs be used to clearly identify these cut-off points for all of the relevant species.
  - 2.4. The cut-off points for beef and dairy cattle, and the method for describing them, be agreed between AQIS and the industry.
  - 2.5. The agreed descriptions be widely distributed to the industry and be referenced in the Australian Livestock Export Standards.
  
3. Implementation of the recommended minimum and maximum condition descriptions and condition scoring systems should be based on:
  - 3.1. Widespread distribution to the industry of high quality visually-based material such as leaflets, posters and durable pocket-books which are easy to use in the field;
  - 3.2. Availability of high quality visual material on the internet;
  - 3.3. A series of information meetings at appropriate centres, and with industry groups.
  
4. The industry should develop customised training in condition scoring, integrated with training in other aspects of selection of livestock for export.

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- 4.1. Formal training and accreditation in selection of livestock for export, including the skill of recognising the acceptable limits of animal condition, should be a requirement for the appropriate regulatory staff responsible for applying the Standards. This training should be based on that provided to staff of the National Livestock Reporting Service.
  - 4.2. Exporters and their service providers should be able to undertake the same formal training to obtain accreditation on a voluntary basis.
  - 4.3. Applied, practical training of exporters and their service providers should be provided as part of the implementation program. This should be tailored to the location and species, and include live assessment of animals selected to demonstrate key decision points in condition score and other visual selection criteria.
  - 4.4. An independent audit of competency in accurate sourcing of animals appropriate for the trade by exporters and their service providers should be carried out to determine any further training needs.
5. Future research should review data gathered following implementation of this system to examine the links between the condition of animals and the outcomes of the export process, particularly very lean and very fat animals, to verify the standards are appropriate for animal welfare and not restricting trade unreasonably. Other specific issues include:
- 5.1. the ability of the AUS-MEAT sheep description language to adequately describe the condition of fat-tail breeds of sheep and their fitness to travel
  - 5.2. verification that the condition scores adopted are appropriate for the heat stress model.

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### Background

The livestock export industry is a significant one for Australia. In 2002 shipments were worth over \$1 billion and included approximately 6 million sheep, 1 million cattle, and 0.1 million goats. In value terms live cattle account for more than half of the trade.

Export numbers fell in 2003 to 0.7 million cattle and 4.3 million sheep as drought recovery limited the availability of export animals in Australia and live sheep exports to Saudi Arabia were suspended.

Table 1: Exports of live sheep and cattle: volume and value<sup>a</sup>

	1999-00	2000-01	2001-02	2002-03	2003-04 f	2004-05 f
<b>Sheep</b>						
No. (million)	4.86	5.94	6.44	5.84	4.15	4.10
Value (\$bn)	0.18	0.26	0.39	0.41	0.25	0.22
<b>Cattle</b>						
No. (million)	0.85	0.85	0.80	0.97	0.75	0.82
Value (\$bn)	0.43	0.48	0.53	0.56	0.42	0.43
Total value (\$bn)	0.61	0.74	0.92	0.97	0.67	0.65

a Excludes breeding stock.

Source: Australian Bureau of Agricultural and Resource Economics *Australian Commodities* vol. 11 no. 1, March Quarter 2004

The livestock export industry has come under pressure from animal welfare groups in recent years following unacceptably high death rates on occasional shipments. The industry has been responding with a range of measures aimed at reducing mortalities, but community awareness was heightened in 2003 with the unexpected rejection of an entire shipment of sheep on the *Cormo Express*.

In response to this pressure, the federal minister Warren Truss appointed a panel to review the live export industry. In their report (the Keniry report), a large number of changes were recommended and as part of this, AQIS implemented the new Australian Standards for the Export of Livestock on 1<sup>st</sup> December 2004.

The new Standards are primarily aimed at improving welfare of live export animals and describe a wide range of criteria which must be met before export can be permitted. Exporters now must assess the condition of their animals to meet two new requirements:

Cattle, sheep, buffalo, goats, deer, alpacas and camels must not be sourced for export if they are "in an emaciated or overfat condition".

Each shipment to the Middle East must undertake a risk assessment, in which condition score is an important criterion determining the risk of heat stress and permitted loading density

To meet these needs, exporters need clear and consistent methods to describe condition of their stock.

Live animal assessment and description systems are used extensively in Australia. Some are used for market-related purposes such as livestock price reporting, sale-by-description and

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writing trading specifications while others are for production purposes including the management of milk production, fertility, nutrition and grazing.

In the 1990s, AUS-MEAT developed standard livestock and meat languages for description of cattle, sheep and goats. These have been adapted for carcase description from earlier condition score languages and are now widely used across Australia in trading and market reporting. These systems have been very successful for targeting meat production, but have moved away from meeting the needs of the live export industry.

The purpose of this review is to provide clear and consistent methods to describe the condition of livestock in the context of the Australian livestock export industry.

### 1 Project objectives

Recommend and provide a comprehensive description of live animal condition score systems suitable for beef cattle, dairy cattle, buffalo, sheep, goats, alpacas, camels and deer.

In support of each recommended system, provide high quality draft photographs or drawings for each system to enable communication of each system to the industry.

#### 1.1 Additional details

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The project brief from MLA adds the following details:

The consultant will base their recommendations on the findings of a comprehensive global review of the literature and discussions with staff of Meat and Livestock Australia (MLA), LiveCorp, the Commonwealth Department of Agriculture, Forestry and Fisheries (DAFF) and the Australian Quarantine and Inspection Service (AQIS).

In completing the review, the consultant will discuss who is using the various condition scores and describe the advantages and disadvantages of each system within the framework of the Australian livestock export industry. If in the unlikely scenario, there is no system suitable for use in a species within the Australian live export industry, then the consultant will develop an appropriate scoring system.

A draft final report including recommendations is to be reviewed at a meeting with MLA and industry representatives prior to final recommendations being made in the report. It is essential that each system have appropriate photographs or drawings illustrating the key points of each score. These materials will then be developed to publication standard for use within the live export industry, which is outside the scope of this project.

Recommendations will include training and quality control of operators using the preferred condition scoring system(s).

## 2 Methodology

The following list outlines the method used in the conduct of this study:

- Consult with staff of MLA, LiveCorp, DAFF and AQIS to clarify the brief and identify any related issues
- Consult with AUS-MEAT regarding possible impact on or issues with live animal language
- Conduct a global search of the literature to identify condition scoring systems in use for each species and ascertain the context of their use. If they appear relevant, obtain further detail by seeking the experience of relevant regulators or industry.
- Identify sources of information and expertise in research on live assessment, particularly in the context of transport and market suitability.
- Consult with key Australian exporters in each species and document:
  - Present use of livestock description
  - Perceived strengths & weaknesses of present systems
  - Needs for change or improvement
- Identify issues where decisions are/need to be made on the basis of description (e.g. price; fitness to travel)
- Consult with AQIS field staff responsible for administering Standards for export of livestock, covering same points as above and seeking their experience with pre-shipment inspection of livestock.
- Consult with AQIS management regarding their expectations from the new Standards
- Recommend the most appropriate simple, user-friendly system for each species. Collect existing photos/drawings and complete supporting written descriptions.
- If different from current system, develop draft photos or diagrams first and discuss with appropriate people (e.g. AQIS field staff, key exporters) before finalising.
- Complete draft report along with posters/diagrams of sufficient quality for presentation to meeting with MLA representatives.
- Provide recommendations for training and quality control of operators using the assessment standards if appropriate.

### 3 Condition scoring

#### 3.1 What is condition score?

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Condition score is a subjective assessment of the overall depth of flesh (mainly muscle and fat) covering the skeleton, and to some extent, the filling of internal body fat reserves. It is used in many species as an indication of the body's state of nutrition or reserves of energy and is useful because it can do this quite simply and effectively among animals of different age, sex, frame size, weight and thickness of muscling.

As animals increase in condition from very lean to fat, the volume of muscle increases and fat is deposited in characteristic depots. These changes can be observed or felt manually at particular sites over the body. Descriptions of the changes in body features have been documented for most species and for convenience are usually divided into a number of arbitrary steps, or “**condition scores**”.

Condition scoring is mainly used by livestock producers in conjunction with pasture management, to manage the nutrition of their breeding animals and optimise breeding performance. Breeding performance in most species of grazing animals responds directly to nutrition and they are more likely to breed if they have been able to accumulate body reserves of fat and muscle.

##### 3.1.1 Advantages of condition scoring

Although it is subjective, condition scoring has a number of practical advantages over any alternative objective systems of description. For example:

- Liveweight is often used as an indicator for breeding performance, but it is not as useful among animals of different frame size and muscling.
- Condition scoring does not require very much learning, and even among relatively inexperienced scorers, results are generally quite consistent.
- No specialised equipment is needed.
- Scoring can be mainly visual – no handling is required. Manual scoring (by feel) is more accurate and useful for training or as a check.
- Scoring is quick and easy to do.

##### 3.1.2 How accurate is condition scoring?

There have been many studies where results by different scorers have been compared in various species. Good levels of accuracy and repeatability are typical, for example, the statement by Vizcarra and Wetterman (1996), referring to a 9-point beef cattle condition scoring system: “Experienced body condition scorers are generally within one body condition score of one another, and individuals with no experience generally are capable of repeating scores 68% of the time; whereas, experienced scorers are capable of repeating scores 83% of the time.”

Accuracy and repeatability of scoring individual animals are quite high, but are not 100%. This reminds us that as with most subjective assessments of animals, there is always some variation between scorers, and biological variation between animals making it virtually impossible to describe an animal's state of nutrition with complete accuracy.

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Competency standards have been set for fat and muscle score assessments by market reporting officers employed by the National Livestock Reporting Service to report on Australia's livestock markets. For example, to be competent, market reporters must assess the GR fat depth of live lambs within 2mm of the actual carcass depth measured at slaughter (see Appendix 1 and 2 for competency standards, and the sheep section for an explanation of GR site).

In scoring groups of animals, the range of variation within the group is an important issue for both market reporting and for the livestock export industry. Some animals in a yard will be slightly fatter or leaner than others and despite the fact that animals are usually drafted into similar groups, some variation will remain.

Variation within the group is a particular issue for the exporter who needs to know the average (for risk assessment) and is required to identify and reject any individuals with extremes of condition outside the permitted range for export.

### 3.1.3 Scoring different species of animals

Well-fed animals accumulate surplus energy in a number of body depots. These are mainly around the internal organs and under the skin, on the outside of the carcass.

Scoring focuses in on the areas where deposits are visible or can be felt easily.

Not all species deposit fat in the same places - each species has its own characteristic body depots for storing reserves of energy and these differences must be accounted for in developing a description system for each species. For example, the camel stores its surplus energy mainly in the hump and fat-tailed breeds of sheep store theirs mainly in and around the tail.

Scoring systems have been developed for each species to broadly account for these differences.

In species commonly used for meat, the subcutaneous fat depth is an important indicator of carcass value. Subcutaneous fat depths corresponding to condition scores have been published for most of these species.

### 3.1.4 Differences within species

Even within species, there are some well-documented differences that affect the way animals accumulate their reserves. For example in cattle:

- Bulls are naturally more muscular than steers, and when in good condition have more muscle and less fat.
- Females accumulate more fat and less muscle, and mature cows can carry much heavier deposits under the skin compared to steers.
- Dairy breeds tend to deposit more fat around their hard-working internal organs, while beef breeds deposit more of theirs on the outside of the carcass, under the skin.
- Bos indicus breed types deposit more fat internally and "look leaner" at the same body condition

Even within steers of the same breed, there can be significant variation in the way fat is distributed over the carcass.

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### 3.2 Objective measures to define condition

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It would be convenient to have an objective measure of condition, to remove some of the subjectivity of condition scoring, to use as a yardstick for fine-tuning assessment skills (and to use for resolving disputes). With scanning technology now much more widely available and used in the livestock industries, this is becoming possible.

The task of defining condition in objective terms is much more complex than it would appear. The broad task is to find objective assessments that indicate the volume of muscle and fat. Because a direct measure on the live animal is not possible, this is usually done by measuring a correlated indicator. For example, fat depth at a particular position over the rib is used to indicate total carcass or body fat.

Even with accurate measurement, biological variation at indicator sites will ensure the result is at best an estimate. This is especially the case with fat depth at a single site, as distribution of fat can vary significantly over a carcass.

The key variables feasible to measure for each species would be: liveweight, frame size, subcutaneous fat depth and rib-eye area. Some allowance would need to be made for pregnancy and gutfill.

A review of opportunities for objective measurement is outside the scope of this review, but there may be sufficient data in some species to at least partly define condition. For example, the Cooperative Research Centre for Beef Quality (Beef CRC) has recorded condition score along with other key variables on large numbers of Australian beef cattle over many years and this data could be used to develop the formulae for an objective measure of condition.

On-going Australian research in the new Cooperative Research Centre for Beef Genetic Technologies will add to our understanding of factors affecting body composition, particularly in regard to prediction of carcass yield (a function of muscle and fat content).

Meanwhile, the equipment, facilities and cost needed to obtain the basic measurements and the calculations needed to compute an objective score clearly make this impractical at the present time. It is more realistic to focus on using visual and manual methods, with the best possible supporting photographs and descriptions.

### 3.3 Condition score and animal welfare

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The underlying reason for the introduction of Live Export Standards is to improve the welfare of animals in the live export trade. Minimum and maximum condition scores are intended to identify animals at highest risk of death or maladjustment during travel.

#### 3.3.1 Very lean animals

Very lean animals have little in reserve to handle additional stresses such as time off feed, drafting, trucking, adaptation to a strange diet and new surroundings. If their temperament or prior experience means the adjustment is delayed, or there is bad weather or unplanned delays occur in transit, they are at higher risk than other groups. This is an important issue for the whole livestock transport industry, especially in poor seasons.

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Improving our ability to describe and identify animals whose body reserves are at critical points will also be of interest in other aspects of managing and regulating animal welfare in Australia, e.g. in drought.

Given that animals being exported live by ship are fed and watered during the voyage, they should gain or at least maintain their weight during the voyage, once they are eating the feed on offer.

To be useful in animal welfare, a condition score language needs to be able to differentiate between very lean animals. There is a considerable range in most species between a lean but healthy animal with little evidence of fat, down to an emaciated animal with depleted body reserves, wasted muscle and physical weakness.

In Australia, the cattle, sheep and goat industries describe body condition with systems that have been adapted for description of carcass fat depth. These are generally deficient at separating the lean, very lean and emaciated animals.

There is little evidence at present to define the relationship between condition score and mortality in very lean animals, so research should be conducted to validate the accuracy of the condition score cut-off points in the regulations.

### 3.3.2 Very fat animals

Very fat animals have been associated with higher levels of mortality, particularly in shipments of longer duration and when travelling from a cool to a hot climate. Factors in fatter animals include:

- Among very fat animals, it is more difficult to identify animals that are not eating or are adjusting poorly to the feeding regime
- Very fat animals that fail to eat adequately can become weak and susceptible to life-threatening metabolic disorders while still appearing in good condition
- Their extra body weight makes it more difficult for them to get back on their feet if they go down or are injured
- Fatter animals in the export trade are often older, particularly sheep. Older animals are more likely to have difficulty adjusting the change of feed and environment and because they are in good condition this is not obvious
- Fatter animals have more difficulty shedding heat load and require more space per head



### 4 Condition scoring systems

Formal and informal systems have been used for many years in Australia to describe body condition in sheep, beef cattle and dairy cattle. Description has been mainly used to describe features important in marketing the animals, such as carcass value, likely time to fatten, suitability for breeding and fitness to travel.

In recent years condition scoring has been used more commonly by farmers to describe the “state of nutrition” of their breeding animals. For example, in beef cows there is a strong relationship between condition at calving and their subsequent conception rates at re-breeding, and the fertility of ewes is directly related to body condition at joining. Farmers use these relationships to fine-tune management of breeding stock.

A score of 1 to 5 has been commonly adopted in most species, at least as the starting point. This is conceptually easy to understand, e.g.

Score 1 = very lean

Score 2 = below average

Score 3 = average or ideal

Score 4 = above average

Score 5 = very fat.

Scoring systems have become more sophisticated in some species as they have used condition scoring to fine-tune nutrition and breeding management or marketing. The main areas where basic scores have been further developed are:

- Further subdivision into more condition scores
  - Additional detail has been required by researchers who study relationships with animal production, and industries such as dairy and beef where producers use it extensively in herd management. The level of detail is not needed in most situations where a broad classification is required.
- Use of a fat score instead of condition score
  - This has been driven by the need to define fatness separately as a carcass specification. It has caused some compromises in the ability of the systems to describe body condition (see the following section for detail).

#### 4.1 Fat score or condition score?

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“Condition” in most species is the amount of muscle and fat tissue that can be assessed over the skeleton. The total amounts, and the relative proportions of each tissue, change as the animal moves from lean to fat condition. To further complicate the picture, animals of the same species, age sex, weight and condition can vary in their proportions of muscle and fat.

The actual subcutaneous fat depth can be used as an indicator of condition, but this assumes a strong correlation to the visual appearance of condition score. The strengths and weaknesses of this connection are important in the context of very lean animals and their suitability for live

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export, because Australia uses fat scores based on subcutaneous fat depth, rather than condition scores, in the official systems used to describe live sheep and cattle.

Subcutaneous fat depth is an important carcass specification for meat animals in Australia. In the 1980s and early 1990s, AUS-MEAT developed standard description systems for carcasses and meat for the main meat species. The industry then made a concerted effort to adapt the live animal description systems and develop the live animal assessment skills that could describe the fat depth specifications of their carcasses.

In order to do this, it was necessary to re-define the live animal condition scores for cattle and sheep in terms of fat depth measurements on the carcass. For example, the current definitions for live animal fat scores for cattle, sheep and goats are listed in Table 2.

Table 2: Objective fat score definitions in the AUS-MEAT live animal languages

	<b>Cattle – mm fat depth over P8 (rump)</b>	<b>Sheep – mm tissue depth at GR site</b>	<b>Goats – mm tissue depth at GR site</b>
<b>Fat score 1</b>	0-2	0-5	0-3
<b>Fat score 2</b>	3-6	6-10	4-6
<b>Fat score 3</b>	7-12	11-15	7-9
<b>Fat score 4</b>	13-22	16-20	10-12
<b>Fat score 5</b>	23-32	Over 20	Over 12
<b>Fat score 6</b>	Over 32		

Source: National Livestock Language Cattle : Bovine 1994 (AUS-MEAT); Sheepmeat/Goat language 1994 (AUS-MEAT)

Australia has used the AUS-MEAT live animal languages and the associated fat scores for cattle, sheep and goats since the mid 1990s. They are the national standards for carcass description, slaughter feedback, live animal trading and market reporting.

Australia's live cattle and sheep languages, and the associated skills of assessing the carcass specifications of live animals, have been vital links in our ability to compete in the international markets for beef and sheep meats. No other country supplies such a diverse range of carcass and meat products, and carcass-based live animal languages make it possible to target production and supply effectively.

The main compromises in using a carcass-based fat score rather than condition score are with some types of beef cattle and with the less common breeds of sheep. Limitations of relying on fat depth as the sole indicator of condition include:

- Very lean animals with little or no subcutaneous fat may vary from strong and healthy (good condition) to weak and emaciated (very low condition)
- As animals vary in body size at the same subcutaneous fat depth, their appearance and condition changes. For example, a 250kg calf carrying 5mm of fat (Fat score 2) would appear much fatter than a mature steer with the same fat depth
- Heavily muscled cattle in good condition carry lower levels of subcutaneous fat compared to lighter muscled animals. For example, six out of 226 led steers at the

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Sydney Royal Easter Show in 2005 carried 0-2mm of measured carcass fat at the P8 site over the rump (and would therefore be described correctly as AUS-MEAT fat score 1, the leanest score) but these animals were moderately to very heavily muscled and in very good “condition”.

