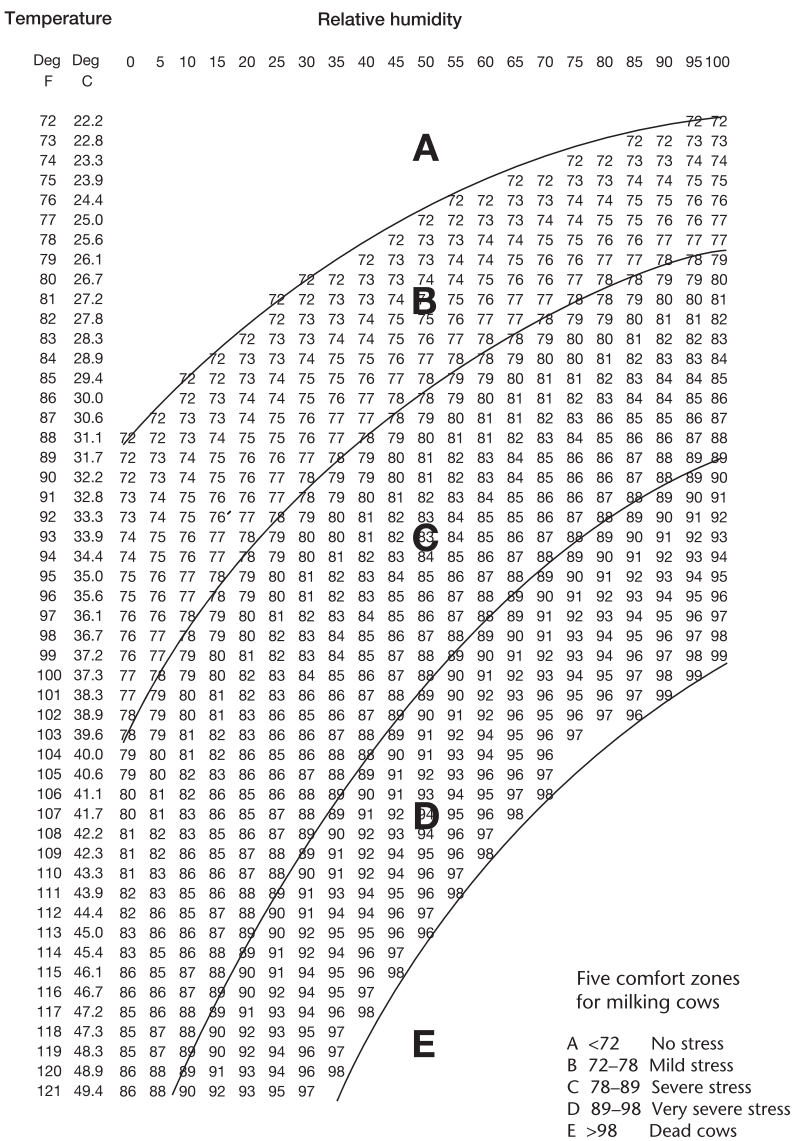
Appendices

Appendix 1 Temperature Humidity Index

The following table presents the Temperature Humidity Index, calculated from temperature (in ºFahrenheit or Centigrade) and relative humidity (%), highlighting its potential effects on cow heat stress and hence performance.



Appendix 2 Checklist to assess current farm management and herd welfare

These observations and answered questions can help assess the management and welfare of the stock and the performance and likely profitability of any farm.

Shed and facilities

- Roof height and natural ventilation
- Temperature and humidity inside shed
- Shed floor and cow lying area (cement, mats)
- Mats, enough for all cows, thin v thick
- Other forms of bedding material
- Stalls; tie stalls v free stalls v open lot
- General stocking density and space for cows to rest
- Adequacy and cleanliness of pens for young stock (heifers, milk-fed calves)
- Area for outside resting at night
- Adequacy and cleanliness of feed troughs and water containers
- Access to clean drinking water, not only as slurry feeding
- Source and adequacy of water for drinking and cleaning
- If sufficient cows, use of mechanical forage chopper
- Room for feed processing and preparation
- Adequacy and hygiene of milking area, including teat dipping and access to hot water
- If machine milking, state of rubber linings
- Cleanliness of milking buckets and milk cans
- General hygiene and condition of cow teats and coats
- Adequacy of effluent disposal and storage system
- Adequacy of office and farm staff area

