DRAFT CHAPTER 7.X.

ANIMAL WELFARE AND DAIRY CATTLE PRODUCTION SYSTEMS

Article 7.X.1.

Definition

Dairy cattle production systems are defined as all commercial cattle production systems where the purpose of the operation includes some or all of the breeding, rearing and management of cattle intended for production of milk.

Article 7.X.2.

Scope

This chapter addresses the welfare aspects of dairy cattle production systems.

Article 7.X.3.

Commercial dairy cattle production systems

~~Commercial d~~Dairy cattle in commercial production may be kept in housed or pastured systems, or a combination of both~~systems include~~:

1. Housed ~~or confined~~

   These are systems where cattle are kept ~~housed~~ on a formed surface indoors or outdoors ~~in confinement~~ and are fully dependent on humans to provide for basic animal needs such as food, shelter and water ~~on a daily basis~~. The type of ~~the~~ housing will depend on the environment, climatic conditions and management system. The animals may be ~~loose~~ housed unrestrained or tethered, within this housing system.

2. Pastured

   These are systems where cattle ~~have the freedom to roam~~ live outdoors, and ~~where the cattle~~ have some autonomy over diet selection ~~(through grazing)~~, water consumption and access to shelter. Pastured systems do not involve ~~exclude~~ any housing except that required for milking.

3. Combination systems

   These are systems where cattle are managed in ~~exposed to~~ any combination of housed ~~housing, confinement or~~ and pasture ~~husbandry methods~~ production systems, either simultaneously, or varied according to weather ~~changes in climatic conditions~~ or physiological state of the cattle.

Article 7.X.4.

Criteria (or measurables) for the welfare of dairy cattle

The following outcome-based criteria, specifically animal-based criteria, can be useful indicators of *animal welfare*. Consideration should also be given to the design of the system and stockmanship. The use of these indicators and their appropriate thresholds should be adapted to the different situations where dairy cattle are managed. ~~Consideration should also be given to the design of the system~~. These criteria can be considered as a tool to monitor ~~the efficiency~~ impact of design and management, given that both of these can affect *animal welfare* ~~will be affected by both system design and stockmanship~~.

Annex XII (contd)

~~Consideration should also be given to the design of the system and stockmanship.~~

1. Behaviour

Certain behaviours could indicate an *animal welfare* problem. These include decreased feed intake, altered locomotory behaviour and posture, altered lying time, ~~human-animal relationship,~~ altered respiratory rate and panting, coughing, shivering and huddling, grooming and the demonstration of stereotypic, agonistic, ~~aggressive~~, depressive or other abnormal behaviours (Wiepkema *et al.*, 1983; Moss, 1992; Desire *et al.*, 2002; Appleby, 2006; Mason and Latham, 2004; Lawrence, 2008; Chapinel *et al.*, 2009).

2. Morbidity rates

Morbidity rates, including for infectious and metabolic *diseases* ~~such as mastitis and metritis~~, lameness, ~~metabolic diseases, parasitic diseases~~, post-partum and post-procedural complications and injury rates, above recognised thresholds, may be direct or indirect indicators of the *animal welfare* status of the whole *herd*. Understanding the aetiology of the *disease* or syndrome is important for detecting potential *animal welfare* problems (Blecha, 2000). Mastitis, lameness, reproductive and metabolic diseases are also particularly important animal health problems for adult dairy cows. Scoring systems, such as body condition, lameness ~~scoring~~ and milk quality, can provide additional information (Sprecher *et al*., 1997; Roche *et al*., 2004; EFSA, 2012)

Both clinical examination and pathology should be utilised as an indicator of *disease*, injuries and other problems that may compromise *animal welfare*. ~~*Post-mortem* examination is useful to establish causes of *death* in cattle.~~

3. Mortality and culling rates

Mortality and culling rates~~,~~ affect the length of productive life~~,~~ and, like morbidity rates, may be direct or indirect indicators of the *animal welfare* status (Moss, 1992). Depending on the production system, estimates of mortality and culling rates can be obtained by analysing the ~~rate and~~ causes of *death* and culling and ~~the~~ their temporal ~~tempore~~ and spatial patterns of ~~mortality~~ occurrence. Mortality and culling rates should ~~can~~ be ~~reported~~ recorded regularly, i.e. daily, monthly, annually or with reference to key husbandry activities within the production cycle.

Necropsy is useful in establishing causes of *death.*

4. Changes in ~~milk yield,~~ body weight~~,~~ ~~and~~ body condition and milk yield

In growing animals, body weight ~~gain (failure to achieve appropriate~~ changes outside the expected growth rate ~~curve)~~ especially excessive sudden loss ~~may be~~ are ~~an~~indicators of poor ~~animal health and~~ animal health or *animal welfare*. Future performance, including milk yield and fertility, of replacement heifers can be affected by under- or over-nutrition at different stages of rearing.

In lactating ~~*animals*~~ animals, body condition ~~score~~ outside an acceptable range, significant body weight change and significant decrease in milk yield may be indicators of compromised welfare (Roche *et al.*, 2004; Roche *et al.*, 2009).

In non-lactating ~~*animals*~~ animals, including bulls, body condition ~~score~~ outside an acceptable range and significant body weight change may be indicators of compromised welfare.