- Mature bulls carry much lower levels of fat than mature cows in the same condition.
- Distribution of fat over the carcass can vary between individuals, particularly as they become older and fatter.
- In species where subcutaneous fat depth is not the major storage depot, fat depth can be a poor indicator of body condition.

A similar issue occurs in sheep with the growing number of large-framed, heavier muscled animals that can be in good condition at heavier weights, while carrying lower levels of fat.

Although Australia uses fat scores in cattle sheep and goats, the training material used at a practical level is still based on condition scoring principles, which are suitable for the majority of stock. The fine-tuning required to accurately estimate fat depth/score in the biologically different types is an advanced skill shared by a smaller number of specialist assessors and educators. There is no available documentation for training at this level but these people hone their skills with regular assessment and feedback of carcass information.

The following sections give some further background to the adoption of fat score as a replacement for condition score in Australia’s official description languages.

### 4.1.1 Australia’s move to fat scores

In the early 1980s NSW established an “objective” independent market reporting service for cattle and sheep. Descriptions for both sheep and cattle were based on 5 condition scores.

As carcass description was developing at this time, the actual fat depth became a key specification and industry extension material produced tables as a guide to the actual carcass fat depths that would normally be associated with each condition score. Extension material such as AgFact A2.7.9 (Sundstrom, 1983) recognised the effect of carcass weight on fat depth at the same condition score (Table 3).

Table 3: Fat cover (mm) in cattle at 12/13 rib site (from AgFact A2.7.9 NSW Agriculture 1983)

<b>HSCW/saleyards condition score</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Up to 160kg</b>	0	1-2	3-5	6-8	9+
<b>160-250</b>	0-1	2-4	5-7	8-11	12+
<b>Over 250</b>	0-2	3-5	6-9	10-18	19+

This AgFact further recognised that “Some European crosses, because of their heavier muscling, may for example have a saleyards [condition] score of 4 but have less fat.”

This highlights an underlying problem with fat scores. They underestimate the condition of heavily muscled animals, and conversely, a heavily muscled animal in good condition may produce a carcass whose fat score is too lean to meet buyer specifications.

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The AgFact further explained that once the fat score was separated from condition score, it was necessary to add a description of muscling, commonly known as trade conformation, to account for the widely different carcass value of these types. (This was formally defined and officially introduced later – see following section).

The development of sale-by-description and direct-to-processor trading on the basis of weight/fat price grids continued in the 1980s the industry developed more specific skills at estimating the actual fat depth to match the evolving use of fat depth in carcass specification. To complete the link between live and carcass languages, AUS-MEAT (1994) re-defined the carcass and livestock language:

Fat scores were allocated to arbitrary bands of fat depth, irrespective of carcass weight. The first five scores roughly corresponded to the existing condition scores for light/medium weight slaughter cattle

A 6<sup>th</sup> fat score was added, to further describe very fat animals, especially overfat cows which can be quite common and have lower carcass value.

The P8 (rump) site was chosen instead of the standard 12/13<sup>th</sup> rib site as the indicator site for fat depth measurement – although not as good as a single indicator of carcass fatness, it was considered more practical to measure as it suffered less damage during hide removal at the abattoir.

### 4.1.2 Combined muscle and fat assessment

The Livestock Market Reporting Service in New South Wales (the only state with an independent service at the time) adopted the new fat scores and found that most animals retained the same fat score as their old condition score, but some cattle posed particular problems.

New European breeds with much heavier muscling came to Australia in the 1970s and 1980s. They were much fuller in the muscle, but carried less fat than the familiar British breeds and regularly deceived buyers who often overestimated their fat cover.

This became an important issue in market reporting, where fat depth alone was shown to be very inadequate at describing some classes of cattle, especially lean young cattle with variation in muscling.

Beef extension officers in New South Wales developed a “muscle score” to use in conjunction with the fat score to describe and understand the fat depth and carcass specifications of cattle with different musculature. This worked well but required skill and training in live assessment, to identify the degrees of fatness and muscling under the hide. The procedure of assessing live muscle score and its validation against carcass yield was completed by NSW Agriculture (Perry et al 1993a and 1993b).

The NSW Meat Industry Authority took the decision to introduce five visually-based “live muscle scores” (A = very heavily muscled to E = lightly muscled) to the NSW market reporting description language alongside fat scores in the late 1980s and NSW Agriculture beef extension officers set the live assessment standards and conducted their training.

On-going analyses by NSW Department of Primary Industries and the National Livestock Reporting Service (NLRS) (McKiernan and Iori, pers. comm.) have proven muscle score to be a significant determinant of value by saleyard buyers.

## Identifying condition scoring systems for the Australian livestock export industry

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As the market reporting services in each state have over time become part of today's National Livestock Reporting Service, they have introduced a combined muscle/fat description system. Muscle score C and fat score 3 are combined and abbreviated to "C3" and descriptions such as "C3 steers" and "D4 cows" are now commonly used across Australia, as they have done for almost two decades in NSW.

Livestock market reporters for NLRS are trained and accredited by NSW Department of Primary Industries who have developed an accredited training program covering the assessment of fat score, muscle score and carcass weight. Appendix 1 and 2 list the levels of performance required of accredited assessors.

### 4.1.3 Attempts to link muscling to the carcass language

NSW Agriculture (now Primary Industries) from the early 1980s has used a "carcass muscle score", calibrated against the "live muscle score", in its Australian Beef Carcass Appraisal Method (ABCAM) used to judge carcass competitions and provide carcass feedback to producers in NSW. Like the live muscle score, this is an assessment of the fullness and convexity of muscling, allowing for the effect of fatness, and requires training to perform consistently and accurately. Research in both domestic and export carcasses demonstrated its positive correlation with carcass yield (Perry et al 1993a and 1993b).

Attempts from the live cattle sector to have AUS-MEAT include a carcass muscle score in the official carcass description language failed. There was strong industry support for a muscle score at the time, but it was considered essential to use only objective measures, to remove subjectivity and enable mechanisation of the process. A compromise was reached and was named "butt profile" – a two-dimensional silhouette of the butt using the same A-E scores as the live muscle score. This proved disastrous as it did not differentiate between degrees of muscling, had no relationship with carcass yield (Perry et al 1993b) and carcass feedback confused the understanding of muscling in live cattle.

Despite being a poor measure of muscling and carcass value, a below average butt profile (Score D) was used by processors, particularly in northern Australia, to downgrade and discount carcasses from producers. This has generated strong negative views among producers, particularly in northern Australia, about assessment of muscling and has caused enormous difficulty in gaining acceptance of a combined muscle and fat assessment in the live animal.

## 4.2 The use of photographs as standards

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Most people find it difficult to translate objective descriptions such as fat score and muscle score, into a mental image of the animal being described. For this reason, good quality photographs are of great assistance in training and in maintaining standards of live animal assessment among the practical people of the industry.

Generic photographs are excellent for gaining a basic understanding or principles, but often become inadequate when applied to a full range of real situations. For example, there is a single photograph of a mature British breed cow to represent AUS-MEAT fat score 1 in the beef livestock language (see Beef section). It is important to understand that Fat score 1 (defined as carrying 0-2mm subcutaneous fat over the rump) will also include animals such as:

- Most calves under 6 months of age, especially if they are growing at a moderate to slow rate;
- Most European breed bulls in working condition

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- A significant proportion of fit, healthy store yearling steers
- All cattle in an emaciated condition

As this suggests, generic photos have severe limitations, but in cattle, photographs can be very useful if they are selected for a specific purpose and targeted. Photographs of lean *Bos indicus* store steers can show important visual differences in condition, and be a much more practical way to define limits of acceptable condition for the live export trade. For example, the two cows pictured below (Figures 1 and 2) are both AUS-MEAT Fat score 1 and are devoid of fat, but there are clear differences. The cow on the left shows a greater degree of emaciation – her hips, short ribs and long ribs appear sharper and more prominent, and her rump and thighs are more concave.

Figures 1 and 2: Cows in Fat score 1 showing different degrees of emaciation



Photographs are less useful in British breed cattle with longer coats, and the foundation British condition scoring system (Lowman et al 1976) is based solely on manual assessment by palpation, rather than visual assessment, for this reason.

The condition score guidelines for deer caution that deer in winter can carry a long coat over their hindquarters, making visual assessment much more difficult.

Live assessment of sheep is extremely difficult by eye when they are carrying any more than 25mm of wool, so photographs are rarely used as standards for sheep.

The usefulness of photographs for assessment training in long-coated animals is highlighted in the description of the assessment procedure for the US goat scoring system (section 11). The loin area of several goats has been shorn to reveal the assessment sites much more clearly, to improve understanding of manual assessment sites. Goats vary in their coat length, and manual assessment is mainly recommended.

## 5 Condition score in the live export industry

### 5.1 Regulatory requirements

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People with the regulatory responsibilities need to be able to clearly and consistently identify the “cut-off points” between animals that are suitable and those that must not be sourced under the Australian Standards for the Export of Livestock (2004).

High quality written materials (including pictures and/or diagrams) that clearly explain the relevant cut-off points would assist consistency in live animal assessment across the industry. Key front-line staff may already have a good understanding of the methods of assessing animals, but material that is clear and easy to interpret by all sectors will help significantly.

It is also vitally important to be able to accurately assess the intermediate scores, for input into the Heat Stress model and correct calculation of the level of risk and numbers of animals able to be included in a given shipment.

### 5.2 How livestock are selected for export

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The actual process of screening varies considerably, depending on whether the animals are handpicked individual breeding animals or large shipments of store or slaughter animals. The animals must pass through a number of steps, e.g.:

- selection for sale by the producer
- inspection by the buyer or agent on the buyer’s behalf
- inspection by stockmen at an assembly depot (sheep and beef cattle)
- inspection by an accredited veterinarian
- inspection by an AQIS veterinarian prior to issue of the export permit.

There is also big variation in the amount of health testing required, depending on animal type and destination. Where extensive individual testing is required, such as with most breeding animals, there is little likelihood that extremely lean or over fat animals will be selected, and ample opportunity to assess condition individually.

For dairy cattle, alpacas, deer and camels, there is usually individual handling and numbers are likely to be small so there is greater opportunity to inspect individual animals, and reject if necessary.

For cattle and buffaloes travelling to Asian destinations, the requirements for individual testing are minimal and numbers are generally large. There is some likelihood of very lean animals being presented for export, especially in drought years. Assessment needs to be based on visual assessment of mobs and drafting out individuals if necessary.

For sheep and goats, numbers are large and detailed inspection of each individual animal is impractical. Inspection needs to be visual in the first instance, with the opportunity to draft off individuals or feel them in a race or yard if closer inspection is required.

### 5.3 Importance of condition score in fitness to travel

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There are many factors, including condition score, which determine whether an animal is fit to travel. The Australian Standards for the Export of Livestock (2004) state: "Livestock sourced for export must be fit to travel. Consistent with the rejection criteria for livestock at the point of export, livestock sourced for export must not present with any condition that could cause the animal's health to decline during transport or export preparation".

The Standards then list more than 20 specific conditions which are criteria for excluding livestock from export, and specify maximum and minimum condition scores.

Apart from these specific factors, some animals are more stressed than others by the processes involved in handling and confinement, the close presence of humans and by the need to adapt to new diets and unfamiliar methods of feeding and watering. Condition is but one factor; selection and training of animals prior to shipment would be an area deserving further attention in the assessment of fitness to travel.

#### 5.3.1 Very lean animals

Animals in very lean condition have low levels of body reserves, and if they react badly to the stress of handling and transport, they are at higher risk. This is particularly so if lengthy transport or time off feed is involved, or if they encounter wet weather during transport to the depot or ship. It is therefore reasonable to set a minimum condition score for live export.

Even if they are very lean, *Bos indicus* cattle on short journeys to Asian ports may be quite fit to travel if they are eating well and not unduly stressed. They are much more likely to have a successful journey and even put on weight during the trip.

An arbitrary condition score alone should not eliminate lean animals if they have adequate body reserves for the travel ahead, they are fit, healthy and otherwise likely to travel successfully.

#### 5.3.2 Fatter animals

Fatter animals have a number of extra risk factors (see 4.3.2) and have more difficulty adjusting to extreme heat. This is especially an issue for sheep and cattle travelling from southern Australia in winter to a much hotter northern hemisphere summer such as the Middle East, or to a tropical Asian environment, these being the two most common destinations for exports of Australian livestock.

The extra risk associated with increasing condition in animals has been defined and is a factor in the new Heat Stress model which exporters are required to complete as part of their risk assessment prior to export to the Middle East.

Using output from the model, exporters identify the permitted pen density for the particular class of stock and voyage. The risk is based on animals of condition score 3 (average) on a scale of 1-5. Animals in condition score 4 or 5 are given a higher risk, and may require more space in the ship (lower pen density) or if the risk is high enough, prevented from travelling altogether.

This risk assessment process has been a very significant step towards improving welfare of animals in the live export trade.



## Identifying condition scoring systems for the Australian livestock export industry

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### 5.4 Exporter requirements

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#### 5.4.1 Customer specification

Exporters rely on their experience and reputation to identify animals suitable for their customers and with the ability to travel successfully. There is no universal language to describe condition, even within the same species, but exporters get to know the requirements of their individual customers and select animals accordingly.

#### 5.4.2 Very lean animals

Some customers, especially buyers of store cattle, prefer animals in very lean condition. Exporters are concerned that an arbitrary minimum regulatory requirement for condition score could exclude animals otherwise very fit and able to travel. This would be an unreasonable impediment to profitable trade, and for this reason, it is important that the cut-off for minimum condition score is not set too high.

Sometimes there will be pressures to accept animals with marginal suitability (e.g. store cattle in very lean condition, otherwise fit to travel), especially if the buyer is keen. This is likely to arise in dry seasons. In this case there must be clear definitions and descriptions of the acceptable minimum condition.

#### 5.4.3 Heat Stress model

Exporters are required to complete a risk assessment for each shipment to the Middle East, using the Heat Stress computer model.

In the model, Condition Score is entered on a 1-5 basis for all species. The score is a significant driver of risk, so descriptions must be clear. It would be convenient if there was uniformity of such condition scoring systems across the whole industry.

### 5.5 Standardising language across species

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Many of the exporters and regulatory staff in the livestock export industry handle a number of different species of animals. The scoring systems that have evolved for different species have created unnecessary confusion, and for the live export industry, a simple 1-5 description across all species would appear much more sensible.

This reflects the natural human instinct to define the two extremes (1 and 5), an “average” (3) and two intermediate points “above and below average” (2 and 4). This is the approach taken for the Heat Stress risk assessment model for each species.

In general, the less intensive and less developed industries have a 1-5 system based on this principle. In the extensive livestock industries, the words “poor, backward store, store, forward store, prime or fat” are widely used and associated with a 1-5 scale.

Industries that have applied condition scoring in their production systems have generally progressed to a more detailed scoring system to suit their needs. This may be by inserting intermediate scores (1.5, 2.5 etc) or re-numbering to 8, 9 or 10 scores.

In the live export industry, it is clear that the practical operators understand condition in 5-category terms, although in some species this is not the official or most common language.

## Identifying condition scoring systems for the Australian livestock export industry

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### 5.6 Training in condition scoring

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There is a well-established infrastructure of training and accreditation in fat scoring sheep and cattle in Australia, underpinning the National Livestock Reporting Service (NLRS – see competency standards in Appendix 1 and 2).

Some training will be needed to underpin the introduction of new live export requirements and should be tailored to the needs of the industry. It is important that this achieves consistent understanding and interpretation of condition score classes and generates public confidence that the sourcing of animals is being done within the acceptable boundaries.

Training poses some special challenges because of the industry's lack of a culture of formal training, its huge geographical spread, the diversity of regional issues and the number of species to cover. The provision of clear literature with photos, diagrams and descriptions should equip the industry with the necessary support to minimise the need for formal training and the associated costs.

It is suggested that training be built around the following principles:

#### 5.6.1 Target audiences

Some key people will require training and independent recognition of their competence in condition scoring. Most involved in sourcing animals will need an understanding of the welfare issues, principles of scoring and support for making decisions about marginal animals.

#### 5.6.2 Content

Training in condition scoring must focus on the actual skills needed. It would be logical that if new training is to be developed, it should be widened to include other issues important in the selection of livestock that are suited for the market and fit to travel. In this respect, the content of training must be guided by the industry.

#### 5.6.3 Independent monitoring

To ensure public confidence, skills in condition scoring should be monitored and evaluated independently of the industry. Key decision-makers should have a reputable qualification to support them.

### 5.7 Options for training

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#### 5.7.1 Formal training, accreditation level

The National Livestock Reporting Service (NLRS) employs professional market reporters who are formally trained and accredited to levels of competence at describing the carcass specifications of live sheep and cattle (see NLRS competency standards, Appendix 1 and 2). This training could be adapted to the need of exporters by focusing on the high and low cut-off points for the condition of animals.

This level of training would be most useful to support AQIS staff who are ultimately responsible for approving livestock for shipment. This type of training could be made more useful if it was

## Identifying condition scoring systems for the Australian livestock export industry

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broadened to address the whole issue of welfare in selecting and preparing animals for export, rather than focusing only on condition score. An integrated training activity containing performance measures and accreditation standards would be more useful for both AQIS staff and industry participants.

### 5.7.2 Applied industry training

With the introduction of the new descriptions, a one-day training activity with the theme “Selection of Livestock for Export” could be customised for the species/location. The content would be integrated to include other requirements in addition to condition score, such as product description (age, sex, pregnancy status etc), visual health, temperament and soundness etc. It is suggested that the day should start with background on welfare, industry issues and livestock assessment, followed in the yards by practical exercises with livestock, as far as possible demonstrating the decisions required. This could include a formal check of condition scoring accuracy by individuals to document their competence or as a benchmark. This type of activity could introduce the condition score language and draw on the experience of AQIS-approved veterinary practitioners in the industry for other aspects of assessing fitness.

## 6 Systems for Beef cattle

### 6.1 Overview of systems available for beef cattle

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#### 6.1.1 International systems

There are a number of different systems being used to describe body condition score throughout the world. Britain, Canada and Ireland have a 5 point system the same as that used for body condition scoring their dairy cattle. Half scores are commonly used in the mid range where production responses occur.

Most systems used in the western countries have evolved from a 5-score system known as the ESCA system (Lowman et al 1976) from the East Scotland College of Agriculture. The 1976 bulletin has quite good descriptions and black and white photographs. It was developed as a hands-on manual system as cattle in Scotland are too long in the coast for accurate visual assessment. Guidelines for visual fat assessment were added in Australia when it was used as the basis of live cattle assessment training in Australia for sale-by-description (NELCM, CALM and AuctionsPlus).

Where condition score and its relationships with fertility has been the subject of research, a 5-point scale has generally not provided enough categories. For example Houghton et al (1990) describe a 5-point scale and further subdivide each score into "plus, average and minus" to effectively generate a continuous 15-point scale. Other researchers generally use a 9-point scale.

The special needs for describing condition of *Bos indicus* cattle in harsh environment were recognised in 1986 by Nicholson and Butterworth from the International Livestock Centre for Africa, Addis Ababa, when they published a definitive 9-point system with excellent black and white photographs. This system is particularly strong in differentiating degrees of emaciation among cattle with very little fat.