Stock

- General condition (thin v good v fat)
- Obvious health issues, such as lameness
- Freedom from obvious injuries
- Is mastitis an issue? If so, what are the management procedures?
- Rumen fill
- Cow cleanliness (udder, thigh & hips, legs)
- Signs of heat stress (> 70 respirations/minute)
- % cows ruminating at rest
- % cows lying down and ruminating
- Cow 'comfort' and contentment (obviously hungry and unsettled)
- Flight zone (< 3 m, 3 to 5 m, > 5 m)

- Evidence of good or poor stock handling practices
- Herd numbers and structure
  - ➤ Milking cows
  - ➤ Dry cows
  - ➤ Heifers (weaning to calving)
  - ➤ Milk-fed calves
  - ➤ Other dairy stock (bulls, steers)

Feed supplies

- Enough fresh forage fed each day? Typical amount fed per milking cow in wet/dry season
- State of forage (improved v native v forage by-products, immature v mature)
- Sourcing fresh forage, grown v off farm
- Enough concentrates fed each day? Typical amount fed per cow
- Concentrates (formulated v mixed)
- What by-products are fed
- If on farm mixing, specific feed additives (macro minerals, vitamins/minerals, rumen buffers)
- Use of shed effluent for forage production

Answers to simple questions

- How many cows did you milk yesterday?
- How much milk did you sell yesterday?
- How much milk did you use to feed your milk-fed calves yesterday?

These answers should allow you to calculate the average milk yield per milking cow

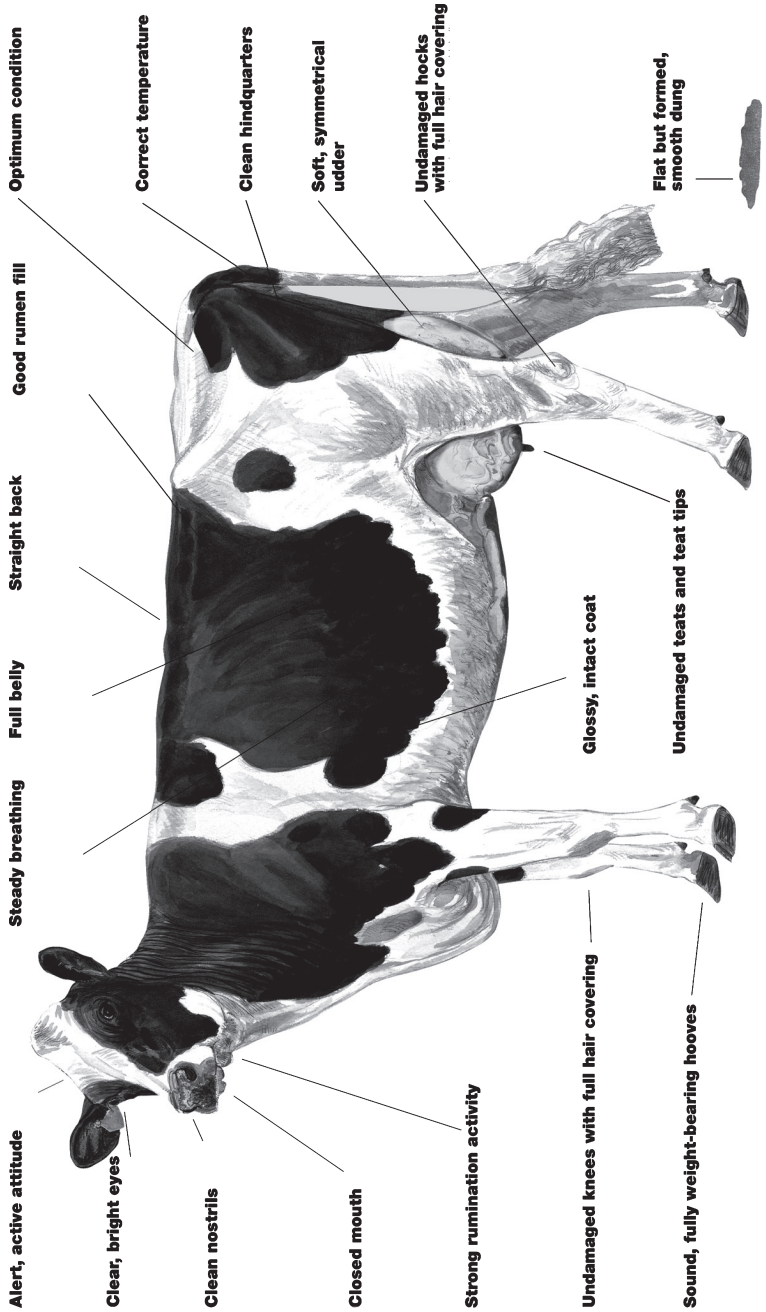
- How much per litre of milk were you paid yesterday?
- If there is a milk grading scheme, what grade was your milk yesterday?
- What was the typical composition of your milk (fat, solids not fat, protein)?
- What was the typical quality of your milk (somatic cell count, TPC or MBRT)?