5. Reproductive efficiency

Reproductive efficiency can be an indicator of animal health and *animal welfare* status. Poor reproductive performance, compared with the performance expected ~~standard~~ for that particular breed, can indicate *animal welfare* problems. Examples may include:

– anoestrus or extended post-partum interval ~~prolonged post-partum anoestrus~~,

– low conception rates,

– high abortion rates,

– high rates of dystocia,

– retained placenta,

– metritis,

– loss of fertility in breeding bulls.

6. Physical appearance

Physical appearance may be an indicator of animal health and *animal welfare*, as well as the conditions of management. Attributes of physical appearance that may indicate compromised welfare include:

– presence of ectoparasites,

– abnormal coat colour, texture or hair loss,

– excessive soiling with faeces, mud or dirt (cleanliness),

– abnormal swellings, injuries and lesions,

– discharges (e.g. from nose, eyes, reproductive tract),

– feet abnormalities,

– abnormal posture ~~indicating pain~~ (e.g. rounded back, head low),

– emaciation and dehydration.

7. Handling responses

Improper handling can result in fear and distress in cattle. Indicators ~~could~~ include:

– evidence of poor human-animal relationship, such as excessive flight distance,

– negative behaviour at milking time, such as reluctance to enter the milking parlour, kicking, vocalisation,

– ~~percentage of~~ ~~*animals*~~ animals striking restraints or gates,

– ~~percentage of~~ ~~*animals* injured~~ injuries sustained during handling, such as bruising, lacerations, broken horns or tails and fractured legs,

– ~~percentage of~~ ~~*animals*~~ animals vocalising abnormally or excessively during restraint and handling,

– disturbed behaviour in the chute or race such as repeated reluctance to enter ~~behaviour~~,

– ~~percentage of~~ ~~*animals*~~ animals slipping or falling.

8. Complications ~~due to~~ from ~~routine~~ common procedures ~~management~~

Surgical and non-surgical procedures may be performed in dairy cattle for ~~improving *animal* performance,~~ facilitating management, ~~and~~ improving human safety and *animal welfare* (e.g. disbudding, hoof trimming), and treatment of certain conditions (e.g. ~~disbudding, hoof trimming, displaced abomasum~~). However, if these procedures are not performed properly, *animal welfare* can be compromised. Indicators of such problems could include:

– post procedure infection ~~and~~, swelling and pain behaviour,

– reduced feed and water intake,

– post procedure body condition and weight loss,

– morbidity and mortality.

Article 7.X.5.

Provisions for good animal welfare

Ensuring ~~high~~ good welfare of dairy cattle is contingent on several management factors, including system design, environmental management, and stockmanship which include~~s~~ responsible husbandry and provision of appropriate care. Serious problems can arise in any system if one or more of these elements are lacking.

Each recommendation includes a list of relevant outcome-based measurables derived from Article 7.X.4. This does not exclude other measures being used where appropriate.

1. Recommendations on system design and management including physical environment

When new facilities are planned or existing facilities are modified, professional advice on design in regards to animal health and welfare should be sought ~~(e.g. Milk Development Council, 2006)~~.

Many aspects of the environment can impact on the health and welfare of dairy cattle. These include heat and cold, air quality, lighting, noise, etc.

a) Thermal environment

Although cattle can adapt to a wide range of thermal environments particularly if appropriate breeds are used for the anticipated conditions, sudden fluctuations in weather can cause heat or cold stress.

i) Heat stress

The risk of heat stress for cattle is influenced by environmental factors including air temperature, relative humidity, ~~and~~ wind speed, animal density (area and volume available per animal), lack of sufficient shade, ~~and~~ animal factors including breed, age, body condition, metabolic rate and stage of lactation, and coat colour and density (West, 2003; Bryant *et al.*, 2007).

Animal handlers should be aware of the risk that heat stress poses to cattle and of the thresholds in relation to heat and humidity that may require action. As conditions change, routine daily activities that require moving cattle should be amended appropriately. If the risk of heat stress reaches very high levels the *animal handlers* should institute an emergency action plan that could include provision of shade, fans, ~~easy~~ access to additional drinking water, reduction of animal density, and provision of cooling systems as appropriate for the local conditions (Igono *et al.*, 1987; Kendall *et al.*, 2007; Blackshaw and Blackshaw, 1994).

Outcome-based measurables: feed and water intake, behaviour, ~~including~~ especially respiratory rate and panting, physical appearance, especially dehydration, morbidity rate, mortality rate, changes in milk yield.

ii) Cold stress

Protection from extreme weather conditions should be provided when these conditions are likely to create a serious risk to the welfare of cattle, particularly in neonates and young cattle and others that are physiologically compromised. This could be provided by extra bedding and natural or man-made shelters (Manninen *et al.*, 2002).

During extreme cold weather conditions, *animal handlers* should institute an emergency action plan to provide cattle with shelter, adequate feed and water.