Canada (Alberta Department of Agriculture, Food and Rural Development) has recently produced an innovative set of audio visual and written publications on CD describing condition scoring in six farmed animal species ("What's the Score?" 2004). This has standardised the method of description and training material, and uses 5 categories in all species except horses.

In the United States most states use a scale of 1-9 adapted from descriptions by Herd and Sprott at Texas (1986). Various state universities have localised the system with their own modified descriptions and photographs (e.g. Vizcarra et al (1996) - Arkansas; Kunkle et al (1991) - Florida; Eversole et al (2000) - Virginia).

The US Department of Agriculture (USDA) has a set of standards for describing feeder cattle, used mainly for market description. It is used for growing young cattle and is based on thriftiness (mainly health), frame size and muscle thickness.

#### 6.1.2 Systems used in Australia

The commercial beef cattle industry in Australia now uses a 1-6 point fat scoring system to describe body condition. It was developed from the ESCA system (Lowman et al 1976) as part of the AUS-MEAT language to link to carcase fat depth specification (for history see 5.1.1).

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Animal production researchers in different Australian states use either the US 1-9 system (Kunkle et al 1991) or the African *Bos indicus* system (Nicholson et al 1986). The Cooperative Research Centre for Meat Quality (Beef CRC) uses a 1-5 system with half-scores.

The Queensland-based Northern Breeding Edge producer workshop program has adopted a 5-score system to underpin producer training in management of breeding herd nutrition. This condenses descriptions from the US 9-point systems into a simplified 5-point scale and uses Australian photographs.

AuctionsPlus (formerly CALM) developed description for store stock trading in the 1980s and these are still widely used. Cattle are described using AUS-MEAT language including fat and muscle scores, but there is an option for an additional description of “condition” of store cattle in four categories – “poor”, “store”, “forward store” and “fresh forward store”. The fifth category would be “fat”. These words were adopted from the informal language still commonly used by producers and agents throughout Australia.

### 6.2 *Bos indicus* and *Bos taurus* are different

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Having a single system to suit both temperate and tropical breeds requires some allowance for the differences in fat distribution between them. The finer points of difference are described in two different American publications, referring to cattle near the mid-range of the US 9-point scale:

“In standard European [i.e.British] beef breeds (*Bos taurus*), if you can observe the 12th and 13th rib they are classified as 4 or less. Zebu or *Bos indicus* breeds store more internal fat and are scored below 5 if more than the upper crest of the 12th and 13th rib are showing (about 0.5 score higher than *B. taurus*).” (Body Condition Scoring, Texas A&M)

“...*Bos taurus* breeds and crossbreds will show a more uniform distribution of fat over the ribs, whereas *Bos indicus* cattle may have very little fat over the ribs but will deposit fat over the hooks and pin bones.” (Eversole et al 2000 - Virginia)

Unfortunately there is no discussion of the differences near scores 1 and 2, but it is likely that around these scores *Bos indicus* cattle will “look leaner” at the same total body fat percentage, and hence be fitter than very lean British breed cattle that look to be in similar condition.

Researchers in animal production in the Northern Territory Department of Business Industry and Regional Development are using the African *Bos indicus* 1-9 scoring system (Neil MacDonald pers. comm.). They find this system is better suited than others to the type of cattle and the levels of nutrition in their environment.

### 6.3 AUS-MEAT 1-6 fat scores

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The AUS-MEAT livestock language is Australia’s standard language for description of beef cattle. It is a fat score rather than a condition score, because it is based only on fat depth (for details see 5.1). It was developed from the ESCA 1-5 condition score system (Lowman et al 1976) by calibrating it with subcutaneous fat depth, as objective carcass description was introduced to Australia from the 1980s. Originally there were five scores, calibrated to the normal range of slaughter cattle. A sixth score was added to cater for older females carrying large amounts of fat.

## Identifying condition scoring systems for the Australian livestock export industry

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The fat scores are now defined in terms fat depth at the P8 site over the rump, connecting it to the standard fat measurement site used on the carcass by the processing sector. The official reference (AUS-MEAT National Livestock Language: Bovine 1994) does not contain any photographs. Those reproduced here are the same photographs originally used with the introduction of the Livestock Market Reporting Service more than two decades ago. They have been added into the NSW Department of Primary Industries publication describing the system (McKiernan et al 2000) which is published on the NSW Department of Primary Industries web site. In today's context they are only of a moderate standard and the example animals are not well chosen. NSW Department of Primary Industries has been training market reporters and others in live assessment for more than 25 years and now has an accredited training program in live assessment, including fat scoring of beef cattle. All reporters from the National Livestock Reporting Service are trained and monitored under this program and are required to achieve prescribed levels of accuracy against carcass fat depth measurement at slaughter (see Appendix 1).

### PRO







- This is Australia's official national description language for cattle
- Linked to carcass/meat description
- Widely used by all sectors and in all official documents
- Used as the basis for National Livestock Reporting Service reports for cattle
- Part of the Eastern Young Cattle Indicator, a key market price index
- Accredited training and monitoring is available
- Scores are objectively defined (P8 fat depth) and can be verified by scanning or at slaughter
- Fat scores 1-5 will directly fit the Heat Stress risk assessment model in most cattle

### CON

- Score 1 is too wide and would include some store cattle otherwise fit for export
- Fat scores don't relate visually to condition over extreme types of cattle
- Describes fat depth only – also needs a Muscle Score and frame size, to be technically accurate description of condition
- Available photos are not good
- Different to most of the other simple 1-5 systems

## Identifying condition scoring systems for the Australian livestock export industry

Table 4: AUS-MEAT 1-6 Fat scores for cattle

Fat Score/ Depth mm	Picture	Manual Assessment	Visual Assessment
1 0-2mm		No fat around tailhead. Short ribs sharp and easily distinguished. Hip bone and ribs clearly visible and hard to touch	Skeleton clearly distinguishable, spine prominent and sharp. Muscle wastage in thighs and stifle.
2 3-6mm		No fat around tailhead. Short ribs sharp and easily distinguished. Hip bone and ribs visible and hard to touch	Backbone clearly defined. Short ribs can be seen separately. Ribs are distinguishable.
3 7-12mm		Short ribs can be individually felt but feel increasingly rounded. Ribs clearly felt. Hip bone still quite hard, and only light deposit of flank fat and around tail head.	Fore ribs not noticeable but last 2 ribs can be seen. Short ribs and hips rounded. Tailhead still prominent.
4 13-22mm		Short ribs only felt with firm pressure. Moderate fat cover around tail head. Hip bone carrying some fat cover.	Short ribs rounded and cannot be seen separately. Area either side of tail head filling but not rounded.
5 23-32mm		Short ribs cannot be felt or need very firm pressure. Ribs and hip well covered. Tail head fat as slight mounds, soft to touch.	Ribs fully covered and not noticeable. Hindquarters plump and full. Abundant fat cover either side of tail head.
6 over 32mm			Heavily covered with fat. Lumpy deposits easily detected around hips and tail head.

Source: McKiernan et al 2000. NSW Department of Primary Industries Agfact A.2.7.16

### 6.4 ESCA 1-5 system (Scotland)

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This system was developed by Lowman et al (1976) at the East Scotland College of Agriculture (ESCA) and the 1976 publication is a foundation document in live assessment. It has been used as the basis of live assessment techniques and training in Europe, North America and Australia.

The system was developed for describing the condition of breeding females (which tend to carry more subcutaneous fat than young cattle or steers). It is based on feeling the depth of fat tissue on the animal on the loin and around the tailhead. Diagrams and photos show the procedure and it contains a series of black and white photographs of cows representing each score.

As adoption of condition scoring spread since 1976, better diagrams have become available along with more complete descriptions.

In Australia it was used as the basis for training to assess carcass fat depth in live cattle, and visually-based descriptions were added to enable assessment without handling the animals.

#### PRO:

- The “original”, simple, 1-5 score system
- Known in Australia (used as the original market reporting system)
- Adopted as the basis for many subsequent systems including AUS-MEAT fat scores
- Training material available for manual assessment (old - ESCA & Australian)
- Objective fat depth equivalents known (approximately)
- Fits HS model

#### CON:

- Primarily a manual system - adapted to visual
- More recent versions are explained better
- No longer in print
- Based only on manual assessment – requires animal confined in a race
- Photographs old, not typical of Australian cattle



## Identifying condition scoring systems for the Australian livestock export industry

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### 6.5 African zebu 1-9 system

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This system was developed by Nicholson and Butterworth (1986) specifically for *Bos indicus* cattle in a harsh African environment. The authors recognised that systems such as ESCA did not allow for the breed difference in fat distribution, and did not adequately cover the wide range of conditions seen in African cattle.

The system is described as having 9 points, with three “core” conditions – fat (F), medium (M) and lean (L), each subdivided into three categories. The scores are abbreviated as F+, F, F-; M+, M, M-; L+, L and L-. Each is given a number from 1 (L-) to 9 (F+).

The authors published an excellent booklet with top quality diagrams and explanation of the underlying body structure. The booklet has the best photographs of all beef cattle systems.

The NT Department of Business and Industry Development uses this system in its animal production research with *Bos indicus* cattle. Researchers there have made estimates of the comparison against the AUS-MEAT fat scores.

The contents of the original booklet are reproduced on the web (with poorer quality diagrams and pictures), by Texas A&M University (see Nicholson et al 1986).

#### PRO


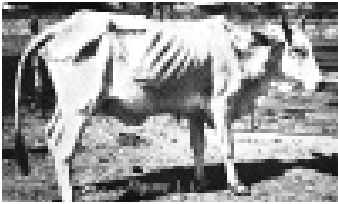

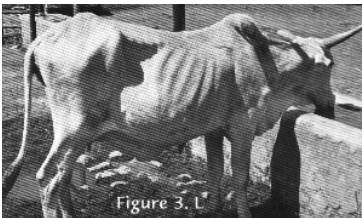

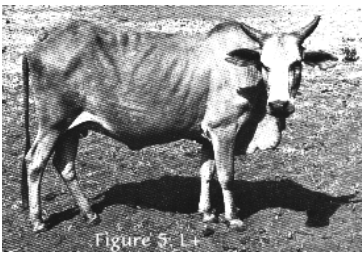

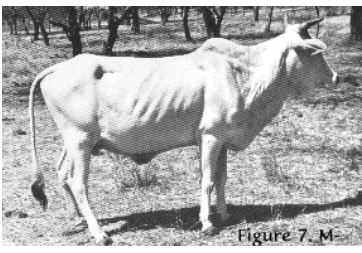
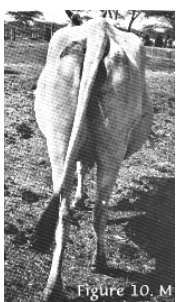
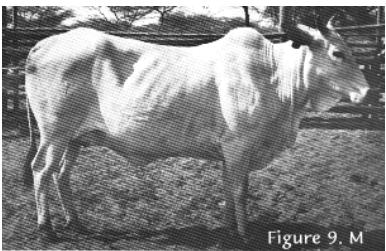
- Developed for *Bos indicus* cattle similar to our northern industry
- Very good description and photos at the lean end of the scale
- Very applicable to northern Australian genotypes
- Excellent photographs available (old, B&W only)
- Suitable to use for defining welfare limits in *Bos indicus* cattle
- Good Score 1 and 2 photos included – would be hard to re-create
- Being used in Australia in NT research
- Could be converted to 1-5 - Score 1 plus 4 pairs

#### CON

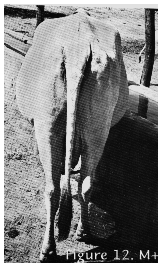
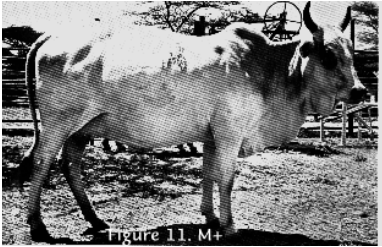
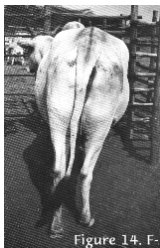
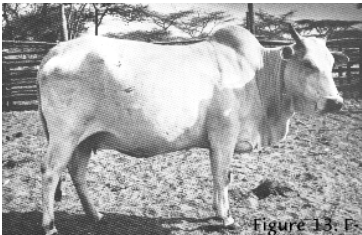

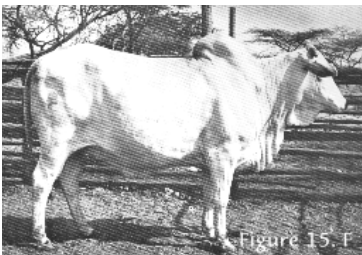

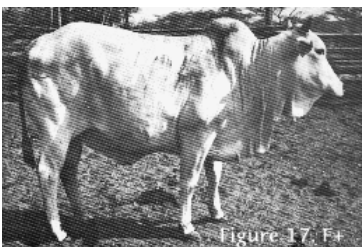
- Scores too low and photos not relevant for southern Australia
- Too detailed for live export industry
- 9 scores, not compatible with other species or HS model
- No longer published
- Photographs not in colour
- Not in common use in Australia

## Identifying condition scoring systems for the Australian livestock export industry

Table 5: African zebu (Bos indicus) 1-9 system

Score Condition	Visual Assessment		Features
1 L-	 Figure 2. L	 Figure 3. L	<b>L-</b> Marked emaciation (animal would be condemned at ante mortem examination). Transverse processes project prominently, neural spines appear sharply
2 L	 figure 4. L	 Figure 3. L	<b>L</b> Transverse processes project prominently, neural spines appear sharply.
3 L+	 Figure 6. L+	 Figure 5. L+	<b>L+</b> . Individual dorsal spines are pointed to the touch; hips, pins, tail-head and ribs are prominent. Transverse processes visible, usually individually.
4 M-	 Figure 8. M-	 Figure 7. M-	<b>M-</b> Ribs, hips, and pins clearly visible. Muscle mass between hooks and pins slightly concave. Slightly more flesh above the transverse processes than in L+
5 M	 Figure 10. M	 Figure 9. M	<b>M</b> Ribs usually visible, little fat cover, dorsal spines barely visible.

## Identifying condition scoring systems for the Australian livestock export industry

Score Condition	Visual Assessment		Features
6 M+	 Figure 12. M+	 Figure 11. M+	<b>M+</b> Animal sooth and well covered; dorsal spines cannot be seen, but are easily felt.
7 F-	 Figure 14. F-	 Figure 13. F-	<b>F-</b> Animals smooth and well covered; but fat deposits are not marked. Dorsal spines can be felt with firm pressure, but feel round rather than sharp.
8 F	 Figure 16. F	 Figure 15. F	<b>F</b> Fat cover in critical areas can be easily seen and felt; transverse processes cannot be seen or felt
9 F+	 Figure 18. F+	 Figure 17. F+	<b>F+</b> Heavy deposits of fat clearly visible on tail-head, brisket, and cod; dorsal spines, ribs, hooks and pins fully covered and cannot be felt even with firm pressure.

Source: Nicholson MJ and Butterworth MH (1986). Reproduced by Texas A&M University at [http://cnrit.tamu.edu/ganlab/Program/Nutbal\\_Tips/condition\\_scoring\\_of\\_zebu\\_cattle.htm](http://cnrit.tamu.edu/ganlab/Program/Nutbal_Tips/condition_scoring_of_zebu_cattle.htm)

## Identifying condition scoring systems for the Australian livestock export industry

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### 6.6 US 1-9 system for beef cattle (Florida version)

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This system was described by Herd & Sprott (1986) and has been used by many around the world, particularly in research. It has been validated against carcass composition in several experiments.

According to Kunkle and Sand (1991), Texas and Oklahoma researchers have found that cows with body condition scores of 3, 5 and 7 had a carcass fat content of 7 to 9%, 15 to 18%, and 25 to 27%, respectively. A cow of medium frame size will weigh approximately 1100 lb (500 kg) at BCS 5 but only 950 lb (430 kg) at BCS 3. In this system, a medium frame beef cow would change in weight approximately 75 lb (34kg) for each condition score.

The system has been described in different extension publications in several US states and is the most commonly used system in the US. The Florida version is included as the example below, but a similar publication with good photographs and explanations (Vizcarra and Wettemann, 1996) is available on the University of Arkansas Cooperative Extension Services web site, and includes an excellent PowerPoint slide show for download, at [http://www.aragriculture.org/lvstkgorg/livestock/beef/nutrition/visual/body\\_condition/body\\_condition.asp](http://www.aragriculture.org/lvstkgorg/livestock/beef/nutrition/visual/body_condition/body_condition.asp)

A number of versions use different photographs, and the Florida version reproduced here includes some photographs of both *Bos indicus* and *Bos taurus* cattle, with some comments about the breed differences (see 7.1).

The system is being used in Australian beef research (Queensland DPI) and is also the basis of systems for describing condition score in buffalo research in Northern Territory.

The descriptive wording was used as the basis for a simplified 1-5 system developed for the MLA Breeding EDGE workshop program in Australia and included in this review.