Answers to more complex questions

- How aware are you of the importance of colostrum feeding to your newborn calves and what are your normal practices?
- Do you keep any farm records? If so, which ones?
- What financial/business records do you keep?
- Do you consider mastitis to be a problem?
- Do you consider cow lameness to be a problem?
- What is the typical peak yield of your cows in early lactation?
- What is the typical lactation length of your cows (< 250, 250–275, 275–300, > 300 days)?

- What are your typical number of days between calving to conception?
- What is your typical number of days between cows drying off and then calving?
- What is your typical age (number of months) of heifers when they first calve down?
- What is your typical percentage of calves that show signs of ill health during milk rearing?
- What is your typical percentage of calves that die during milk rearing?
- How many years have you been milking cows?
- Will you still be milking cows in 1 year's time or 5 years' time?
- Do your children want to follow you on the farm?
- Name three of your biggest problems on your farm. This can be any constraint at all, such as labour supplies, government/co-op or milk processor support and services, dry season forage supplies. Poor milk returns and high cost of production are universal problems for all small holder dairy farmers, so should not be included unless they are an obvious problem on this farm.

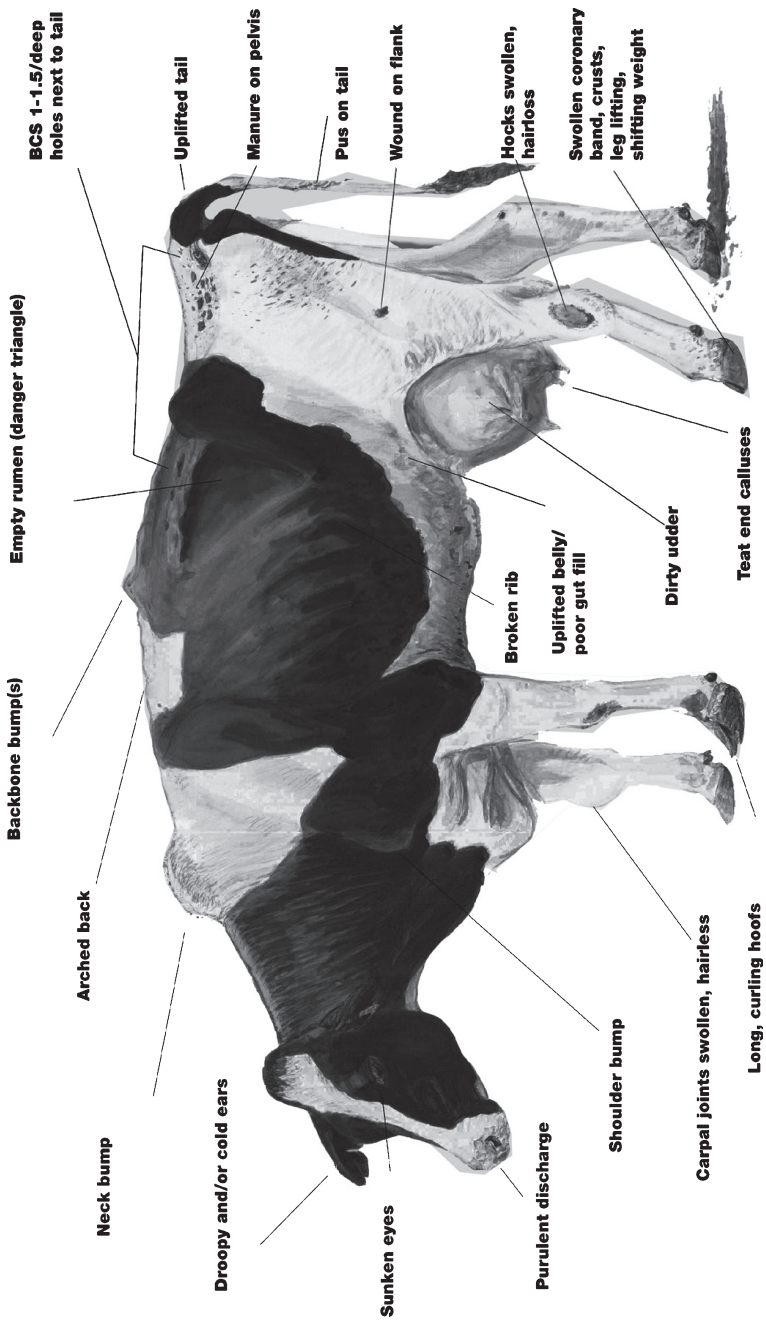
Appendix 3 Cow signals to assess health and welfare



Cow's anatomy	Observation and interpretation
Whole body	**Alert, active attitude** Distracted attitude: poor health, low energy status and possibly rumen acidosis