Outcome-based measurables: mortality and morbidity rates, physical appearance, behaviour, ~~including~~ especially abnormal postures, shivering and huddling, growth rate ~~curve~~, body condition and weight loss.

b) Lighting

~~Confined~~ Housed cattle that do not have sufficient access to natural light should be provided with supplementary lighting which follows natural periodicity sufficient for their health and welfare, to facilitate natural behaviour patterns and to allow adequate and safe inspection of the cattle (Arab *et al.*, 1995; Dahl *et al.*, 2000; Phillips *et al.*, 2000). The lighting should not cause discomfort to the animals. Housed dairy cows should be provided with subdued night time lighting. Entrance to restraint devices should be well lit.

Outcome-based measurables: behaviour, especially altered locomotory behaviour, morbidity, physical appearance~~, mobility~~

c) Air quality

Good air quality and ventilation ~~is an~~ are important ~~factor~~ for the health and welfare of cattle ~~by~~ and reduce~~ing~~ the risk of respiratory discomfort and *diseases*. ~~It~~ Air quality is affected by air constituents such as gases, dust and micro-organisms, and is influenced strongly by management and building design in housed systems. ~~The air~~ Air composition is influenced by ~~the stocking~~ animal density, the size of the cattle, flooring, bedding, waste management, building design and ventilation system.

Proper ventilation is important for effective heat dissipation in cattle and to prevent~~ing~~ the build-up of effluent gases (e.g. ammonia and hydrogen sulphide), including those from manure ~~storage systems~~, and dust in the ~~confinement~~ housing unit. ~~Poor air quality and poor ventilation are risk factors for respiratory discomfort and *diseases*.~~ The ammonia level in enclosed housing should not exceed 25 ppm. A useful indicator is that if air quality is unpleasant for humans it is also likely to be a problem for cattle.

Outcome-based measurables: morbidity rate, ~~behaviour,~~ mortality rate, behaviour, especially respiratory rate or panting, coughing, changes in weight and body condition ~~score~~ or~~,~~ growth rate ~~curve~~ physical appearance, especially wet coat.

d) Noise

Cattle are adaptable to different levels and types of noise. However, exposure of cattle to sudden and unexpected noises, including from personnel, should be minimised where possible to prevent stress and fear reactions. Ventilation fans, alarms, feeding machinery or other indoor or outdoor equipment should be constructed, placed, operated and maintained in a manner that minimises ~~sudden and unexpected~~ noise.

Outcome-based measurables: behaviour especially agitation and nervousness ~~altered locomotory behaviour~~, changes in milk yield.

e) Flooring, bedding, resting surfaces and outdoor areas

In all production systems cattle need a well-drained and comfortable place to rest (Baxter *et al.*, 1983; Baxter, 1992; Moberg and Mench, 2000; Bell and Huxley, 2009; O'Driscoll *et al.*, 2007). All cattle in a group should have sufficient space to lie down and rest at the same time (Kondo *et al.*, 2003; Barrientos *et al.,* 2013; Chapinal *et al.*, 2013).

Particular attention should be given to the provisions for ~~calving~~ areas used for calving. The environment in such areas (e.g. floors, bedding, temperature, calving pen and hygiene) should be appropriate to ensure the welfare of calving cows and new born calves (Sepúlveda-Varas *et al.* accepted).

In housed systems calving areas should be thoroughly cleaned and provided with fresh bedding between each calving. Group pens for calving should be managed based on the principle 'all in - all out'. The group calving pen should be thoroughly cleaned and provided with fresh bedding between each animal group. The time interval between first and last calving of cows kept in the same group calving pen should be minimised.

Outdoor calving pens and ~~paddocks~~ field should be selected to provide the cow with a clean and comfortable environment. ~~(See also 7.x.5.1 point 2 point i.)~~

Floor management in housed production systems can have a significant impact on cattle welfare (Ingvartsen *et al.*, 1993; Rushen and de Passillé, 1992; Barkema *et al.*, 1999; Drissler *et al.*, 2005). Areas that compromise welfare and are not suitable for resting (e.g. places with excessive ~~water and~~ faecal accumulation, wet bedding (Fregonesi *et al.*, 2007)) should not be included in the determination ~~calculation~~ of the area available for cattle to lie down.

Slopes of the pens should ~~be maintained to~~ allow water to drain away from feed troughs and not pool ~~excessively~~in the pens.

~~Facilities~~ Flooring, bedding, resting surfaces and outdoor yards should be cleaned as conditions warrant, to ensure good hygiene, comfort and minimise ~~disease~~ risk of diseases and injuries.

In pasture systems, stock should be rotated between fields ~~paddocks~~ to ensure good hygiene and minimise ~~disease~~ risk of diseases and injuries.

Some form of bedding should be provided to all animals housed on concrete. In straw, sand or other bedding systems such as rubber mats, crumbled-rubber-filled mattresses and waterbeds, the bedding should be suitable (e.g. hygienic, non-toxic) and maintained to provide cattle with a clean, dry and comfortable place in which to lie (Fisher *et al.*, 2003; Zdanowicz *et al.*, 2004; Bell, 2007; Bell and Huxley, 2009;Fregonesi, *et al.,* 2009).