#### PRO







- Good descriptions and photos available
- Several versions available in US with good support
- Good with fatter British breed cattle
- Less animals otherwise fit for export would be included in extreme scores 1 & 9
- Good precision for defining lean/fat cutoffs
- Florida version available with *Bos taurus* and *Bos indicus* photos
- Used in Australian research

#### CON











- Unnecessarily detailed for live export
- Different to 1-5 systems used in other species
- Need conversion for HS model
- Foreign - not known or used by commercial industry in Australia
- We have an official system – AUS-MEAT
- Not directly comparable to African zebu 1-9 system

## Identifying condition scoring systems for the Australian livestock export industry

Table 6: US 1-9 system for beef cattle (Florida version)

BCS	Picture		Description
<p><b>1</b> Emaciated</p>			<p>Bone structure of shoulder, ribs, back, hooks and pins sharp to touch and easily visible. Little evidence of fat deposits or muscling</p>
<p><b>2</b> Very Thin</p>			<p>Little evidence of fat deposits, some muscling in hindquarters. The spinous processes fell sharp to the touch and are easily seen with space between them.</p>
<p><b>3</b> Thin</p>			<p>Beginning of fat cover over the loin, back and foreribs. Backbone still highly visible. Processes of the spine can be identified individually by touch and may still be visible. Spaces between the processes are less pronounced.</p>
<p><b>4</b> Borderline</p>			<p>Foreribs not noticeable to the eye, particularly in cattle with a big spring of ribs and ribs wide apart. The transverse spinous processes can be identified only by palpitation (with slight pressure) to feel rounded rather than sharp. Full but straightness of muscling in hindquarters.</p>

## Identifying condition scoring systems for the Australian livestock export industry

<p><b>5</b> Moderate</p>			<p>12th and 13th ribs not visible to the eye unless animal has been shrunk. The transverse spinous processes can only be felt with firm pressure to feel rounded – not noticeable to the eye. Spaces between the processes only distinguishable with firm pressure. Areas on each side of the tail head are fairly well filled but not mounded.</p>
<p><b>6</b> Good</p>			<p>Ribs fully covered, not noticeable to the eye. Hindquarters plump and full. Noticeable sponginess to covering of foreribs and on each side of the tail head. Firm pressure now required to feel transverse processes.</p>
<p><b>7</b> Very Good</p>			<p>Ends of the spinous processes can be felt with very firm pressure. Spaces between processes can barely be distinguished at all. Abundant fat cover on either side of tail head with some patchiness evident.</p>
<p><b>8</b> Fat</p>			<p>Animal taking on a smooth, blocky appearance; bone structure disappearing from sight. Fat cover thick and spongy with patchiness likely.</p>
<p><b>9</b> Very Fat</p>			<p>Bone structure not seen or easily felt. Tail head buried in fat. Animal's mobility may actually be impaired by excess amount of fat.</p>

Source: Kunkle WE and Sand RS (1991). Available at <http://edis.ifas.ufl.edu>

## Identifying condition scoring systems for the Australian livestock export industry

### 6.7 USDA Feeder Cattle Standards

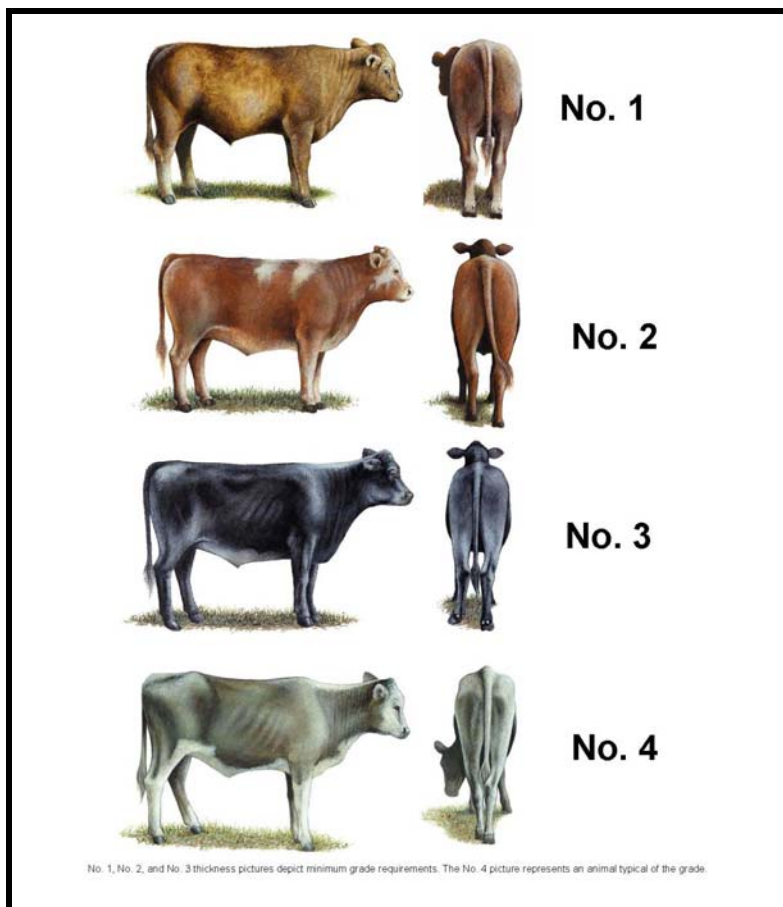
USA has a national uniform system of description for feeder cattle that includes a description of muscling. This effectively describes condition score. The system is used for market reporting and for aggregating of small lots at selling centres, to increase buyer competition.

The system is specifically for feeder cattle (young growing cattle under 30 months of age suitable to enter feedlots) and includes other criteria for predicting final weight and carcass grade.

There are five scores – four scores for “thrifty” cattle and a fifth for “unthrifty” (i.e. very poor or diseased animals).

Apart from Australia’s AuctionsPlus (CALM) description system, this is the only well-described and illustrated system that is specifically designed for market description of store cattle.

Figure 3: Muscle thickness from USDA Feed Cattle Standards



#### PRO

- Designed for young growing cattle
- Good descriptions, illustrations available
- Accounts for muscling differences

#### CON

- Scores are reversed compared to all other systems
- Does not specifically describe condition but is strongly related to it
- Not as good for mature cattle, cows or Bos indicus types
- Based on US feedlot industry requirements
- Not known in Australia
- Need conversion for HS model

### 6.8 AuctionsPlus (formerly CALM) store cattle description

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Australia pioneered sale-by-description, and developed the AUS-MEAT livestock language to link to carcass specifications. This language, based on subcutaneous fat depth at the P8 (rump) site, proved inadequate to fully describe the condition of store cattle for potential buyers. They were more familiar with an informal set of descriptions such as “store” and “forward store”. These descriptions were not clearly defined.

Although mainly developed for slaughter cattle, store cattle make up a major segment of the sale-by-description market.

To help bridge this gap, CALM included some optional description criteria for store cattle. This was done by selecting the commonly used informal descriptions and giving them a tighter, although still subjective, definition.

Through training and accreditation of assessors nationally, the AuctionsPlus system has achieved considerable uniformity in description of condition of store cattle. There was never any attempt to define the categories any better with photographs, as all cattle are also described in the AUS-MEAT weight/fat classes.

The following description is an extract from the CALM Assessor Manual Cattle (3rd edition 1988), the same as is still used today by AuctionsPlus:

#### CONDITION

Fatness has been estimated in mm or fat score for the slaughter stock assessment. For store stock, condition score is also given to expand description. This is particularly to indicate strength to travel and expected time to fatten.

POOR: Very low condition, nil fat; bone structure really standing out. Dry harsh coat. Possible doubt re strength to travel, assessor to elaborate.

STORE: Low but strong condition, nil fat, bone structure clearly visible; dry coat, sufficient strength to travel reasonable distances.

FWD STORE: Nil to very light fat cover; bone structure just visible, little or no cleaning up in coat; some filling out of muscles; should travel well.

FRESH FWD STORE: Rising in condition/nutrition; very light fat cover; showing full muscle potential; cleaning up in coat.

The unwritten fifth category would be “prime or fat”



## Identifying condition scoring systems for the Australian livestock export industry

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### PRO

- Easy acceptance across industry
- Formalises “industry unofficial” language
- Used by AuctionsPlus to complement AUS-MEAT language

### CON

- Not very accurate -goalposts can vary around the country
- No objective standards
- Easy to assume knowledge of it (but not necessarily correctly)
- No pictures or diagrams
- Aimed at leaner (store) cattle only

### 7 Systems for Dairy cattle

Condition scoring is widely used by dairy farmers throughout the world. It is relatively easy to learn and is a consistent indicator of breeding and lactation performance. It is especially suitable in herds where cows vary in frame size.

A New Zealand study of body composition of 40 mature dairy cows (Gregory et al 1998) showed that as condition score rises, so does total body fat, but over the range of scores 1-3 (8 point scale) animals have a basal level of fatness which, according to the authors, corresponds to an “emaciated state”.

A previous British study (Butler-Hogg et al 1985) showed that of the main fat depots, the subcutaneous (surface) fat changes more than the internal fat depots as cows gain or lose condition.

#### 7.1 Importance of condition scoring in the live export trade

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Dairy cattle are sourced directly from farmers and generally undergo an extensive period of health testing and inspection by veterinarians on an individual animal basis before being accepted for export.

It is unlikely that unfit animals (either emaciated or overfat) would be selected for export so there is a very low need to devote time to developing any specialised descriptive language or training to address welfare concerns related to dairy cattle in extremes of condition.

Currently there is no uniform system used to describe condition although it is an important part of the buyer's requirement. There is also no uniform method used by buyers from various countries. These buyers have their own selection criteria and animals are accepted or rejected on that criterion. Those in the live export industry use a range of informal descriptions similar to those used for beef cattle (e.g. store, forward store,) and these are said to be working well.

Exporters of dairy cattle are required to undertake a risk assessment using the Heat Stress model. This requires input of condition scores on a 1-5 basis, so irrespective of the system used to describe condition of dairy cattle in other contexts the scores are currently required on a 1-5 basis.

#### 7.2 Overview of systems available to describe condition

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Dairy farmers, more than other livestock producers, understand and use condition of their cows to monitor management. There are a number of systems in common use around the world.

Many countries have systems that are similar in many respects however the exact method of scoring, and the emphasis placed on particular features to differentiate between animals of differing body condition scores vary slightly.

A recent comparison of the various systems (Roche et al 2004) found a close correlation between the systems in Ireland, Australia, United States and New Zealand.

In Britain, Ireland and the United States a 5 score system is commonly used to determine body condition score (BCS). In Australia the “Condition Magician” system has 8 body condition scores while in New Zealand the commonly used system has a 10 body condition scores.

## Identifying condition scoring systems for the Australian livestock export industry

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There is a wide variety of extension material available and accessible on the web explaining the various systems from Canada (e.g. Rodenburg, 1996, Ontario, included here), the UK (e.g. DEFRA 2001, included here), and USA (e.g. Babcock Institute, Wisconsin)

### 7.3 “Condition Magician” – 1-8 system, Australia

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In Australia, the dairy production industry mainly uses an 8-score system known as “Condition Magician”. The basic system was described by David Earle in 1970s but was revised and re-published in Victoria (Robins et al 2002) as “Condition Magician”, part of the “Target 10” dairy extension program.

It is supported by an excellent practical pocket-sized booklet which is readily available. Its feature is clear digitally enhanced photographs for both Holstein and Jersey breeds, and clear diagrams that specifically describe the critical differences between scores.

Unfortunately, although the scale is 1-8, it only describes scores 3-6 in detail as this is the range over which dairy cows would normally be managed on farm. The booklet’s introduction uses the following words to justify its omission of explanation of the extreme scores:

“Cows in body condition score less than 3 are very thin and are either severely undernourished or suffering disease

Cows in body condition score greater than 6 are over fat and are at risk of suffering from a variety of metabolic diseases after calving.”

#### PRO

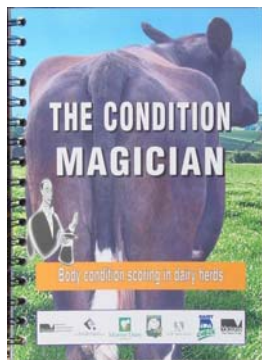
- Well known and understood by producers.
- Good, modern teaching material including photos available
- Recently updated and supported by industry for improving herd management & production
- Would be suitable for describing buyer requirements in the normal (mid) range of condition scores

#### CON

- Focuses only on mid-range scores – the extremes are specifically required for the live export industry
- Photos/descriptions use adult cows in production – not heifers which are our main live exports
- Not used in all states
- Not generally understood by agents/traders or customers
- Would require conversion to 1-5 for use in the Heat Stress risk assessment model

## Identifying condition scoring systems for the Australian livestock export industry

Figure 4: The Condition Magician Pocketbook



The following extracts (Figures 5a and 5b) are from the pocket-sized handbook. The early sections of the handbook contain these excellent diagrams of the distinguishing features, the remainder includes photographs and explanation of scores 3-6 for Holstein and Jersey cows.

Figures 5a and 5b: Extracts from "The Condition Magician", Robins et al 2002

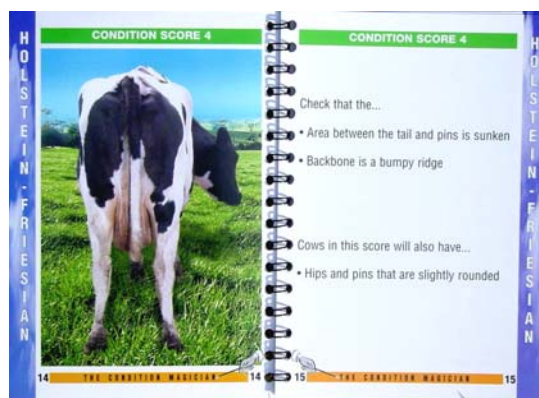
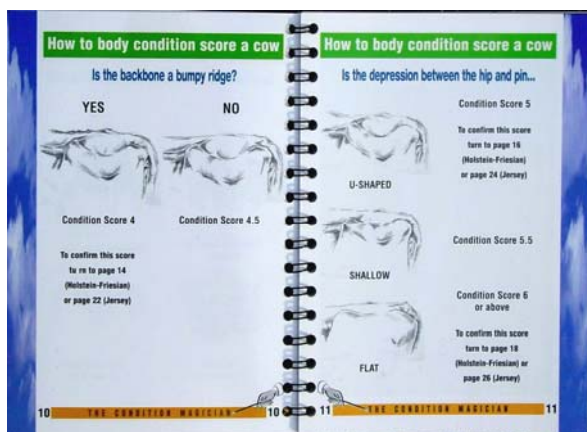


Figure 5b: Condition score

### 8.4 Canadian 1-5 system (Ontario)

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This simple system is one of several similar systems available and used in Canada. Its feature is the photographs taken from three different angles to clearly highlight development of fatty tissue over the side, back and loin.

#### PRO




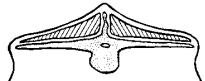



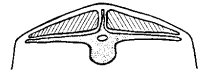


- Simple 1-5 system
- Very good fact sheet with concise diagrams
- Excellent photographs of different BCS
- Used within the Canadian dairy industry
- Fits 1-5 scores for Heat Stress risk assessment model
- Relates easily to the current informal system used by exporters.

#### CON

- Not currently widely in use in Australia.
- Used by some consultants in the dairy industry

## Identifying condition scoring systems for the Australian livestock export industry

Table 7: Canadian 1-5 System (Ontario)

Score			Description
1 Emaciated			The ends of the short ribs are sharp to the touch and together give a prominent shelf-like appearance to the loin. The individual vertebrae (spinous processes) of the backbone are prominent. The hook and pin bones are sharply defined. The anal area has receded and the vulva appears prominent
2 Thin			The ends of the short ribs can be felt but they and the individual vertebrae are less prominent. The short ribs do not form as obvious an overhang or shelf effect. The hook and pin bones are prominent but the depression of the thurl region between them is less severe. The area around the anus is less sunken and the vulva less prominent.
3 Average			The short ribs can be felt by applying slight pressure. The shelflike appearance of these small bones is gone. The backbone is a rounded ridge and hook and pin bones are round and smoothed over. The anal area is filled out but there is no evidence of fat deposit.
4 Heavy			Individual short ribs can only be felt when firm pressure is applied. Together they are rounded over with no shelf effect. The ridge of the backbone is flattening over the span between the hook bones over the backbone is flat. The area around the pin bones is beginning to show patches of fat deposit
5			The bone structure of the topline, hook, pin bones and short ribs is not visible. Fat deposits around the tailbone and over the ribs are obvious. The thighs curve out, the brisket and flanks are heavy and the chine very round.

Source: Rodenberg 1992. Body condition scoring of dairy cattle

### 7.5 UK DEFRA 1-5 system for dairy cattle

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The UK Department of Environment, Food and Rural Affairs (DEFRA) has published a 12-page description of the 1-5 scoring system used across the UK (DEFRA 2001). Like other systems for describing dairy cows, it concentrates on assessing the loin and hindquarter of the cow and is designed for use mainly over the middle range of scores for fine-tuning of feeding management.

The publication is available in pdf format on the DEFRA web site and contains good pictures, including pictures for score 2.5, but there are no pictures for Score 5.

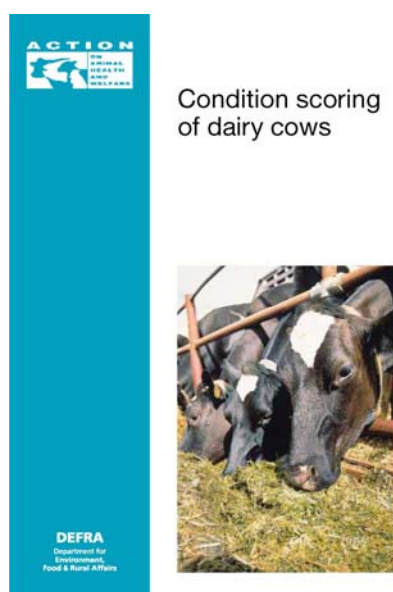
#### PRO:

- Simple, 1-5 system
- Good booklet with pictures and explanations
- Fits 1-5 for Heat Stress risk assessment model
- Relates easily to the current informal system used by exporters.

#### CON:











- Not used in Australia
- Designed for mature cows, not heifers

Figure 6: Condition scoring for dairy cows –DEFRA



## Identifying condition scoring systems for the Australian livestock export industry

Table 8: UK (DEFRA) 1-5 system for dairy cows

Score Condition	Visual Guide		Detailed Description
	Tail Head	Loin - Spine	
<b>1</b> Poor			Tail head; deep cavity with no fatty tissue under skin. Skin fairly supple but coat condition often rough. Loin – spine; prominent and horizontal processes sharp
<b>2</b> Moderate			Tail head; shallow cavity but pin bones prominent; some fat under skin. Skin supple. Loin; horizontal processes can be identified individually with ends rounded.
<b>2.5</b> Moderate to good			
<b>3</b> Good			Tail head; fat cover over whole area and skin smooth but pelvis can be felt. Loin; end of horizontal process can only be felt with pressure – only slight depression in loin.
<b>4</b> Fat			Tail head; completely filled and folds and patches of fat evident. Loin; cannot feel processes and will have completely rounded appearance.
<b>5</b> Grossly fat			Tail head; buried in fatty tissue, pelvis impalpable even with firm pressure

Source: Condition scoring of dairy cows, DEFRA 2001



## Identifying condition scoring systems for the Australian livestock export industry

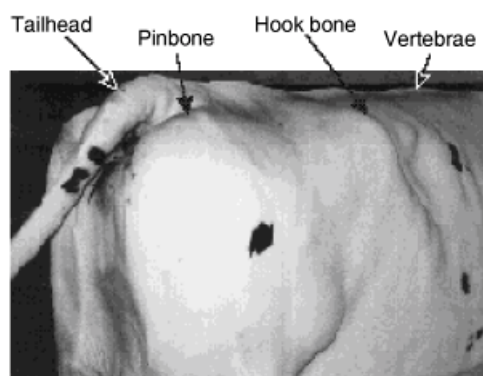
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### 7.6 US 1-5 system for dairy cows (Babcock Institute)

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This is essentially the same 1-5 score system as used in other countries but has a different set of diagrams, mainly for use in helping identify the key reference points for manual assessment and the distinguishing features (Wattiaux 1995).

Figure 7: Identification of some body parts used to assign body condition scores (from Wattiaux 1995)



#### PRO

- Simple 1-5 system
- Good diagrams explanations for training
- Fits 1-5 for Heat Stress risk assessment model
- Relates easily to the current informal system used by exporters.

#### CON

- Not used in Australia
- Designed for mature cows, not heifers
- Does not come with a complete set of photographs.

## Identifying condition scoring systems for the Australian livestock export industry

Table 9: Body condition scoring chart for Holstein dairy cows


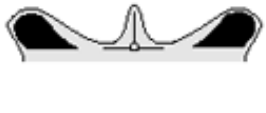























Body Condition Score	Vertebrae at the middle of the back	Rear view (cross-section) of the hook bones	Side view of the line between the hook and pinbones	Cavity between tailhead and pinbone	
				Rear view	Angled view
<b>1</b> Severe under-conditioning					
<b>2</b> Frame obvious					
<b>3</b> Frame and covering well balanced					
<b>4</b> Frame not as visible as covering					
<b>5</b> Severe over-conditioning					

Table (from Wattiaux 1995): Body condition scores (Adapted from A.J. Edmondson, I.J. Lean, C.O. Weaver, T. Farver and G. Webster. 1989. A body condition scoring chart for Holstein dairy cows. J. Dairy Sci. 72: 68-78.).

### 8 Buffaloes

Only two systems were found describing buffaloes, although there are probably others in existence. Both have been directly adapted from similar systems for beef cattle.

Currently there is no uniform system used in Australia to describe condition although it is an important part of the buyer's requirement. There is also no uniform method used by buyers from various countries.

Buyers of store animals for further fattening tend to want lean animals – the leaner the better.

Those in the live export industry use a range of informal descriptions similar to those used for beef cattle (e.g. store, forward store, backward store) and these are said to be working fine.