	Steady breathing Rapid and shallow: heat stress or pain. Sometimes at start of rumination period as well Normal: 10 to 30 times per minute (in temperate regions), < 50 times per minute (in tropical regions)
	Optimum condition Too thin: inadequate energy intake Too fat: excessive energy intake Normal: good flesh cover with a little fat Good condition leads to improved disease resistance, fertility and health around calving (pay attention to breed)
	Glossy intact coat Dull coat: poor health or nutrition Skin injuries: cause and result of agitation and reduced disease resistance
	Correct body (rectal) temperature Too high (> 39.0°C): fever Too low (< 38.0°C): milk fever or serious illness Normal (between 38.0 and 38.5°C): healthy
Head	**Clear, bright eyes** Deep set eyes indicate cow is sick and dehydrated
	Clean nostrils Mucus with pus/blood and skin injuries: skin of the nose is inflamed due to virus or cold Clear mucus does not indicate much
	Closed mouth Some drooling: usually hunger Lot of drooling: swallowing problems or mouth pain Coughing: due to cold air, dust or disease
	Strong rumination activity Reduced chewing: diet lacks effective fibre Spitting out the cud: tooth problems, prickly bits in feed Normal: 55 to 75 chews per cud
Forequarters	**Undamaged knees with full hair covering** Bare knees: scraping on ground while getting up Swollen knees: bruising when getting up, lack of space in stall
	Sound, fully weight bearing hooves Tiptoeing, standing on tips of hooves Injured or swollen coronary band Eczema or scabs in interdigital space
Abdomen	**Full belly** Belly too empty: hadn't eaten enough last week Take account of the size of the calf, if any
	Good rumen fill Too empty: hasn't eaten enough yesterday No discernible layered structure (apple shaped): not enough fibre in diet