The design of a standing, or cubicle, or free stall, should be such that the ~~*animals*~~ animals can stand and lie comfortably on a solid surface (e.g. length, width and height should be appropriate for the size of the largest animal) (Tucker *et al.* 2003; Tucker *et al.*, 2004; Bell 2007; Cook *et al.*, 2008; Tucker *et al.*, 2009; Bernardi *et al.*, 2009; Anderson, 2010). There should be sufficient room for the animal to rest and to rise adopting normal postures, to move its head freely as it stands up, and to groom itself without difficulty. ~~Where possible, this design should allow for the *animal* to move its head freely as it stands up~~. Where individual spaces are provided for cows to rest, there should be at least one space per cow (Fregonesi *et al.*, 2007).

Alleys and gates should be designed and operated to allow free movement of cattle. Floors should be designed to minimise slipping and falling, promote foot health, and reduce the risk of claw injuries. ~~Slippery surfaces should be avoided (e.g. grooved concrete; metal grating, not sharp; rubber mats or deep sand) to minimise slipping and falling~~ (Rushen and de Passilé, 2006; Haufe *et al.*, 2009).

If a housing system includes areas of slatted floor, cattle, including replacement stock, should have access to a solid lying area. The slat and gap widths should be appropriate to the hoof size of the cattle to prevent injuries (Hinterhofer *et al.*, 2006; Telezhenko *et al.*, 2007).

If cattle have to be tethered whether indoors or outdoors, they should, as a minimum, be able to lie down, and stand up, maintain normal body posture, and turn around groom themselves unimpeded. Cows kept in tie stall housing should be allowed sufficient untethered exercise to prevent welfare problems. When tethered outdoors they should be able to walk. *Animal handlers* should be aware of the higher risks of welfare problems where cattle are tethered (Loberg *et al.*, 2004; Tucker *et al.*, 2009).

Where breeding bulls are in housing systems, care should be taken to ensure that they have sight of other cattle with sufficient space for resting and exercise. If used for natural mating, the floor should not be slatted or slippery.

Outcome-based measurables: morbidity rates, especially (e.g. lameness, and injury rates (e.g. hock and knee injuries and skin lesions pressure sores), behaviour, especially altered posture, grooming and locomotory behaviour, changes in weight and body condition score, physical appearance (e.g. hair loss, cleanliness score), growth rate curve.

f) Location, construction and equipment

The impacts of climate and geographical factors on dairy cattle should be evaluated when farms are established. Efforts should be made to mitigate any negative impacts of those factors, including matching dairy breed to location and consideration of alternate sites.

Farms for dairy cattle should be situated in an appropriate geographical location for the health, welfare and productivity of the cattle.

All facilities for dairy cattle should be constructed, maintained and operated to minimise the risk to the welfare of the cattle (Grandin, 1980).

In pasture and combination systems tracks and races between the milking area and paddocks field should be laid out and managed so as to minimise the overall distances walked. Construction and maintenance of tracks and races, including their surface, should minimise any risk to the welfare of the cattle, especially from foot health problems.

Equipment for milking, handling and restraining dairy cattle should only be used in a way that minimises the risk of injury, pain or distress. Manufacturers of such equipment should consider animal welfare when preparing operating instructions.

Electrified equipment designed to control animal behaviour (e.g. cow trainer, electrified gate) that has been associated with increased incidence of welfare problems should not be used may cause welfare problems if not designed and maintained properly.

Electric Electrified fences and gates should be well-designed and maintained to avoid welfare problems, and used only according to manufacturer's instructions

Cattle in all housed or pastured production systems should be offered adequate space for comfort and socialisation (Kondo *et al.*, 2003).

Where access to an outdoor area, including pasture, is possible, there may be additional benefits to dairy cattle from the opportunity to graze and exercise, especially and a decreased risk of lameness.

In all production systems, feed and water provision should allow all cattle to have ~~unimpeded~~ access to feed and water (DeVries and Keyserlingk, 2005; DeVries *et al.*, 2005, DeVries *et al.*, 2004; Endres *et al.*, 2005). Feeding systems should be designed to minimise agonistic behaviour. Feeders and water providers should be easy to clean ~~and free of spoiled, mouldy, sour, unpalatable feed and faecal contamination~~.

Milking parlours, free stalls, standings, cubicles, races, chutes and pens should be free from sharp edges and protrusions to prevent injury to cattle.

~~Where possible, t~~There should be a separate~~d~~ area ~~to closely examine~~ where individual ~~*animals*~~ animals~~,~~ can be examined closely and which ~~should have~~ has restraining facilities.

~~A hospital area for~~ When relevant, sick and injured ~~*animals*~~ animals should ~~be provided so the *animals* can~~ be treated away from healthy ~~*animals*~~ animals When a dedicated space is provided this should accommodate all the needs of the animal e.g. recumbent animals may require additional bedding or an alternative floor~~s~~ surface.

Hydraulic, pneumatic and manual equipment should be adjusted, as appropriate, to the size of cattle to be handled. Hydraulic and pneumatic operated restraining equipment should have pressure limiting devices to prevent injuries. Regular cleaning and maintenance of working parts is essential ~~imperative~~ to ensure the system functions properly and safe for the cattle.

Mechanical and electrical devices used in facilities should be safe for cattle.

Dipping baths and spray races ~~are sometimes~~ used ~~in dairy cattle production~~ for ectoparasite control~~. Where these are used, they~~ should be designed and operated to minimise the risk of crowding and to prevent injury and drowning.