Systems available to describe condition

The two systems identified were the 1-8 description system being used in Northern Territory research (Barry Lemcke, unpublished) and a Sri Lankan 1-5 system.

#### 8.1 NT research 1-8 system for Buffaloes

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In Australia, Mr Barry Lemcke from NT Department of Business, Industry and Resource Development (NT) Pastoral Division, Darwin, is the industry's leading researcher. In his own work with buffalo he uses a 1-8 system he developed himself, based on the beef cattle system used by Queensland beef researchers. This in turn was a 9-step system modified from one recommended by the National Beef Production Performance Scheme, probably originating from Herd & Sprott (1986).

The NT buffalo condition scoring system has not been documented publicly but the NT Buffalo Industry Council agrees there is a need to take suitable photographs and publish a condition scoring system.

The following descriptions are used in his NT research but the system is not available publicly and does not have photographs or diagrams.

## Identifying condition scoring systems for the Australian livestock export industry

Table 10: NT Buffalo Condition Scoring System (B. Lemcke, unpublished)

Cond. Score	Description	Nominal Fat Cover P8 and Rib in Adult	Loin Muscle/ Rump muscle	Spinal Processes/ Ribs	Hips and Pinbones
1	Emaciated	0	Muscle wasted extremely concave	All spinal processes and ribs highly visible	Extremely Pointed
2	Poor	0	Deeply Concave	All spinal processes and ribs prominent	Pointed
3	Backward Store	0	Mildly concave	Most ribs visible	Pointed
4	Store	0-1mm	Straight-mildly Concave	Short ribs still felt, 6-8 ribs visible	Some Cover
5	Forward Store	2-4mm	Straight-slightly convex	Short Ribs hard to feel, 3-4 ribs still visible	Covered
6	Good/Prime	5-12mm	More Convex	Smooth, last 1-2 ribs possibly still visible	Rounded
7	Fat	12-20mm	Well rounded, Flat across back and rump	Sacral ridge covered, no ribs seen	Well rounded
8	Overfat/Obese	>20mm	Very Well Rounded groove above vertical spinal processes	Sacral ridge well covered	Lumps around and above tail head

### PRO:

- Good, easy to follow descriptions
- Easy to distinguish score 1 from score 2
- Known and used by Australian research
- Support from Buffalo industry

### CON:

- Not officially published
- No photographs or training material available
- Not known or used by the trade
- Perception by trade that 8 scores is unnecessarily detailed
- Would need conversion for Heat Stress risk assessment model

## Identifying condition scoring systems for the Australian livestock export industry

### 8.2 Sri Lankan 1-5 system

Our research identified a Sri Lankan publication with an excellent 1-5 description system for water buffalo. It has been produced in parallel with a simple 1-5 system for dairy cattle. Both were produced as part of a world aid program designed to improve the ability of local farmers to adapt to intensification of livestock farming.

The program included a significant input of resources into training and support of local extension specialists to teach local farmers the technique and how to use it to monitor nutrition. There is a comprehensive set of training material available.

The following is a photocopied extract from the manual produced at the University of Peradiniya for training extension staff (Abeygunawardena et al. 1999). A fuller discussion of the system and available material will be included in the final report.











#### PRO:

- Simple, 1-5 scores
- Easy to teach to stock owners, exporters, agents, traders
- Good black & white photographs and teaching material available (in Sri Lanka)
- Scores suit Heat Stress risk assessment model

#### CON:

- Scores are not used or known in the Australian industry
- Not detailed enough for research
- Industry favours 1-8 system

Figure 8. Sri Lankan System

Table 1: The Body Condition Scale for Buffaloes			
Score	Posterior View	Lateral View	Visual and Palpable Features
1			An emaciated animal. Cavities on the side of the tail-head are very pronounced; borders of pin bones very sharp; individual bones of spine and ribs visible; ends of short ribs very pronounced and can be palpated; no fat layer under the skin.
2			A thin animal. Cavities are less pronounced; borders of the pin bones are sharp; individual bones of spine are visible; ends of short ribs less sharp; can be palpated; thin layer of fat under the skin.
3			A lean and healthy animal. Cavities are not present; borders of pin bones are rounded; individual bones of spine are not visible and muscles are detectable over the bones; ends of short ribs can still be palpated with firm pressure; a medium layer of fat under the skin.
4			A fat animal. Cavities are filled out; borders of pin bones are rounded; individual bones of spine are not visible and there is musculature over the bones; ends of short ribs can only be palpated with strong pressure as they are covered with a thick layer of fat under the skin.
5			An obese animal. Buffaloes or cattle of this condition are usually not found in village farms. Cavities are not present; borders of pin bones are very rounded; individual bones of spine are not visible and there is abundant muscle and fat over the bones; ends of short ribs are not palpable as they are covered with a very thick layer of fat.

## 9 Systems for Sheep

### 9.1 Overview of systems available for sheep and lambs

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Australia is a world leader in live assessment of sheep for the purpose of describing carcass traits, but there are a number of body condition scoring systems being used in other countries. Canada, EU member states and the United States of America predominantly use a subjective 5 point system that is quite similar to the Australian AUS-MEAT system.

Assessment techniques (palpation of 'short rib' regions) and associated carcass grading differ from Australian systems. New Zealand has significantly 'tighter' fat depth ranges for specified carcass weight categories based on palpation of the GR site over the 12th rib (see below).

Information about systems commonly used in countries actively competing against Australia within the live sheep trade has been difficult to find. Major competitors (North African and Middle Eastern countries) mainly supply hair and/or fat-tail breed sheep and lambs. Many of these breeds have recently been introduced into Australia to capitalise on premiums and consumer demand for traditional fat-tail breeds in the Middle East.

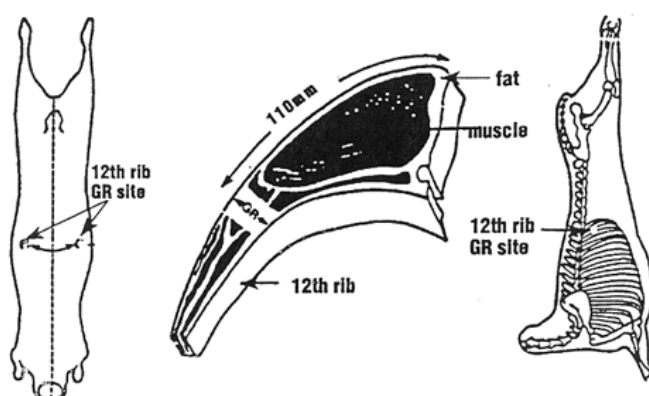
The AUS-MEAT scoring system may need to be addressed and/or modified for fat-tail breeds. Because they deposit their surplus fat in the rump and tail regions, assessment over the long ribs does not give a true indication of their body reserves. They are also known as "hardy" breeds and may show greater fitness at lower levels of condition. It remains to be seen however if breeds such as the Awassi, Karakul, Damara and (to a lesser degree) the Afrikaner and Van Rooy currently in Australia will become more available for live export.

### 9.2 Manual palpation - the GR measurement site

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Australia and New Zealand use description systems primarily aimed at describing the meat value of the carcass. This is done in the live animal by estimating the tissue depth at the GR measurement site, and in the carcass by measuring the actual depth on the carcass (see Figure 8).

Figure 9: The GR fat measurement site



## Identifying condition scoring systems for the Australian livestock export industry

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Meat buyers at the saleyards frequently use tail/rump palpation by 'grabbing' a docked tail and 'feeling' the rump area on sheep and lambs. This has no significant relationship with carcass traits. As the GR site is the standard carcass fat measurement site throughout Australia, the use of this technique to estimate condition score is not recommended or justified.

Tail/rump palpation is also unlikely to have a role in estimating tail weight and dressing percent yield within fat-tail breeds because it is difficult to achieve consistent standards of competence.

### 9.3 Objective alternatives to GR Site Palpation

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There are several objective alternatives to GR site condition scoring available in Australia and abroad. Unfortunately many of these are not practical for industry use because of low accuracy (in terms of their relationship to GR site carcass measurement accuracies), cost of equipment and the rate of throughput when assessing individual animals.

Real Time Ultrasound technology is widely used within stud operations to identify genetically superior animals for growth rate, fat deposition and muscling (when used in conjunction with accurate breeding, management and environmental data). Soft tissue/fat depth may be obtained at the GR and 'C' site (approximately 25mm from mid line directly over eye muscle at 12/13th rib). The 'C' site is regarded as being the best indicator for carcass fatness but is a difficult site to accurately estimate if palpating.

Measurement of eye muscle depth using real time ultrasound has enabled superior seedstock (sires and dams) to be selected within and between stud and breed types for muscling and ultimately retail meat yield.

Delphi fat measurement Now superseded by real time ultrasound the Delphi allowed operators to measure and record differences in distances between fat and tissue/muscle layers. Although 'C' and GR sites can be accurately measured muscle depth cannot.

CT (Computer Tomography) Scanning measurements are extremely accurate in determining the carcass lean and fat contents of sheep and lambs. Conformation traits, muscularity and muscle and fat distribution may also be measured.

The technology, although accurate, is not as practical as real time ultrasound, but for evaluating breeding animals, it may increase genetic progress by as much as 50% per annum. It may have a role in future seedstock selection.

### 9.4 Canadian 1-5 system for sheep and lambs

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Canada uses a technique similar to that used and developed in the U.K where a condition score from 1 to 5 is assigned, based on soft tissue depth. The scoring method relies on manual palpation of the loin area (long and short ribs) with additional assessment of the dock (tail), shoulder and chest to determine carcass 'grade' at slaughter.

Prominence of spinous (vertical) and transverse (horizontal) processes of vertebrae, fat and muscle depths are assessed during the condition scoring process.

The Alberta government has produced an excellent CD containing video, animated figures, diagrams and detailed support material for their 1-5 condition scoring system. The CD package

## Identifying condition scoring systems for the Australian livestock export industry

(What's the score? 2004) covers six domestic species of livestock, including sheep, beef and dairy cattle.







Table 11: Canadian 1-5 system for sheep. Source: Anon (2005a)

### PRO

- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock
- Excellent multimedia training material available on CD

### CON

- Scores cannot be visually assessed accurately if wool length is greater than 25mm
- Scores not related directly to carcase fat depth
- Scores may not adequately describe fat tail breeds

Score		Description	
1		Spine sharp, back muscle shallow,	Lean
2		Spine sharp, back muscle full, no fat	
3		Spine can be felt, back muscle full, some fat cover	Good Condition
4		Spine barely felt, muscle very full, thick fat cover	Fat
5		Spine impossible to feel, very thick fat cover, fat deposits over tail and rump	

## 9.5 US 1-5 system for sheep and lambs

The United States predominantly use systems based on a scale of 1 (emaciated) to 5 (obese). Variations on the system include a 0 to 5 and/or the use of 'half' scores between 2 and 4, effectively extending the condition scoring scale to include upwards of 8 descriptors.

Muscle and fat deposition over and around loin area vertebrae and palpation of vertebrae protrusions are used during live animal assessment.

The five condition scores are:

*Condition Score 1:* Very thin Spinous process very prominent and sharp; transverse process also easily felt and sharp; fingers can be pushed easily under ends; loin muscle shallow, concave; no fat over muscle, under skin.

*Condition Score 2:* Thin Spinous process prominent but less sharp; transverse process smoother on ends; fingers can be pushed with little pressure under ends; loin muscle more depth and fullness; no discernible fat covering.



## Identifying condition scoring systems for the Australian livestock export industry

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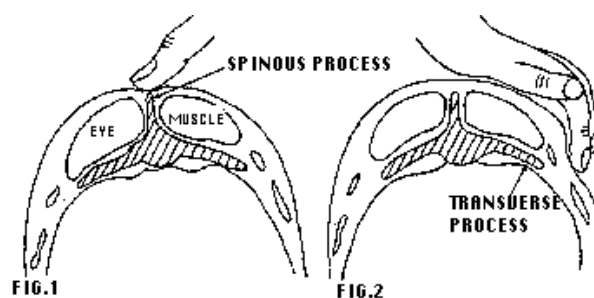
*Condition Score 3:* Average Spinous process easily felt with finger pressure but smooth not sharp; transverse process smooth and fat covered; firm pressure needed to push fingers under edge; loin muscle full with cover of .15-.20 inches of fat.

*Condition Score 4:* Fat Spinous process can be felt with considerable finger pressure; transverse process cannot be felt, ends covered with fat; loin muscle full with cover of .25 -.35 inches fat.

*Condition Score 5:* Very fat Spinous process cannot be felt; back broad with hollow; transverse process cannot be felt; loin very wide and thick over loin edge; evidence of fat around dock extending forward on rump. Fat covering over .4 inch over loin muscle, 1.0 inch or more over rib.

Source: Morrical, D and Hettel, G (2005)

Figure 10: Palpation over spinous processes



### PRO

- Requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock
- Conformation scores and frame size information assists with selection of animals for slaughter and market premiums.
- Photographs showing leg conformation scores

### CON

- Condition scores cannot be visually assessed accurately if wool length is greater than 25mm
- Scores not related directly to carcass fat depth
- Scores may not adequately describe fat tail breeds
- Fat depth is estimated above ribeye in live animal. It is difficult to determine fat thickness in low and high fat class categories on live animals.
- Conformation scores and frame sizes are subjective and require a high level of skill

### 9.6 EU systems for sheep and lambs

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Condition scoring of sheep and lambs within the EU (including the UK) is predominantly based on the palpation of spinal vertebrae in the lumbar (loin) region to determine fat coverage/depth.

Prior to slaughter fat depth at the 12<sup>th</sup> rib above the midpoint of the ribeye is assessed and used to predict yield grade. Carcase eye muscle depth may also be used to assign scores from 0 to 5 (although Score 0 is seldom used as it only applies to severely emaciated animals).

Fat classes 3 and 4 are frequently divided into low (L) or high (H) classifications in line with the S/EUROP Sheep Carcase classification grid used throughout cooperating countries uniformly since 1986. S/EUROP is a subjective system that categorises carcasses based on hindquarter conformation and fat class information.

#### PRO

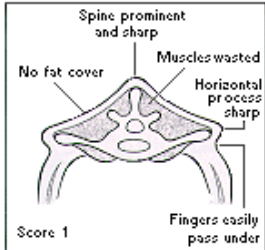
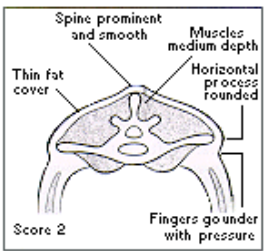
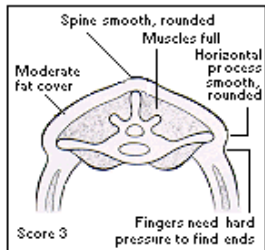
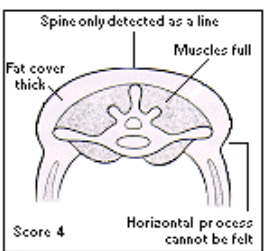
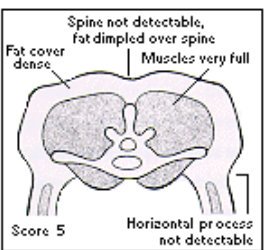
- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock

#### CON

- Condition scores cannot be visually assessed accurately if wool length is greater than 25mm
- Scores not related directly to carcase fat depth
- Scores may not adequately describe fat tail breeds
- Fat depth is estimated above ribeye in live animal. It is difficult to determine fat thickness in low and high fat class categories on live animals.
- Conformation scoring on live animal and carcase is subjective and requires high level of skill

## Identifying condition scoring systems for the Australian livestock export industry

Table 12: EU system for sheep and lambs (conformation scores)

<p><b>Score 1</b></p> <p>The vertical and horizontal processes are prominent and sharp. The fingers can be pushed easily below the horizontals and each process can be felt. The loin muscle is thin and with no fat cover</p>	 <p>Spine prominent and sharp No fat cover Muscles wasted Horizontal process sharp Score 1 Fingers easily pass under</p>
<p><b>Score 2</b></p> <p>The vertical processes are prominent but smooth, individual processes being felt only as corrugations. The horizontal processes are smooth and rounded, but it is still possible to press the fingers under. The loin muscle is of moderate depth but with little fat cover.</p>	 <p>Spine prominent and smooth Thin fat cover Muscles medium depth Horizontal process rounded Score 2 Fingers go under with pressure</p>
<p><b>Score 3</b></p> <p>The vertical processes are smooth and rounded; the bone is only felt with pressure. The horizontal processes are also smooth and well covered; hard pressure with the fingers is needed to find the ends. The loin muscle is full, with a moderate fat cover.</p>	 <p>Spine smooth, rounded Moderate fat cover Muscles full Horizontal process smooth, rounded Score 3 Fingers need hard pressure to find ends</p>
<p><b>Score 4</b></p> <p>The vertical processes are only detectable as a line; the ends of the horizontal processes cannot be felt. The loin muscles are full and have a thick covering of fat.</p>	 <p>Spine only detectable as a line Fat cover thick Muscles full Score 4 Horizontal process cannot be felt</p>
<p><b>Score 5</b></p> <p>The vertical processes cannot be detected even with pressure; there is a dimple in the fat layers where the processes should be. The horizontal processes cannot be detected. The loin muscles are very full and covered with very thick fat</p>	 <p>Spine not detectable, fat dimpled over spine Fat cover dense Muscles very full Score 5 Horizontal process not detectable</p>

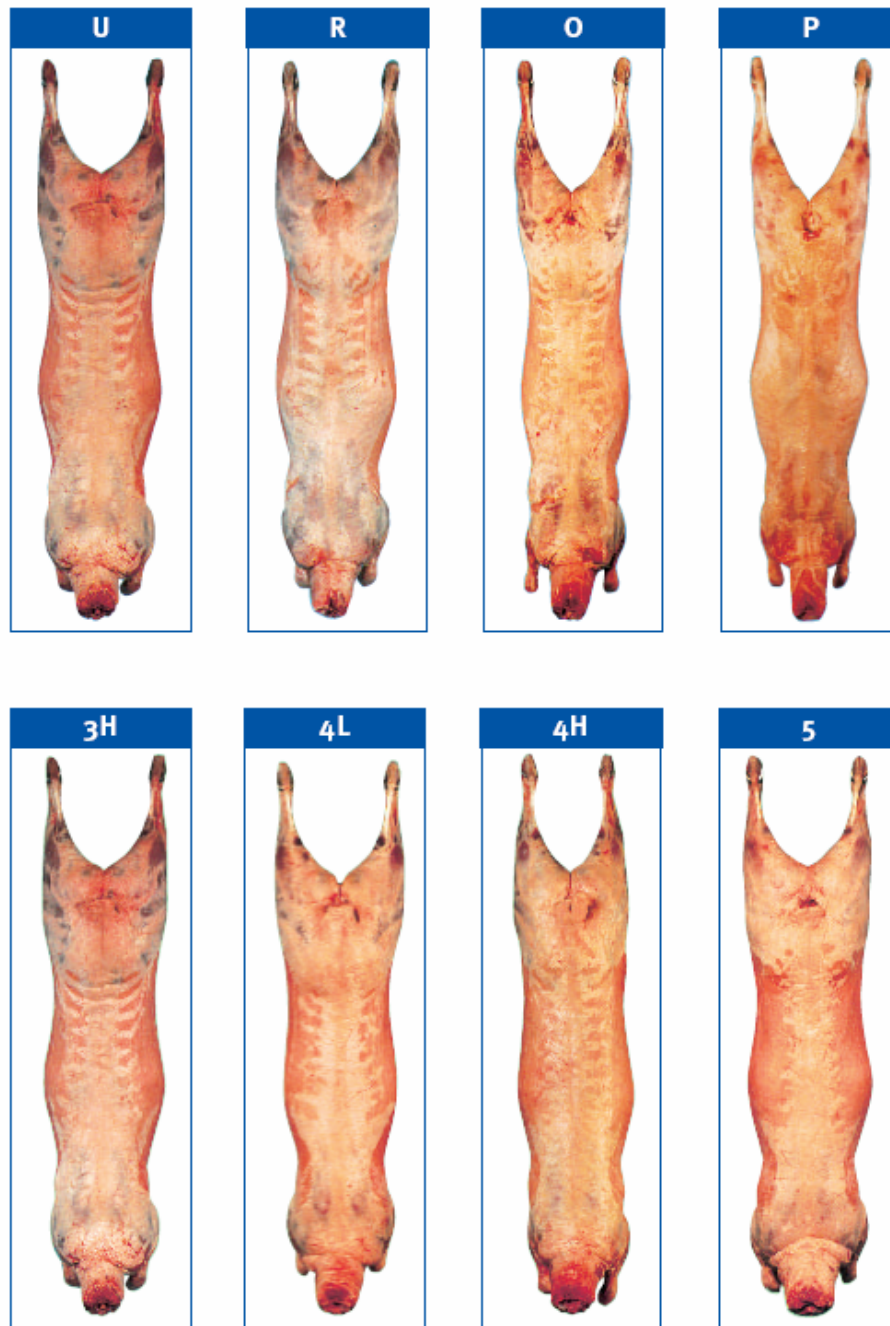
Source:

<http://www.defra.gov.uk/animalh/welfare/farmed/sheep/pb1875/score3.gif&imgrefurl=http://www.defra.gov.uk/animalh/welfare/farmed/sheep/pb1875/SHEEP7a.htm&h=147&w=154&sz=6&tbnid=vyy5M90G1xEJ:&tbnh=86&tbnw=90&hl=en&start=2&prev=/images%3Fq%3Dfat%2Bscore%2Bsheep%26hl%3Den%26lr%3D>

## Identifying condition scoring systems for the Australian livestock export industry

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Figure 11: EU conformation scores (fat scores)



Source Figure 9: [http://www.qmscotland.co.uk/analysis/downloads/planned\\_carcase\\_production.pdf](http://www.qmscotland.co.uk/analysis/downloads/planned_carcase_production.pdf)

### 9.7 New Zealand

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New Zealand has an outwardly complicated description grid for lamb and mutton. They are classified according to fat content (GR measurement) and muscling (low to medium fat classes only).