	Straight back Arched back: painful hooves or physical wear and tear Injuries: usually bruising against stall partition
Hindquarters	**Clean hindquarters** Dung on both sides of rump: dung too thin Asymmetric soiling: environment too dirty
	Soft, symmetrical udder Hard: due to oedema around calving or mastitis (painful) Enlarged quarter: active mastitis Shrunken quarter: previous mastitis
	Undamaged teats and teat tips Trodden teats: too much agitation, stalls too narrow or too slippery Check milking machine and technique if you see calloused teat tips: incorrect action of milking machine Swelling, redness or tiny blood spots: also due to udder oedema
	Undamaged hocks with full hair covering Bare hocks: scraping on stall floor, lack of grip Thick hocks: lack of stall space, stall floor too hard Scabs: inflammation due to dirt or moisture
	Flat but formed, smooth dung Long stems: insufficient rumination activity Not too loose or too firm: always relate to ration components (e.g. grazed pastures) and lactation stage (dry v peak lactation) Use dung feedback to assess the diet: feeding methods, feed intake, digestion, water intake and health Discus with nutritionist when dung does not seem optimal

Appendix 4 Cow signals to assess sickness and distress



Cow's anatomy	Observation and interpretation
Head	Sunken eyes: sick
	Droopy and/or cold ears: sick
	Purulent nasal discharge: rhinitis or chronic lung problem
Forequarters	Neck bump: neck rail feed fence too low
	Shoulder bump: poorly designed feed fence/feed too far away
	Long curling hoofs: hoof trimming too late or not at all
	Carpal joints swollen, hairless: stall surface too hard, too little head space
Abdomen	Arched back: lame
	Backbone bumps: lying against stall divider
	Empty rumen: has eaten too little
	Broken rib: stall divider
	Uplifted belly/poor gut fill: pain/poor feed intake for days
Hindquarters	Body condition score of 1 to 1.5 and deep holes next to tail: long-term physical problems
	Dirty udder: dirty resting area and/or floors
	Teat end calluses: milking machine problems
	Uplifted tail: pain in birth canal
	Manure on pelvis: diarrhoea
	Pus on tail: endometritis
	Wound on flank: wet resting surfaces
	Swollen hocks and hair loss: stall surfaces too hard, abrasive or not enough grip
	Swollen coronary band, crusts, leg lifting, shifting weight: hoof diseases

Appendix 5 A scoring system to assess dairy cow welfare on any farm

This has been more fully described in Chapter 8 of this book. It contains 36 questions or observations. It is based on the 'five freedoms of animal welfare' and addresses both tethering and loose housing. As this scoring system was developed to focus more on good rather than poor animal welfare, the higher the scores, the better the welfare for the animals.

How to use this scoring system

1. Complete the details on farm. Animal numbers are important for score calculations.
2. Each of the 'five basic freedoms of animal welfare' is assessed.
3. Each measure is assigned a maximum value of 1.0. The total for each freedom is scored according to the number of measures answered. If the measure does not apply to that particular farm (for example it may not have any young calves), this should not be taken into account in the total.
4. For each measure, when 'yes' applies to more than 90% of animals, score 1.0 point. When 'yes' applies to 30% or less of animals, score 0.0 points. When 'yes' applies to 30–90% of animals, score 0.5 points.
5. Methods for scoring body condition, rumen fill, cleanliness, locomotion, hooves and teat scores are provided in Chapter 6 of this book.

Details of farm visited

Farm location	
Cooperative or feedlot	
Date and time of visit	
Owner/person responsible	
Total number of milking cows on farm	
Total number of calves on farm	

Summary of scores for each measure of animal welfare

Measure	**Score**
1. Freedom from hunger and thirst	
Do all animals (including calves) have continuous access to water?	
Are all feeders and drinkers functional?	
Are feeders and drinkers clean?	
Are cows in a body condition score between 2 and 4 out of 5 (Chapter 6.1)?	
Do cows have a rumen score appropriate to their point of calving (Chapter 6.6)?	
Are calves fed colostrum?	
Are cows fed a quality mixed ration?	
TOTAL	