Collecting yards (e.g. entry to the milking parlour) should be designed and operated to minimise stress ~~crowding~~ and prevent injuries and lameness.

The loading areas and ramps, including the slope of the ramp, should be designed to minimise stress and injuries for the animals and ensure the safety of the *animal handlers*, according to Chapters 7.2., 7.3. and 7.4.

Outcome-based measurables: handling response, morbidity rate, especially lameness, mortality rate, behaviour, especially altered locomotory behaviour, injury rate, changes in weight and body condition ~~score~~, physical appearance, ~~lameness,~~ growth ~~curve~~ rate.

g) Emergency plans

~~Where t~~The failure of power, water and feed supply systems could compromise *animal welfare*~~,~~. D~~d~~airy producers should have contingency plans to cover the failure of these systems. These plans may include the provision of fail-safe alarms to detect malfunctions, back-up generators, ~~access to maintenance providers~~ contact information for key service providers, ability to store water on farm, access to water cartage services, adequate on-farm storage of feed and alternative feed supply.

~~Dairy producers should have contingency plans to cover the evacuation of animals in case of emergency (e.g. fire, flooding).~~

~~Outcome-based measurables: mortality, morbidity, behaviour, vocalization.~~

Preventive measures for emergencies should be input-based rather than outcome based. Contingency plans should include an evacuation plan and be documented and communicated to all responsible parties. Alarms and back-up systems should be checked regularly.

2. Recommendations on stockmanship and animal management

Good management and stockmanship are critical to providing an acceptable level of *animal welfare*. Personnel involved in handling and caring for dairy cattle should be competent and ~~receive up-to-date appropriate~~ with relevant experience or training to equip them with the necessary practical skills and knowledge of dairy cattle behaviour, handling, health, biosecurity, physiological needs and welfare. There should be a sufficient number of *animal handlers* to ensure the health and welfare of the cattle.

a) Biosecurity and animal health

i) Biosecurity and disease prevention

For the purpose of this chapter, b~~B~~iosecurity means a set of measures designed to maintain a *herd* at a particular health status and to prevent the entry or spread of infectious agents.

Biosecurity plans should be designed, ~~and~~ implemented and maintained, commensurate with the best possible ~~desired~~ *herd* health status, available resources and infrastructure, and current *disease* risk and, for ~~OIE~~ *listed diseases* in accordance with relevant recommendations ~~found~~ in the *Terrestrial Code*.

These *biosecurity plans* should address the control of the major sources and pathways for spread of pathogens:

– cattle, including introductions to the herd,
– calves coming from different sources,
– other domestic animals, ~~and~~ *wildlife*, and pests,
– people including sanitation practices,
– equipment, tools and facilities,
– *vehicles*,
– air,
– water supply, feed and bedding,
– manure, waste and dead stock disposal,
– ~~feed,~~
– semen and embryos.

Outcome-based measurables: morbidity rate, mortality rate, reproductive efficiency, changes in weight and body condition ~~score~~, changes in milk yield.

ii) Animal health management

For the purpose of this chapter, a~~A~~nimal health management means a system designed to optimise the physical and behavioural health and welfare of the dairy *herd*. It includes the prevention, treatment and control of *diseases* and conditions affecting the *herd* (in particular mastitis, lameness, ~~reproduction~~ reproductive and metabolic diseases).

There should be an effective programme for the prevention and treatment of *diseases* and conditions, formulated in consultation with a *veterinarian*, where appropriate. This programme should include the recording of production data (e.g. number of lactating cows, births, animal movements in and out of the *herd*, milk yield), morbidities, mortalities, culling rate and medical treatments. It should be kept up to date by the *animal handler*. Regular monitoring of records aids management and quickly reveals problem areas for intervention.

~~At national or regional level there should be programmes to gather records and monitor diseases of importance for animal welfare.~~

For parasitic burdens (e.g. endoparasites, ectoparasites and protozoa), a programme should be implemented to monitor, control and treat, as appropriate.

Lameness can be ~~is~~ a problem in dairy cattle ~~herds~~. *Animal handlers* should ~~take measures to prevent lameness, and~~ monitor the state of feet and claws, and take measures to prevent lameness and maintain foot health (Sprecher et al., 1997; Flower and Weary, 2006; Chapinal et al., 2009)

Those responsible for the care of cattle should be aware of early specific signs of *disease* or distress (e.g. coughing, ocular discharge, changes in milk appearance, chang~~inges~~ in locomoti~~on~~ory behaviour ~~score~~), and non-specific signs such as reduced feed and water intake, reduction of milk production, changes in weight and body condition, changes in behaviour or abnormal physical appearance (FAWC, UK, 1993; Ott *et al.*, 1995; Anonymous, 1997; Blecha, 2000; EU-SCAHAW, 2001; Webster, 2004; Mellor and Stafford, 2004; Millman *et al.*, 2004; OIE, 2005; Appleby, 2006; Broom, 2006; Gehring *et al.*, 2006; Fraser, 2008; Blokhuis *et al.*, 2008; Mench, 2008; Fraser, 2009; Ortiz-Pelawz *et al.*, 2008; FAWAC, Ireland; Hart, 1987; Tizard, 2008; Weary *et al.*, 2009).