Stock are assessed through palpation at the 12/13<sup>th</sup> rib 110mm from the midline and assigned a series of symbols to describe fat depth. These include 'A' (devoid), 'Y' (up to and including 6 to 9mm depending on estimated carcass weight), 'P' (from 6 to 12mm depending on estimated carcass weight), 'T' (12-15mm), 'F' (over 15mm), 'C' (variable) and 'M' (none). Carcass weight estimates are assigned symbols A, L, M, X and H according to weight category.

#### PRO

- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock
- Linked to carcass description
- Widely used by all sectors and in all NZ official documents
- Provides objective producer feedback and an objective basis for establishing prices paid for sheepmeat purchased 'over the hooks' or direct to works
- Provides livestock buyers with an objective yardstick to compare their live animal assessment against
- Scores are objectively defined (GR site) and can be verified by GR site palpation, scanning or at slaughter through palpation, GR knife, Electronic probe and/or Video Image Analysis (VIAScan)

#### CON

- Fat scores cannot be visually assessed accurately if wool length is greater than 25mm
- Much too complicated and detailed for use in the live export trade
- Designed for carcass trading, not for live animal management
- No diagrams or photographs found to describe assessment of fat and muscling

# Identifying condition scoring systems for the Australian livestock export industry

Table 13: New Zealand system Source: NZMCA (2005)

Fat Classes		Weight Classes																														
		A	L <sup>1</sup>	M	X	H																										
EXPORT CARCASS CLASSES	<b>A</b> Lightweight and almost devoid of external fat	<table border="1"> <tr> <td colspan="5">None</td> </tr> <tr> <td colspan="5">Up to but not including 9.0kg</td> </tr> <tr> <td colspan="5">Less than 9.0kg</td> </tr> </table>					None					Up to but not including 9.0kg					Less than 9.0kg															
	None																															
	Up to but not including 9.0kg																															
Less than 9.0kg																																
<b>Y</b> Low fat content.	<table border="1"> <tr> <td rowspan="2">YL</td> <td>Up to and including 6mm</td> <td rowspan="2">YM</td> <td>Up to and including 7mm</td> <td rowspan="2">YX</td> <td>Up to and including 9mm</td> </tr> <tr> <td>9.0kg and up to but not including 13.5kg</td> <td>13.5kg and up to but not including 17.0kg</td> <td>17.0kg and over</td> </tr> <tr> <td colspan="2">9.0kg to 12.5kg</td> <td colspan="2">13.0kg to 16.0kg</td> <td colspan="2">16.5kg and over</td> </tr> <tr> <td colspan="2"></td> <td>YME</td> <td>Well muscled YM<sup>2</sup></td> <td>YXE</td> <td>Well muscled YX<sup>2</sup></td> </tr> </table>					YL	Up to and including 6mm	YM	Up to and including 7mm	YX	Up to and including 9mm	9.0kg and up to but not including 13.5kg	13.5kg and up to but not including 17.0kg	17.0kg and over	9.0kg to 12.5kg		13.0kg to 16.0kg		16.5kg and over				YME	Well muscled YM <sup>2</sup>	YXE	Well muscled YX <sup>2</sup>						
YL	Up to and including 6mm	YM	Up to and including 7mm	YX	Up to and including 9mm																											
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		YME	Well muscled YM <sup>2</sup>	YXE	Well muscled YX <sup>2</sup>																											
<b>P</b> Medium fat content.	<table border="1"> <tr> <td rowspan="2">PL</td> <td><sup>1</sup> Over 6mm, up to and including 12mm</td> <td rowspan="2">PM</td> <td><sup>2</sup> Over 7mm, up to and including 12mm</td> <td rowspan="2">PX</td> <td>Over 9mm, up to and including 12mm</td> </tr> <tr> <td>9.0kg and up to but not including 13.5kg</td> <td>13.5kg and up to but not including 17.0kg</td> <td>17.0kg and up to but not including 21.5kg</td> </tr> <tr> <td colspan="2">9.0kg to 12.5kg</td> <td colspan="2">13.0kg to 16.0kg</td> <td colspan="2">16.5kg to 20.0kg</td> </tr> <tr> <td colspan="2"></td> <td>PNE</td> <td>Well muscled PM<sup>2</sup></td> <td>PXE</td> <td>Well muscled PX<sup>2</sup></td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td>PHE</td> <td>Well muscled PH<sup>2</sup></td> </tr> </table>					PL	<sup>1</sup> Over 6mm, up to and including 12mm	PM	<sup>2</sup> Over 7mm, up to and including 12mm	PX	Over 9mm, up to and including 12mm	9.0kg and up to but not including 13.5kg	13.5kg and up to but not including 17.0kg	17.0kg and up to but not including 21.5kg	9.0kg to 12.5kg		13.0kg to 16.0kg		16.5kg to 20.0kg				PNE	Well muscled PM <sup>2</sup>	PXE	Well muscled PX <sup>2</sup>					PHE	Well muscled PH <sup>2</sup>
PL	<sup>1</sup> Over 6mm, up to and including 12mm	PM	<sup>2</sup> Over 7mm, up to and including 12mm	PX	Over 9mm, up to and including 12mm																											
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		PNE	Well muscled PM <sup>2</sup>	PXE	Well muscled PX <sup>2</sup>																											
				PHE	Well muscled PH <sup>2</sup>																											
EXPORT PROCESSING CLASSES <small>(not exported in carcass form except under dispensation)</small>	<b>T</b> High fat content. Cut and trimmed of excessive fat prior to export.	<table border="1"> <tr> <td rowspan="2">TL</td> <td>Over 12mm, up to and including 15mm</td> <td rowspan="2">TM</td> <td>Over 12mm, up to and including 15mm</td> </tr> <tr> <td>9.0kg and up to but not including 13.5kg</td> <td>13.5kg and up to but not including 17.0kg</td> </tr> </table>			TL	Over 12mm, up to and including 15mm	TM	Over 12mm, up to and including 15mm	9.0kg and up to but not including 13.5kg	13.5kg and up to but not including 17.0kg	<table border="1"> <tr> <td rowspan="2">TH</td> <td>Over 12mm, up to and including 15mm</td> </tr> <tr> <td>17.0kg and over</td> </tr> </table>		TH	Over 12mm, up to and including 15mm	17.0kg and over																	
	TL	Over 12mm, up to and including 15mm	TM	Over 12mm, up to and including 15mm																												
		9.0kg and up to but not including 13.5kg		13.5kg and up to but not including 17.0kg																												
	TH	Over 12mm, up to and including 15mm																														
17.0kg and over																																
<b>F</b> Excessive fat content. Cut and trimmed of excessive fat prior to export.	<table border="1"> <tr> <td rowspan="2">FL</td> <td>Over 15mm</td> <td rowspan="2">FM</td> <td>Over 15mm</td> </tr> <tr> <td>9.0kg and up to but not including 13.5kg</td> <td>13.5kg and up to but not including 17.0kg</td> </tr> </table>			FL	Over 15mm	FM	Over 15mm	9.0kg and up to but not including 13.5kg	13.5kg and up to but not including 17.0kg	<table border="1"> <tr> <td rowspan="2">FH</td> <td>Over 15mm</td> </tr> <tr> <td>17.0kg and over</td> </tr> </table>		FH	Over 15mm	17.0kg and over																		
FL	Over 15mm	FM	Over 15mm																													
	9.0kg and up to but not including 13.5kg		13.5kg and up to but not including 17.0kg																													
FH	Over 15mm																															
	17.0kg and over																															
<b>C</b> Not eligible for export due to trimming. Intact carcasses may be exported. Has at least three of the four hind primal cuts (legs and short loins) acceptable as export cuts.	<table border="1"> <tr> <td rowspan="2">CL</td> <td>Up to and including 12mm</td> <td rowspan="2">CM</td> <td>Up to and including 12mm</td> </tr> <tr> <td>9.0kg and up to but not including 13.5kg</td> <td>13.5kg and up to but not including 17.0kg</td> </tr> </table>			CL	Up to and including 12mm	CM	Up to and including 12mm	9.0kg and up to but not including 13.5kg	13.5kg and up to but not including 17.0kg	<table border="1"> <tr> <td rowspan="2">CH</td> <td>Up to and including 12mm</td> </tr> <tr> <td>17.0kg and over</td> </tr> </table>		CH	Up to and including 12mm	17.0kg and over																		
CL	Up to and including 12mm	CM	Up to and including 12mm																													
	9.0kg and up to but not including 13.5kg		13.5kg and up to but not including 17.0kg																													
CH	Up to and including 12mm																															
	17.0kg and over																															
<b>M</b> (Manufacturing)	Includes carcasses which: <ul style="list-style-type: none"> <li>* are too thin for export in carcass form or as primal cuts</li> <li>* are damaged but fail to meet the other criteria</li> </ul>																															

- GR – A fat content assessment based on measurement of total tissue depth over the 12th rib at a point 11cm from the midline of the carcass.
- Hot weight – the basis on which New Zealand producers are paid. This measurement is used only within New Zealand.
- Export weight, or cold weight – the basis on which New Zealand export carcasses are sold.
- Muscling class.

Beta Lamb is a specialised class. A very young milked lamb weighing less than 7.5kg. Moderately to well muscled with an even but not excessive fat cover.

Excessively yellow coloured carcasses are not eligible for export in carcass form cut form or boneless form.

<sup>1</sup> Devoid of fat A type carcasses that are in the L weight range are classed as restricted YL.

<sup>2</sup> "Leggy" carcasses from the PL and PM classes are classed as restricted PL and PM. Producers receive the same payment for "leggy" carcasses and no separate identification appears on the killing sheet.

<sup>3</sup> See Muscling Class.

Source: NZMCA (2005)

### 9.8 AUS–MEAT 1-5 Fat scores for Sheep

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The Australian sheepmeat industry uses a 1 to 5 point soft tissue/fat scoring system to describe body condition in sheep and lambs. The depth of tissue over the GR site (see Figure 12) is estimated in live sheep or measured on the carcass.

Tissue over the GR site includes a small amount of muscle, and as fat is deposited, it is readily felt building up as soft padding over the hard bone of the 12<sup>th</sup> rib. The differences between animals are mainly due to fat.

As in beef cattle, fat scores were developed as part of the AUS-MEAT language to link to live animal condition to carcass fat depth specification, calibrated with typical slaughter animals. Technically, the AUS-MEAT description is a fat score rather than a condition score.

In practice, difference between fat score and condition score in most sheep is very small. In fact, Western Australia still uses condition scoring over the loin, rather than the GR site, to link directly to the carcass language. A study is planned by MLA in 2005 to compare the actual differences and their significance in today's sheep population.

Soft tissue/fat depth measured at the GR site has consistently proven to be a primary determinant of saleable meat yield. Muscling has not been shown to influence yield to the same degree as carcass fat deposition.

Improvements in selection for genetically superior sires and dams (between and within breeds) and the introduction of heavily muscled breeds may however see the future need for refinement of condition scoring nationally to include a muscle/conformation grade.

The AUS-MEAT system describes GR site fat scores in 5mm ranges (see Table 14)

National Sheep and Lamb Appraisal Competency Standards (RUA AG3400W A "Select Sheep for Market") require participants to achieve competency in both Fat Score (1-5) and GR fat (tissue depth at GR site in mm) estimates.

#### PRO

- Australia's official national description language for sheep and lambs
- Linked to carcass meat description
- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock
- Widely used by all sectors and in all official documents
- Used as the basis for National Livestock Reporting Service reports for sheepmeat
- Provides an objective basis for producer feedback and pricing sheepmeat purchased 'over the hooks', direct to works or through AuctionPlus
- Provides livestock buyers with objective feedback on their live animal assessment
- Accredited training and monitoring is available

## Identifying condition scoring systems for the Australian livestock export industry

- Scores are objectively defined and can be verified by GR site palpation, scanning or at slaughter through palpation, GR knife, Electronic probe and/or Video Image Analysis (VIAScan)
- Fat scores 1-5 will directly fit the Heat Stress risk assessment model in most sheep breeds

### CON

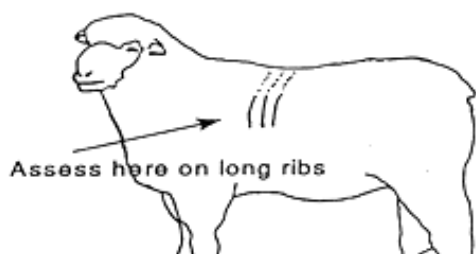
- Fat scores cannot be visually assessed accurately if wool length is greater than 25mm
- Fat scores may not adequately describe fat tail breeds
- Describes soft tissue/fat depth only – additional information relating to muscle score and depth and frame size may be needed to adequately describe state of nutrition

Table 14: Manual assessment criteria and GR tissue depth for each fat score

Fat Score	GR tissue depth (mm)	Manual assessment over the long ribs
1	0-5	Individual ribs felt very easily; cannot feel any tissue over the ribs.
2	6-10	Individual ribs easily felt, but some tissue present.
3	11-15	Individual ribs can still be felt, but can feel tissue.
4	16-20	Can just feel ribs and fluid movement of tissue.
5	>20	Ribs barely felt; tissue movement very fluid.

NB. Generally, at the same weight, ewe lambs will be fatter than wether lambs, which will in turn be fatter than ram lambs. Source: AUS-MEAT Sheepmeat/goat language 1994

Figure 12: Palpation at the GR site over the long ribs



Source: White and Holst (2001)



### 10 Goats

#### 10.1 International situation

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The number of live goats exported annually has varied from 13,776 (1995) to 136,125 in 2002 (MLA 2004). More than 1 million live goats have been traded from Australia since our first shipment, to the Middle East, in 1982/83 (RIRDC 2002).

Although relatively few goats are exported by air there has been a significant increase in air freighted dairy and boer goats for breeding purposes in recent years.

Australian live goat exports were valued at A\$8.6 million in 2003/04 with most shipped to Malaysia, Singapore and the Middle East (MLA 2004).

#### 10.2 Overview of systems available for goats

---

Within Australia, the AUS-MEAT Goat Meat language is used by purchasers of live goats, carcasses and other goat meat products. This language adopted the same method of description used for sheep, based on carcass weight and fat score classes 1-5 defined by tissue depth at the GR measurement site (Greenwood et al 1993).

There are a number of systems used to describe body condition score of goats internationally. Most use a subjective 5 point system similar to the current Australian system and/or broad descriptors for body condition such as thin/poor, good/moderate and/or fat/obese.

Some systems use an extended condition score scale of 1 to 8 or 9 based on cattle condition score principles. Most systems recommended palpation of the loin and long ribs with additional assessments made on the tail, brisket and, in one case, girth width.

Little to no information could be found for other condition scoring systems world wide. Most appear to be based on the commonly used 1 to 5 grading system commonly used in sheep or lamb condition scoring with minor variations with respect to palpation site(s) and description of fat and muscling. South Africa for example use a 1 to 5 sheep condition scoring system, modifying it for goat use by 'adding half a score' to each grade on the basis that goats preferentially store fat intra-abdominally and not over the lower back (Vatta, 2001).

Several Mediterranean-based research projects (Delfa et al. 1995, Santucci et al.1991) found the sternal (brisket) region to be a better predictor than other sites for estimating relative fat deposition at all fat depot sites and for estimating carcass composition. Aumont et al (1993) contradicted the use of sternal scoring, finding body condition scoring to be the better predictor of total fat tissue when assessed either on the live animal or on the carcass.

#### 10.3 Canadian System for goats

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Two Canadian condition scoring systems were identified. A basic system, using palpation of short ribs, pin and hip bones defined condition scores as emaciated, very lean, lean, medium or fat. Catton (2002) has suggested the adoption of an improved condition scoring system with palpation of lumbar (loin) and sternal (brisket) regions plus a visual score. The latter system scores goats on a scale of 0 through 5, effectively a 6 point scale. The sternal condition is believed to better reflect the fat composition of a goat while the lumbar region reflects body protein/muscle development (Catton 2002).

## Identifying condition scoring systems for the Australian livestock export industry

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### PRO

- Skill is relatively easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock

### CON

- No objective benchmarks
- Cannot relate live animal measurements to potential slaughter value
- Suited more to dairy goat condition scoring
- Inadequate training material available (diagrams, photographs etc.)

## 10.4 US 1-5 system for goats

---

The system most widely used in the United States to describe goats is based on a scale of 1 to 5 with each score describing the degree of muscling and fat deposition over and around the loin vertebrae (Thompson and Meyer 2002). It is clearly described on the Langston University (Oklahoma) web site.

There are a number of other systems, less relevant for our needs, described in USA, including recommendations to measure brisket width (Meyers-Raybon 2004), visual scoring (Fredricks 2005) and a 1 to 9 point graduated scale (Luginbuhl and Poore 2005) where score values of 1 to 3 are described as 'thin', 4 to 6 as 'moderate' and 7 to 9 as 'fat' (see Appendix 1).