2. Freedom from discomfort	
Do cows have a cleanliness score of 2 or less out of 5 (Chapter 6.5)?	
Is bedding provided?	
Is bedding clean and deep enough for cows to lie comfortably?	
Can animals lie down and get up easily?	
Is there shelter from extreme weather?	
Are cows free from hock sores?	
Are cows free from pressure sores?	
Are cows free from any signs of heat stress (< 70 breaths per minute)?	
TOTAL	
3. Freedom from pain, injury and disease	
Are cows free from injuries on their bodies?	
Do cows have a locomotion score of 2 or less out of 5 (Chapter 6.2)?	
Are cows free from clinical disease?	
Do cows have healthy hooves (e.g. no incidences of diseases described in Chapter 6.3)?	
Do cows have clean, healthy looking udders?	
Do cows have teat scores of 2 or less out of 4 (Chapter 6.8)?	
Do cows have their tails intact?	
Have calves been disbudded (not dehorned)?	
Have any male calves been castrated at 3 months of age or less?	
TOTAL	
4. Freedom from fear and distress	
Do cows approach the stockperson?	
Do calves approach the stockperson?	
Will the cows let the stockperson approach within 3 m?	
Can cows be moved gently, without hitting, yelling?	
Will cows walk slowly, not run, when encouraged to move by the stockperson?	
TOTAL	
5. Freedom to express normal behaviour	
Are cows free to move (untethered)?	
If tethered, are cows given access to move freely each day?	
Are calves housed in appropriate groups (between 2 and 8)?	
Can animals turn around fully in their cubicle?	
Is there a minimum of dry lying area of 3.5 m^2 for adult cattle/bulls and 2.5 m^2 for growing heifers?	
Is there evidence of normal social behaviours (limited aggressive interactions during feeding and resting)?	
Are stereotypical behaviours minimal?	
TOTAL	

The framework to calculate the animal welfare status of each farm visited is presented below. It is based on calculating a single value for each of the five freedoms then developing an animal welfare index based on equal weightings to each of these five freedoms.

Calculation of an animal welfare index for the farm visited

1. Freedom from hunger and thirst	
Total number of measures recorded (A); maximum of 7	
Sum of scores recorded (B)	
% score for Measure 1 (A/B x 100)	
2. Freedom from discomfort	
Total number of measures recorded (A); maximum of 8	
Sum of scores recorded (B)	
% score for Measure 2 (A/B x 100)	
3. Freedom from pain, injury and disease	
Total number of measures recorded (A); maximum, of 9	
Sum of scores recorded (B)	
% score for Measure 3 (A/B x 100)	
4. Freedom from fear and distress	
Total number of measures recorded (A); maximum of 5	
Sum of scores recorded (B)	
% score for Measure 4 (A/B x 100)	
5. Freedom to express normal behaviour	
Total number of measures recorded (A); maximum of 7	
Sum of scores recorded (B)	
% score for Measure5 (A/B x 100)	
6. Farm animal welfare index	
Mean value of all five % above	

Appendix 6 Animal welfare agencies in Australia

Shown below are the non-government and government agencies in Australia actively involved in animal welfare activities, including cattle.

Non-government organisations

Royal Society for the Protection of Cruelty to Animals (RSPCA)
http://www.rspca.org.au/

Animals Australia
http://www.animalsaustralia.org/

World Animal Protection
http://www.worldanimalprotection.org

Voiceless
https://www.voiceless.org.au/

People for Ethical Treatment of Animals (PETA)
http://www.peta.org/

Australian Veterinary Association
http://www.ava.com.au/

Government agencies

Australian Livestock Export Corporation (MLA/LIVECORP)
http://www.livecorp.com.au/animal-welfare

Department of Agriculture, Fisheries and Forestry, Animal and Plant Health, Canberra
http://www.daff.gov.au/animal-plant-health/welfare

Animal Welfare Science Centre, University of Melbourne, Victoria and Victorian Department of Environment and Primary Industries, Melbourne
http://www.animalwelfare.net.au/

State governments
Many state government agriculture departments employ animal welfare specialists

Universities
Many of the veterinary science faculties at universities employ animal welfare specialists.

The World Association for Animal Health (OIE) is one of the key international agencies responsible for animal welfare with headquarters in Paris and website http://www.oie.int/animal-welfare/animal-welfare-key-themes/

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