Cattle at higher risk of *disease* or distress will require more frequent inspection by *animal handlers*. If *animal handlers* suspect the presence of a *disease* or are not able to correct the causes of *disease* or distress, they should seek advice from those having training and experience, such as *veterinarians* or other qualified advisers, as appropriate.

~~In the event of an *OIE listed disease* being suspected or diagnosed, the official veterinary services should be notified (see Chapter 1.1. of the *Terrestrial Code*).~~

Vaccinations and other treatments administered to cattle should be carried out ~~undertaken~~ by *veterinarians* or other people skilled in the procedures and on the basis of veterinary or other expert advice.

Animal handlers should be competent ~~have experience~~ in managing chronically ill or injured cattle, for instance in recognising and dealing with non-ambulatory cattle, especially those that have recently calved. Veterinary advice should be sought as appropriate.

Non-ambulatory cattle should have access to water at all times and be provided with feed at least once daily and milked as necessary. They should be provided shade and protected from predators. They should not be transported or moved unless absolutely necessary ~~except~~ for treatment or diagnosis. Such movements should be done carefully using methods avoiding dragging or excessive lifting.

Animal handlers should also be competent in assessing fitness to transport, as described in Chapter 7.3.

In case of ~~chronic~~ *disease* or injury, when treatment has failed or ~~been attempted and~~ recovery ~~deemed~~ is unlikely (e.g. cattle that are unable to stand up, unaided or refuse to eat or drink), the ~~*animal*~~ animal should be humanely killed (AABP, 2013; AVMA, 2013) ~~and~~ in accordance with ~~to Chapter 7.5 or~~ Chapter 7.6 ~~as applicable~~.

~~*animals*~~ Animals suffering from photosensitisation should be provided with ~~offered~~ shade and where possible the cause should be identified.

Outcome-based measurables: morbidity rate, mortality rate, reproductive efficiency, depressive behaviour, altered locomotory behaviour, physical appearance and changes in weight and body condition ~~score~~, changes in milk yield.

iii) Emergency plans for disease outbreaks

Emergency plans should cover the management of the farm in the face of an emergency *disease outbreak*, consistent with national programmes and recommendations of *Veterinary Services* as appropriate.

b) Nutrition

The nutrient requirements of dairy cattle have been well defined. Energy, protein, mineral and vitamin content of the diet are major factors determining milk production and growth, feed efficiency, reproductive efficiency, and body condition (National Research Council, 2001).

Cattle should be provided with access to an appropriate quantity and quality of balanced nutrition that meets their physiological needs. ~~Feeding systems should be designed to minimise agonistic behaviour.~~

Where cattle are maintained in outdoor conditions, short term exposure to climatic extremes may prevent access to nutrition that meets their daily physiological needs. In such circumstances the *animal handler* should ensure that the period of reduced nutrition is not prolonged and that extra food and water supply are provided if welfare would otherwise be compromised.

Animal handlers should have adequate knowledge of appropriate body condition ~~scores~~ scoring systems for their cattle and should not allow body condition to go outside an acceptable range according to breed and physiological status (Roche *et al.*, 2004; Roche *et al.*, 2009).

Feedstuffs and feed ingredients should be of satisfactory quality to meet nutritional needs and stored to minimise contamination and deterioration (CA 2004, CAC/RCP 54-2004). Where appropriate, feed and feed ingredients should be tested for the presence of substances that would adversely impact on animal health (Binder, 2007). Control and monitoring of animal feed should be implemented in accordance with relevant recommendations in Chapter 6.3.

The relative risk of digestive upset in cattle increases as the proportion of grain increases in the diet or if quality of silage is poor. ~~Therefore, when g~~Grain or new diets ~~is given to dairy cattle it~~ should be introduced slowly and ~~constitute no more than 50% of the daily diet. P~~palatable fibrous food such as silage, grass and hay, should be available *ad libitum* to meet metabolic requirements in a way that promotes digestion and ensures normal rumen function.

Animal handlers should understand the impact of cattle size and age, weather patterns, diet composition and sudden dietary changes in respect to digestive upsets and their negative consequences (displaced abomasum, sub-acute ruminal acidosis, bloat, liver abscess, laminitis) (Enemark, 2008; Vermunt and Greenough, 1994). Where appropriate, dairy producers should consult a cattle nutritionist for advice on ration formulation and feeding programmes.

Particular attention should be paid to nutrition in the last month of pregnancy, with regards to energy balance, roughage and micronutrients, in order to minimise calving and post-calving diseases and body condition loss (Drackley, 1999; Huzzey *et al.*, 2005; Bertoni *et al.*, 2008; Goldhawk *et al,* 2009; Jawor *et al.,* 2012; Vickers *et al.,* 2013).

Liquid milk (or milk replacer) is essential for healthy growth and welfare. However, ~~f~~Feeding calves all-liquid diets as the sole source of nutrition after 4-6 weeks of age limits the physiological development of the ~~fore-stomach~~ rumen ~~and the normal development of the process of rumination.~~ Calves over two weeks old should have a sufficient daily ration of fibrous food and starter ration (concentrate) to promote rumen development and to reduce abnormal oral behaviours ~~(Reece & Hotchkiss, 1987).~~

Dairy producers should become familiar with potential micronutrient deficiencies or excesses for ~~housed and pastured~~ production systems in their respective geographical areas and use appropriately formulated supplements where necessary.