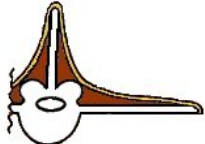
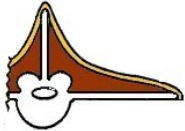

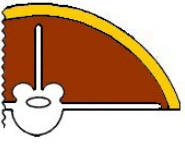
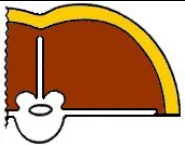
The 1 to 5 system is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region and long ribs. Vertical (spinous) and horizontal (transverse) vertebral protrusions are palpated in addition to the cover over the central spinal column as shown in Table 1. The techniques are the same as described for sheep by Thompson and Meyer (2002).

Half scores are generally used between condition scores 2 and 4, effectively expanding the system to include 7 descriptors. The intermediate half scores are deemed helpful when an animal's condition is not clear.

Haenlein (2002) also includes a sternal fat description in addition to the 1 to 5 score system as illustrated in Photos 1-12 in Figure 13. Sternal descriptions are shown in Table 15 as described by Catton (2002). Sternal fat assessment is however not as strong a predictor of total fat tissue as condition scoring the spinous and transverse vertebral processes (Aumont et al 1993) and is not practical for assessing large numbers of animals.

## Identifying condition scoring systems for the Australian livestock export industry

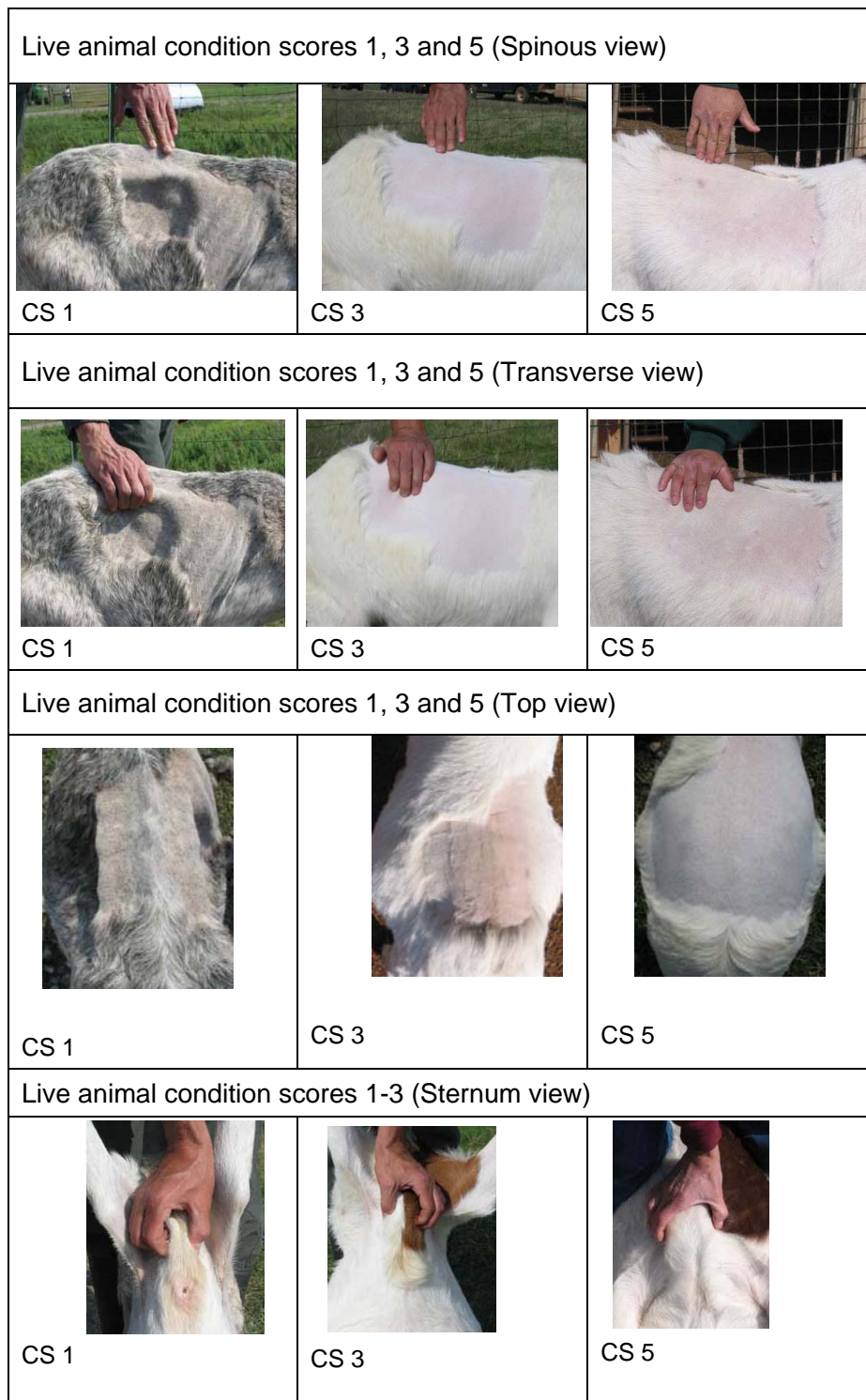
Table 15: Condition Scores 1-5

<b>1</b> Poor	No muscle on edges of transverse process, bones very sharp, thin skin Vertebral angle has little muscle and is very concave. Spinous processes very prominent with no muscle in between. Sharp outline visible; no muscle between skin and bones. Very sharp, no padding	
<p>Features Skeleton has little or no muscle. Hollows in the flanks below the loin are very concave.            Causes Poor diet, disease, parasitism, lactation, or any combination of these.            Problems Slow growth rate in kids; stunting in growing animals, conception failure, abortion, weak or dead newborns, metabolic disease during pregnancy, very susceptible to disease.            Solutions Better nutrition, management and herd health program. Evaluate disease status</p>		
<b>2</b> Thin	Muscle extends to the edges of transverse process, spacing can be felt between the vertebral processes, thin skin. Outline slightly contoured; light padding but bones still somewhat prominent and very easy to feel. Sharp, little padding	
<p>Features Skeleton has some muscle. Hollows in the flanks below the loin are somewhat concave.            Causes Poor diet, disease, parasitism, lactation or any combination of these.            Problems Slow growth rate in kids and growing animals, metabolic disease, weak or dead newborns, susceptible to disease. Solutions - Better nutrition, management and herd health program. Evaluate disease status</p>		
<b>3</b> Good	Muscle and subcutaneous fat covers edges of vertebral process; individual bones are somewhat distinct. Smooth, without signs of fat; pelvic bones and spine are distinct Slight pressure needed to feel the pin bones	
<p>Features Muscle over skeleton felt with gentle pressure. Firm pressure is not needed to feel bones. Hollows in the flanks are barely concave or level with the surrounding area of the sides.            Problems None. Maintain condition at 3 or slightly higher, depending on age and production status.</p>		
<b>4</b> Fat	Vertebral processes indistinct and firm pressure needed to feel them. Vertebral angle rounded but not yet bulging over spinous processes. Spinous process spacing difficult to detect; spine felt as a hard line Heavily padded with fat; bones can only be felt with firm pressure. Heavily padded with fat, and firm pressure needed to feel them	
<p>Features Very firm pressure needed to feel all bony structures.            Causes Feeding in excess, limited exercise. Problems Inhibited locomotion, easily tired, orthopedic abnormalities, dystocia, metabolic disease. Solutions Reduce plane of nutrition, provide exercise</p>		
<b>5</b> Obese	Edge of vertebral processes and spacing between too fat to feel bones. Vertebral angle bulges over the level of the spinous processes. Spine lies in the center of a groove of fat. Buried in fat, bones very indistinct. Buried in fat, hard to locate	
<p>Features Bones covered with a thick layer of fat over the muscle are very hard to feel.            Causes Feeding in excess, limited exercise. Problems Inhibited locomotion, easily tired, orthopedic abnormalities, infertility, dystocia, metabolic disease. Solutions Reduce plane of nutrition, provide exercise.            From <a href="http://kinne.net/bcs.htm">http://kinne.net/bcs.htm</a></p>		

Source: Kinne (2005)

## Identifying condition scoring systems for the Australian livestock export industry

Figure 13: Live animal condition scores (Catton 2002)



## Identifying condition scoring systems for the Australian livestock export industry

Table 16: Condition score description for goats (Catton).

<b>Score 0</b> Cachexic	Lumbar	Vertebrae and intervertebral articulation easily felt. Muscle and fat not evident, only skin and bone.
	Sternal	Sternum is easily palpated, with prominent fleshless depressions on either side. Immovable callous over sternum
<b>Score 1</b> Skeletal	Lumbar	Intervertebral articulations still seem easily palpated. Som muscle over transverse processes.
	Sternal	Depressions on either side of sternum still prominent. Callous is movable.
<b>Score 2</b> Thin	Lumbar	More muscle and fat over transverse processes. Depressions still evident on either side of the dorsal processes.
	Sternal	Fat pad palpable over sternum, and on either side of sternum. Callous is small or absent.
<b>Score 3</b> Good	Lumbar	Spinous processes palpable with light pressure. Muscle and fat fill the depressions over the transverse processes.
	Sternal	Noticeable indents on each side of sternum, due to the presence of muscle and fat next to the sternbrae.
<b>Score 4</b> Fleshy	Lumbar	Spinous processes challenging to palpate. Plentiful muscle and fat covering over vertebrae.
	Sternal	Sternum impalpable. Indents on either side of sternum felt with light pressure.
<b>Score 5</b> Obese	Lumbar	Prominent furrow along spine with flesh bulging up along either side.
	Sternal	Sternum impalpable. No evidence of indents on either side of sternum.

### PRO

- Skill is relatively easily learned and requires no equipment
- Independent of liveweight or frame size
- Clear and descriptive cross-sectional diagrams
- Can be used to assess nutritional requirements of breeding and market stock
- Can use half scores to 'rank' animals in condition (need for an exact score is removed)
- Excellent interactive web site where you can view photographs of side, spinous, sternum, top and transverse aspects of each condition score. (<http://www.luresext.edu/goats/research/bcs.html>)

### CON

- Live animal assessments do not relate to carcass measurements
- Sternal (brisket) assessment too slow for large numbers of animals
- Not a good indicator of overall carcass fat or saleable meat yield

### 10.5 AUS-MEAT 1-5 Fat scores (Australia)

As with sheep, the GR measurement site over the 12<sup>th</sup> rib has proven to be easy to locate and measure, both on the live animal and carcass. It provides a reliable indicator of the meat and fat content of the carcass (McGregor 2002).

Figure 14: The GR fat measurement site in the live goat and goat carcass (AUS-MEAT 2001)

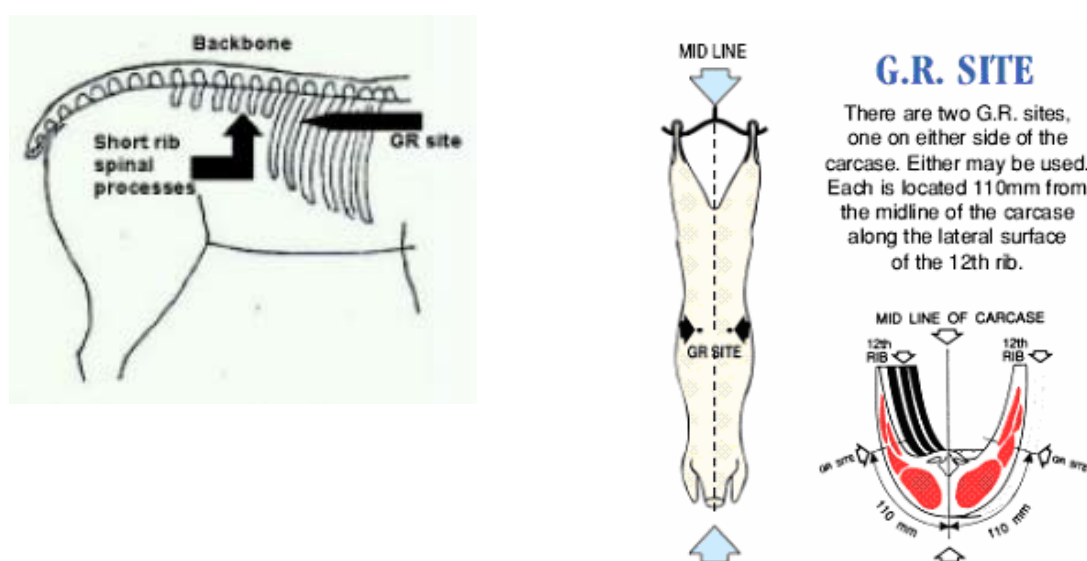
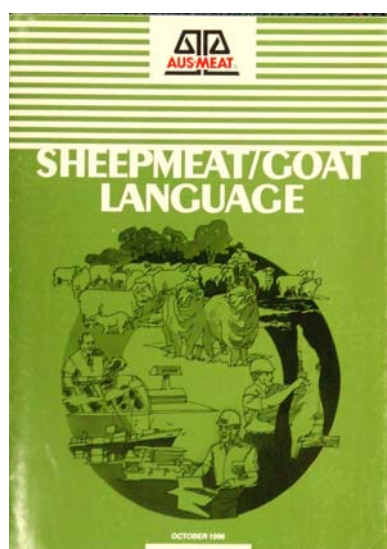


Figure 15: Sheepmeat/Goat Language



There are four main criteria for assessing the market suitability of goats: liveweight, fat score, condition score and age. Fat scoring the live animal at the GR site over the long ribs indicates tissue depth in millimetres (muscle and fat) while condition scoring over the short ribs gives a direct assessment of the amount of tissue present over one of the prime carcass sites.

As goats generally have less subcutaneous fat than sheep, it is easier to gain a more reliable estimate of the body condition and carcass yield of goats using body condition scores than sheep (McGregor 2002).

## Identifying condition scoring systems for the Australian livestock export industry

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Table 17: The relationship between goat fat classes and tissue depth

Fat Class	Description	Tissue depth at GR site
1	Very lean	up to 3 mm
2	Lean	4 to 6 mm
3	Moderately lean	7 to 9 mm
4	Moderately fat	10 to 12 mm
5	Fat	over 12 mm

McGregor (2002)

Table 18: What fat scores feel like on the live goat

Fat Score	1	2	3	4	5
What you feel at the GR site	Ribs very easily felt. No tissue can be felt over ribs	Ribs very easily felt. Slight amount of tissue over ribs	Ribs easily felt. Some tissue over ribs	Ribs can be felt. Lots of tissue present	Ribs only felt with pressure. Tissue very prominent and may be fluid.

McGregor (2002)

Goat meat fat classes in Australia are based on GR tissue depth in the same way as for sheep, but have a tighter and lower range of GR tissue depths, with the five fat classes using 3mm increments (see Table 3). As described in section 10.8, the Australian commercial sheepmeat industry describes GR site fat scores in 5mm increments because sheep carry more subcutaneous fat than goats.

There are National Competency Standards for Sheep and Lamb Appraisal (RUA AG3400W A "Select Sheep for Market") that require participants to achieve competency in estimating both Fat Score (1-5) and GR fat (tissue depth at GR site in mm), but there is no equivalent Competency Standard covering assessment of goats. A broad, generic competency based package (RUAG 4450GTA) includes 'preparation and arranging goats for market' but does not require fat score or condition scoring competency accreditation.

### PRO

- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock
- Australia's official national description language for goats
- Linked to carcase meat description
- Widely used by all sectors and in all official documents

## Identifying condition scoring systems for the Australian livestock export industry

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- Used as the basis for National Livestock Reporting Service reports for goat meat
- Provides objective producer feedback and an objective basis for pricing goat meat purchased 'over the hooks', direct to works or through AuctionsPlus
- Provides livestock buyers with objective feedback on their live animal assessment
- Fat Scores are objectively defined (GR site, mm) and can be verified by GR site palpation, scanning or at slaughter through palpation, GR knife and Electronic probe
- Fat scores 1-5 will directly fit the Heat Stress risk assessment model

### CON

- No accredited training programs are available nationally
- Current Competency Based Training and Accreditation Standards are generic and limited with respect to industry live goat assessment requirements
- Currently use diagrams to portray fat and condition score
- Limited photos available and do not adequately portray each fat/condition score

## 10.6 Dairy goat description in Australia

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The dairy goat industry in Australia uses an 8-score system, described in the Dairy Goat Manual report (2002) from the Rural Industries Research and Development Corporation (RIRDC). It uses a 1 to 8 score system where a doe is described as being in 'good condition' at score 5 or 6 as shown in Table 19. The descriptors are similar to those used in the AUS-MEAT Goat language except that mention is made of visual and tail base assessment.

### PRO

- Skill is easily learned and requires no equipment
- Independent of liveweight or frame size
- Can be used to assess nutritional requirements of breeding and market stock

### CON

- No accredited training programs are available nationally
- Extended 1-8 score system with no objective basis
- Complex - uses palpation at seven (7) sites on live animal
- Competency Based Training and Accreditation Standards in Australia do not include live goat assessment
- Limited photos available and do not adequately portray each fat/condition score



# Identifying condition scoring systems for the Australian livestock export industry

Table 19: Australian 1-8 system for dairy goats

## How To Condition Score

An objective scoring system enables farmers to know they are all discussing the same thing.

Farmers often have different ideas of body condition, and a common language that everyone can understand is valuable. Dairy cow farmers have found the scale of 1 - 8 useful, and it is adapted here for use with goats. The range is from emaciated (score 1) to very fat (score 8).

This system is based on a hands-on assessment. Visual assessments alone is not reliable as coat condition can be misleading, especially over winter and spring when accurate condition scores are most likely to be needed. A full belly can also be misleading.

Goats do not have much fat under the skin, but the amount of flesh does change.