All cattle, including unweaned calves, need an adequate supply and access to palatable water that meets their physiological requirements and is free from contaminants hazardous to cattle health (Lawrence *et al.*, 2004a; Cardot *et al.*, 2008).

Outcome-based measurables: mortality rates, morbidity rates, behaviour~~,~~ especially agonistic behaviour (at the feeding area), changes in weight and body condition ~~score~~, reproductive efficiency, changes in milk yield, growth rate ~~curve~~ vocalisation.

c) Social environment

Management of cattle should take into account their social environment as it relates to *animal welfare,* particularly in housed systems (Le Neindre, 1989; Sato *et al.*, 1993; Jóhannesson and Sørensen, 2000; Bøe and Færevik, 2003; Bouissou *et al.*, 2001; Kondo *et al.*, 2003). Problem areas include: agonistic and oestrus activity, mixing of heifers and cows, feeding cattle of different size and age in the same pens, decreased space allowance ~~high stocking density~~, insufficient space at the feeder, insufficient water access and mixing of bulls.

Management of cattle in all systems should take into account the social interactions of cattle within groups. The *animal handler* should understand the dominance hierarchies that develop within different groups and focus on high risk ~~*animals*~~ animals, such as very young, very old, small or large size for cohort group, for evidence of agonistic behaviour ~~bullying~~ and excessive mounting behaviour. The *animal handler* should understand the risks of increased agonistic interactions between ~~*animals*~~ animals, particularly after mixing groups~~. Cattle that are suffering from excessive agonistic activity should be removed from the group~~ (Bøe and Færevik, 2003; Jensen and Kyhn, 2000; von Keyserlingk *et al.*, 2008).

When other measures have failed, cattle that are expressing excessive agonistic activity or excessive mounting behaviour should be removed from the group (Bøe and Færevik, 2003; Jensen and Kyhn, 2000; von Keyserlingk et al., 2008).

Animal handlers should be aware of the *animal welfare*~~,~~ problems that may be caused by mixing of inappropriate groups of cattle~~,~~ and provide adequate measures to minimise them (e.g. introduction of heifers in a new group, mixing of ~~*animals*~~ animals at different production stages that have different dietary needs) (Grandin, 1998; Grandin, 2003; Grandin, 2006; Kondo *et al.*, 2003).

Horned and non-horned cattle should not be mixed because of the risk of injury (Menke *et al.*, 1999). When farmers intend to change the phenotype of their animals, they should take appropriate measures to reduce this risk.

Outcome-based measurables: behaviour~~,~~ especially ~~(e.g.~~ lying times~~,)~~, physical injuries and lesions, changes in weight and body condition ~~score~~, physical appearance (e.g. cleanliness), lameness scores, changes in milk yield, morbidity rate, mortality rate, growth rate~~,~~ ~~curve~~ vocalisation.

d) ~~Stocking density~~ Space allowance

Cattle in all production systems should be offered adequate space for comfort and socialisation (Kondo *et al.*, 2003).

~~High stocking densities~~ Insufficient and inadequate space allowance may increase the occurrence of injuries and have an adverse effect on growth ~~curve~~ rate, feed efficiency, and behaviour such as locomotion, resting, feeding and drinking (Martin and Bateson, 1986; Kondo *et al.*, 2003).

Space allowance ~~Stocking density~~ should be managed taking into account different areas for lying, standing and feeding. ~~such that c~~ Crowding should not ~~does not~~ adversely affect normal behaviour of cattle and durations of time spent lying (Bøe and Færevik, 2003).

~~This includes the ability to~~ All cattle should be able to rest simultaneously, and each animal ~~to~~ lie down ~~freely~~, stand up and move ~~around~~ freely. ~~without the risk of injuries, move freely around the pen and access feed and water.~~In growing animals, space allowance ~~Stocking density~~ should also be managed such that weight gain ~~and duration of time spent lying~~ is not adversely affected ~~by crowding~~ (Petherick and Phillips, 2009). If abnormal behaviour is seen, corrective measures should be taken, such as increasing space allowance, ~~reducing stocking density~~, redefining the areas available for lying, standing and feeding.

In pastured systems, stocking density should depend on the available feed and water supply and pasture quality (Stafford and Gregory, 2008).

Outcome-based measurables: behaviour, especially agonistic or depressive behaviour, morbidity rate, mortality rate, changes in weight and body condition ~~score~~, physical appearance, changes in milk yield, parasite burden, growth rate ~~curve.~~

e) Protection from predators

Cattle should be protected ~~as much as possible~~ from predators.