### Main Indicators

**Loin area:** backbone, forward of hips









**Short ribs:** ie. The projections sideways below the backbone

**Loin:** the muscle area between ridge of backbone and short ribs

**Hips**

**Pins**

**Base of tail:** Sometimes the tail head may be raised especially pre and post kidding, giving a misleading impression of poor condition. The backbone on the rump may also be raised, an individual conformation factor not a condition score issue

Score 1	Score 2	Score 3	Score 4
<p>Minimal flesh over skeleton  <b>Backbone:</b> a sharp prominent ridge, vertebrae clearly felt / visible along its entire length  <b>Short Ribs:</b> very sharp, fingers fit easily underneath  <b>Hips:</b> very prominent.  <b>Pins:</b> prominent  <b>Base of tail:</b> deep hollows.</p>	<p><b>Ribs:</b> easily felt / visible  <b>Backbone:</b> a very prominent ridge  <b>Short ribs:</b> sharp, can easily feel underneath.  <b>Loin:</b> slight muscle, deeply concave.  <b>Hips:</b> very prominent.  <b>Pins:</b> prominent  <b>Base of tail:</b> deep hollows.</p>	<p><b>Backbone:</b> a prominent ridge  <b>Short ribs:</b> prominent, can feel under.  <b>Loin:</b> moderately concave.  <b>Hips:</b> prominent  <b>Pins:</b> slight cover  <b>Base of tail:</b> small hollows.</p>	<p><b>Backbone:</b> slight cover.  <b>Short ribs:</b> smooth edges.  <b>Loin:</b> slightly concave.  <b>Hips:</b> slight cover  <b>Pins:</b> light cover  <b>Base of tail:</b> slightly sunken.</p>
			
			

# Identifying condition scoring systems for the Australian livestock export industry

Table 19 continued









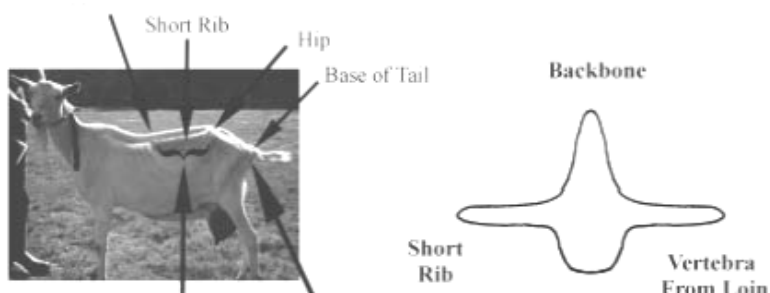
Score 5	Score 6	Score 7	Score 8
<p><b>Backbone:</b> light cover.  <b>Short ribs:</b> light cover.  <b>Loin:</b> flat between 3 points.  <b>Hips:</b> light cover.  <b>Pins:</b> rounded.  <b>Base of tail:</b> almost filled out.</p>	<p><b>Backbone:</b> smooth cover.  <b>Short ribs:</b> well covered.  <b>Loin:</b> slightly rounded.  <b>Pins:</b> well rounded.  <b>Base of tail:</b> filled out.</p>	<p><b>Backbone:</b> smooth and rounded.  <b>Short ribs:</b> hard to feel.  <b>Loin:</b> well rounded.  <b>Rump:</b> slightly rounded.  <b>Hips:</b> well covered.  <b>Pins:</b> well covered.  <b>Base of tail:</b> some fat roll across rump above tail.</p>	<p><b>Backbone:</b> can only just be felt.  <b>Short ribs:</b> can't be felt.  <b>Loin:</b> very well rounded.  <b>Rump:</b> rounded.  <b>Hips:</b> not obvious.  <b>Pins:</b> not obvious.  <b>Base of tail:</b> fat roll across rump above tail.</p>
			
			

Figure 16: Palpation sites in the goat RIRCD (2002)



## 11 Alpacas

The Alpaca industry in Australia is small but growing, with an estimated 70,000 animals. Australia has the second biggest population outside South America. Most are in the hands of small breeders and there is not enough volume yet to establish viable markets for fibre.

Live export is very small, being mainly confined to high value breeding animals and mainly going out by air. These are unlikely to be selected for export if they are in emaciated or over fat condition.

Figure 17: Body scanning chart for Alpacas

The Australian Alpaca Association has produced a body condition score guide which is available on the association's web site. The New Zealand Alpaca Association has used the same diagrams and material to produce an excellent "paddock card" outlining the system (reproduced here as Figure 17).

### PRO:

- Simple 1-5 system
- Clear descriptions
- Good material readily available
- System recently produced for Australian conditions

### CON:

- No known disadvantages

# Paddock Card - Body Scoring

**Alpaca condition or body scoring, a health check**  
Quick & simple to do & can easily be done on a regular basis

- ✓ Check the spine as per diagram
- ✓ Keep a record of each body score
- ✓ Check the ribs
- ✓ Look at upper rear legs
- ✓ Feel the chest
- ✓ Look at front legs and chest

Score 1 requires vet inspection asap. Score 4 and 5 may require nutritional advice, or just a diet (no extra feed). Beware of changes in BS.

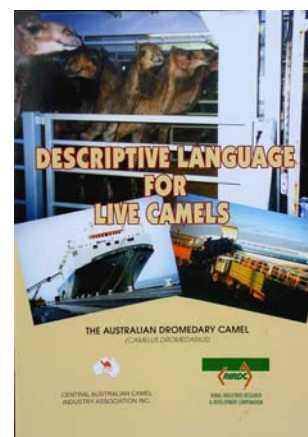
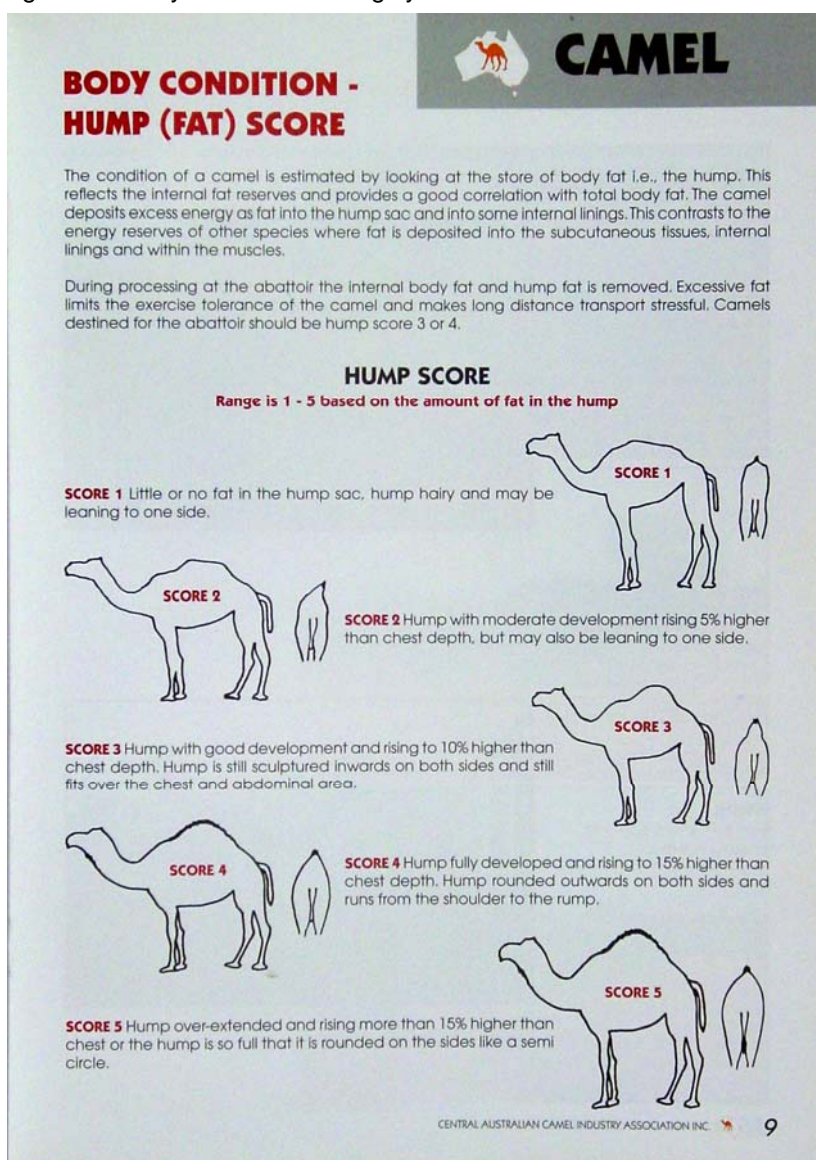
	<b>1</b>	<b>EMACIATED</b> - very steep angle along spine & curves inward - ribs are very easily felt - hard bony v-shaped chest - very increased space between rear legs - very little muscle & absolutely no fat
	<b>2</b>	<b>THIN</b> - spinal slope more than 45 degrees - ribs can be easily felt - hard chest with a slight v-shape - some increased space between rear legs - some loss of muscle
	<b>3</b>	<b>OPTIMAL</b> - about 45 degree angle along spine - ribs felt with slight pressure - firm muscular chest - chest makes straight line between front legs
	<b>4</b>	<b>OVERWEIGHT</b> - convex shape between the backbone & upper ribs - ribs felt with some pressure - somewhat rounded soft feeling chest - inner thighs smooth & less defined
	<b>5</b>	<b>OBESE</b> - backbone looks flat - firm pressure needed to feel ribs - rounded soft feeling chest - large area of contact between rear legs - little or no definition on inner thighs - may have difficulty walking properly

ALPACA ASSOCIATION NEW ZEALAND INC. Production from the Health & Education Subcommittee, February 2004.  
[www.alpaca.org.nz](http://www.alpaca.org.nz) Diagrams with compliments of Australian Alpaca Association

## 12 Camels

The Central Australian Camel Industry Association has done some excellent work aimed at developing markets for Australia's considerable population of feral camels. The main focus is on meat products, as live export is hampered by the low numbers handled and the special requirements for transport and handling facilities.

Figure 18: Body condition scoring system for camels



As part of this industry development, some excellent material has been produced, including a booklet defining a description language for live camels (CACIA 2001).

As camels mainly accumulate their surplus energy as fat in the hump, the system is based on assessment of fullness of the hump (hump score).

PRO:

- Developed by the Australian industry for this purpose
- Simple 1-5 system
- Good description and diagrams
- No other description system found

CON:

- No photographs available

Source: Descriptive language for live camels. 2001. Central Australian Camel Industry Association

## 13 Deer

The Deer Industry Association of Australia has developed its own condition scoring system on a 1-5 basis, improving on a similar system described in New Zealand (Audigé et al 1998). The system was extensively evaluated in red deer against live animal performance as well as carcase parameters for carcase description (Mulley et al 2001).

The Deer Industry Association in Australia has published separate colour charts for both red deer and fallow deer, with the corresponding linkage to carcase fat depth specifications.

The chart for fallow deer is reproduced here (Figure 19), but the red deer charts is similar. They have been widely distributed in the deer industry and are readily available from the Deer Industry Association.

Figure 19: Australian Body Condition Scoring Chart for Fallow Deer



### PRO

- Developed in Australia based on research
- Simple 1-5 system
- Separate charts for red & fallow deer
- Excellent charts with photographs readily available
- Wide industry support
- Compatible with meat specification
- Compatible with HS model

### CON

- No known disadvantages

Source:

Deer Industry Association of Australia

## 14 Conclusions

### 14.1 Conclusions

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Body condition score (BCS) is an important factor describing an animal's state of nutrition. It is a subjective assessment, relatively easy to learn and apply, but very difficult to replace in a practical way with objective alternative.

For the live export trade a good consistent description system is important for administering the Australian Livestock Export Standards (2004) (in particular, defining animals that are too lean or too fat for export). It is also a significant input in the Heat Stress risk assessment model, which exporters are now required to complete as part of their risk assessment for shipments to the Middle East.

There are many different systems, and explanations of systems, available for describing condition score. This is especially so for beef and dairy cattle, where BCS is widely used in research and on-farm breeding herd management. Because scoring is a manual and/or visual skill, systems for all species tend to be supported with pictures and diagrams.

For the livestock export industry, a simple 1-5 system is the most appropriate in each species for consistency and ease of use with the Heat Stress risk assessment model. Such systems have been identified in all the target species, and as far as possible have been recommended for use, except with beef and dairy cattle.

The beef cattle, sheep and goat industries in Australia are strongly committed to the AUS-MEAT live cattle and sheep language. These form the basis of livestock market reporting, market specification and trading and are matched to carcass description language. This has give Australia unique ability to match production with market requirements, and it was considered highly desirable not to weaken this position by recommending a different system.

For sheep and goats, the AUS-MEAT language is a 1-5 fat score defined by carcass fat depth, and is virtually interchangeable with condition score, so in practice this can be used with no major problem. Some fine-tuning may be needed for fat-tailed breeds of sheep – their condition will be underestimated by standards techniques because they carry fat reserves over the rump and tail rather than over the ribs and loin. They may also have a greater ability to thrive in leaner body condition.

With cattle, the AUS-MEAT language is also interchangeable with condition score in most cattle with minimal problem. The objective fat scores were originally developed by calibrating fat depth of typical slaughter cattle from the basic ESCA 1-5 condition score system and the 6<sup>th</sup> score was added to separate extremely fat animals, mainly old cows. This means that for most cattle, the AUS-MEAT fat scores line up directly with a 1-5 condition score system and could be used directly.

The main issue likely to arise from using the AUS-MEAT language for cattle is that if it is interpreted literally, Fat score 1 (0-2mm subcutaneous fat at the P8 site over the rump) will include many lean store cattle (especially from northern Australia) that are otherwise suitable for export. The appropriate boundary could be clarified by providing specific guidelines with photographs for cattle, to define the borderline for minimum acceptable condition.

Although condition of animals is an important factor in their fitness to travel, there are many other factors such as health, temperament and pre-shipping training of the animals. Although it would be desirable to have all industry participants trained in the techniques of condition scoring, it is not

## Identifying condition scoring systems for the Australian livestock export industry

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considered practical or cost-effective to require this. We consider it should be sufficient to provide well-presented, practical guidelines on the permitted limits of condition and distribute them widely. On the other hand, key veterinary staff responsible for approval of livestock for export should be properly trained and accredited in condition scoring, to support their role in administering the Standards.

The only accredited training in condition scoring available in Australia is that run by NSW Department of Primary Industries for market reporters of the National Livestock Reporting Service. This focuses on assessment of carcass traits in live animals, but the same skills can be applied to identifying the appropriate condition score levels in animals suitable for live export.

The welfare of animals is of prime concern to all livestock production industries. With increasing public anxiety about issues such as starvation, mistreatment and stress in animals, the authorities need to develop a better understanding of how to define the state of nutrition of animals and find new techniques to assist farmed animals to adapt to the handling and transport required in commercial animal production and marketing.

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### 16 Appendix 1 Live cattle competency standards (RTE3113A “Identify and Draft Livestock”)

**NOTE:** This is an extract from the standards used for training and accreditation of market officers employed by the National Livestock Reporting Service (NLRs). The standards would need to be modified to suit the needs of the live export industry.

#### Live Cattle Appraisal

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##### 16.1.1 Conditions of Assessment

The individual being assessed will be required to submit a hand written sheet detailing their assessment of live animals for the following criteria; live weight (kg), estimated dressing percentage (% of live weight), Hot Standard Carcase Weight (kg), p8 fat (mm) and Live Muscle Score (A to E range).

- Materials  
Calculator, notes and writing equipment may be used to complete the assessment task.
- Assessment tasks

In order to be granted competency in Identify and Draft Livestock (RTE3113A) all assessment tasks must be completed successfully. If competency is not granted a follow up assessment within a period of 3 months upon receipt of results may be granted.

#### Competency Standards

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Competency is determined after having completed a minimum of 20 live animal assessments using the following standards and achieving average or better than average accuracy level for all criteria i.e. live weight, dressing percentage, carcase weight, fat cover at the p8 site and live muscle score.

#### Live Animal Assessment Criteria

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##### Live weight

Estimate (kg)	Actual (kg)	Variance (+- kg)	% Variance
	Weigh scales	Estimate - actual	$(\text{Variance}/\text{Actual}) * 100$

##### Dressing percentage

Estimate (%)	Actual (%)	Variance (%)
	$(\text{HSCW}/\text{Live weight}) * 100$	Estimate - actual

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### Carcase weight 1

Estimate (kg)	Actual (kg)	Variance (+- kg)	% Variance
	Processor measure	Estimate - actual	$(\text{Variance}/\text{Actual}) * 100$

### Fat (p8 rump site)

Estimate (mm)	Actual (mm)	Variance (+- mm)
	Processor measure	Estimate - actual

### Live Muscle Scale (A+-E =15 point scale)

Estimate (LMS,+/- option)	Actual (LMS)	Variance (LMS)
	Assessor benchmark score	Estimate - actual

### Accuracy Levels

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Accuracy or performance levels are an indication of the level of accuracy for each of the assessment tasks. They indicate to the individual being assessed the level of performance and possible areas for improvement.



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### Accuracy levels 1

Level	Live weight (kg)		Dressing %	Carcase Weight (kg)	Fat p8 (mm)		Muscle Score
	Cows	Others			Indicative weights (refer to DRS %)	Fat depth (mm)	
	<5%	<3%	< 1%	< 4	0-2	0	* (see below)
					3-6	1	
					7-12	2	
					13-22	4	
					23+	7	
Good	5-8%	3-5%	1 – 2%	4 – 8	0-2	1	+/- 1 score
					3-6	2	
					7-12	3	
					13-22	6	
					23+	8	
Average	8-12%	5-7%	2 – 3%	8 - 12	0-2	2	+/- 2 scores
					3-6	3	
					7-12	4	
					13-22	7	
					23+	1	
Below average	>12%	>7%	> 3	> 12	0-2	>	+/- 3 scores
					3-6	>	
					7-12	>	
					13-22	>	
					23+	>	

Note: \* Each muscle score can be assigned a numeric score; as follows.

### Live Muscle Scores (15 point scale) 1

LMS	A+	A	A-	B+	B	B-	C+	C	C-	D+	<sup>D</sup>	D-	E+	E	E-
score	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

### 17 Appendix 2 Sheep and Lamb Appraisal and Competency Standards (RUA AG3400W A “Select Sheep for Market”)

*NOTE: This is an extract from the standards used for training and accreditation of market officers employed by the National Livestock Reporting Service (NLRS). The standards would need to be modified to suit the needs of the live export industry.*

#### Live Sheep and Lamb Appraisals

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##### Learning Outcomes and Assessment Criteria:

The participant will be able to:

List and demonstrate an understanding of the marketing systems available to sheep and lamb producers.

Identify different market segments available and carcass attributes for each segment in terms of fat cover and carcass weight for the sale of surplus sheep and lambs.

Complete a live animal assessment and submit a hand written sheet detailing their assessment of live animals for the following criteria: live weight (kg), estimated dressing percentage (as a % of live weight), Hot Standard Carcass Weight (kg), NLRS Fat Score and GR fat in (mm).

Identify and list the factors that impact on the value of sheep and lambskins and their markets.

Accurately complete and explain the importance of a vendor declaration for sheep and lambs in relation to on farm quality assurance.

##### Materials

- Calculator, notes and writing equipment may be used to complete the assessment task.
- Protective clothing and/or footwear are recommended while assessing sheep or lambs.

##### Assessment tasks

- In order to apply for competency in ‘Live Sheep and Lamb Appraisal’, the assessee will be allowed to complete a follow-up assessment within a period of 3 months of advice of results. Upon successfully meeting competency criteria an award in the form of a certificate of competency in RUA AG3400W A, Select Sheep for Market, will be granted.

#### Competency Standards

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Competency is assessed as having completed a live assessment using the following standards and achieving competent level for all criteria

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### Live Animal Assessment Criteria

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#### Live weight for Sheep and Lambs 1

Estimate (kg)	Actual (kg)	Variance (+- kg)	% Variance
	Weigh scales	Estimate - actual	Estimate/Actual as a %

#### Dressing percentage

Estimate (%)	Actual (%)	Variance (actual)
	(HSCW*/Live weight)	Estimate - Actual

\* or cold weight provided participants are notified of such prior to accreditation

#### Carcase Weight

Estimate (kg)	Actual (kg)	% Variance
	Processor measure	Estimate/Actual as a %

#### Fat Score 1-5

Estimate	Actual Score	Variance (+/- fat score)
	Abattoir measurement	Estimate - actual

#### GR Fat Score (in mm)

Estimate	Actual Score	Variance (+/-mm)
	Abattoir measurement	Estimate - actual

### Accuracy Levels

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Accuracy or performance levels are an indication of the level of accuracy for each element of the competency tasks. They indicate to the assessee the level of performance and possible areas for improvement. It should be noted they are not a test result and are quite separate to the key task – achieving competency.

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### Accuracy Levels

Level	Liveweight (kg)	Dressing %	Carcase Weight (kg)	NLRS Score* Fat	GR Fat Score (mm)
Sheep and Lambs					
17.1.1.1 <i>Comp</i>	Up to +/-10%	Up to +/- 3%	Up to +/- 5%	+/- 1 score	Up to +/- 2mm
17.1.1.2					
<b>Not yet Competent</b>	> +/- 11%	> +/- 3%	> +/-6%	> +/- 1 score	> +/- 3mm

### 18 Acknowledgements

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