Outcome-based measurables: mortality rate, morbidity rate (injury rate), behaviour, physical appearance.

f) Genetic selection

Welfare and health considerations, in addition to productivity, should be taken into account when choosing a breed or subspecies for a particular location or production system (Lawrence *et al.*, 2001; Lawrence *et al.*, 2004b; Boissy and Le Neindre, 1997; Dillon *et al.*, 2006; Boissy *et al.*, 2007; Jensen *et al.*, 2008; Veissier *et al.*, 2008; Macdonald *et al.*, 2008). ~~Examples of these include nutritional maintenance requirement, ectoparasite resistance and heat tolerance.~~

In breeding programmes, ~~at least as much~~ attention should be paid to criteria conducive to the improvement of cattle welfare, including health~~, as to production criteria~~. The conservation and development of genetic lines of dairy cattle, which limit or reduce animal welfare problems, should be encouraged. Examples of such criteria include nutritional maintenance requirement, disease ~~ectoparasite~~ resistance and heat tolerance.

Individual ~~*animals*~~ animals within a breed should be selected to propagate offspring that exhibit traits beneficial to animal health and welfare by promoting robustness and longevity. These include resistance to infectious and production related *diseases*, ease of calving, fertility, body conformation and mobility, and temperament.

Outcome-based measurables: morbidity rate, mortality rate, length of productive life, behaviour, physical appearance, reproductive efficiency, lameness, human-animal relationship, growth rate ~~curve,~~ body condition ~~score~~ outside an acceptable range.

g) Artificial insemination, pregnancy diagnosis and embryo transfer

Semen collection should be carried out by a trained operator in a manner that does not cause pain or distress to the bull and any teaser animal used during collection and in accordance with Chapter 4.6.

Artificial insemination and pregnancy diagnosis should be performed by a competent operator and in accordance with the provisions of Chapter 4.7.

Embryo transfer should be performed under an epidural or other anaesthesia by a trained operator, preferably a *veterinarian* or a *veterinary para-professional* and in accordance with the provisions of Chapter 4.7.and Chapter 4.8.

Outcome-based measurables: behaviour, morbidity rate, reproductive efficiency

h) Dam and Ssire selection and calving management

Dystocia is can be a welfare risk to dairy cattle (Proudfoot *et al*, 2009). Heifers should not be bred before they reach are at the stage of physical maturity sufficient to ensure the health and welfare of both dam and calf at birth. The sire has a highly heritable effect on final calf size and as such can have a significant impact on ease of calving. Sire selection for embryo implantation, insemination or natural mating, should take into account the maturity and size of the female.

Pregnant cows and heifers should be managed during pregnancy so as to achieve an appropriate body condition range for the breed. Excessive fatness increases the risk of dystocia and metabolic disorders during late pregnancy or after parturition.

Cows and heifers should be monitored when they are close to calving. *Animals* Animals observed to be having difficulty in calving should be assisted by a competent handler as soon as possible after they are detected.

Outcome-based measurables: morbidity rate (rate of dystocia), mortality rate (cow and calf), reproductive efficiency, especially rate of dystocia, retained placenta and metritis, body condition score.

i) Newborn calves (see also 7.x.5.1e)

Calving aids should not be used to speed the birthing process, only to assist in cases of dystocia, and should not cause undue pain, distress, or further medical problems.

Newborn calves are susceptible to hypothermia. The temperature and ventilation of the birthing area should consider the needs of the newborn calf. Soft, dry bedding and supplemental heat can help prevent cold stress.

Receiving adequate immunity from colostrum generally depends on the volume and quality of colostrum ingested, and how soon after birth the calf receives it.

Animal handlers should ensure that calves receive sufficient colostrum, preferably from their own dam, and within 24 hours of birth to provide passive immunity. Colostrum is most beneficial if received during the first six hours after birth. Where there is risk of disease transfer from the dam, colostrum from a healthy cow should be used. Where possible, calves should continue to receive colostrum or equivalent for at least five days after birth.

Where new Recently born calves need to be should not be transported until the navel has healed is dry, and after which time any transport required this should be carried out according to Chapter 7.3.

Calves should be handled and moved in a manner which minimises distress and avoids pain and injury.

Outcome-based measurables: mortality rate, morbidity rate, growth rate curve.

j) Cow-calf separation and weaning

Different strategies to separate the calf from the cow are utilised in dairy cattle production systems. These include early separation (usually within 48 hours of birth) or a more gradual separation (leaving the calf with the cow for a longer period so it can continue to be suckled). Separation is ~~can be~~ stressful for both cow and calf (Newberry and Swanson, 2008; Weary *et al.*, 2008).

For the purposes of this chapter, weaning means the change from a milk-based diet to a fibrous diet and the weaned calf no longer receives milk in its diet. This change should be made ~~done~~ gradually and calves should be weaned only when their ruminant digestive system has developed sufficiently to enable them to maintain growth, health and good welfare (Roth *et al.*, 2009).

~~If necessary,~~ ~~d~~Dairy cattle producers should seek expert advice on the most appropriate time and method of weaning for their type of cattle and production system.

Outcome-based measurables: morbidity rate, mortality rate, behaviour after separation (vocalisation~~s~~, activity of the cow and calf), physical appearance, changes in weight and body condition ~~score~~, growth rate ~~curve~~.

k) Rearing of replacement stock

Young calves are at particular risk of thermal stress. Special attention should be paid to management of the thermal environment (e.g. provision of additional bedding, nutrition or protection to maintain warmth and appropriate growth). (Camiloti *et al.*, 2012)

~~Where possible,~~ R~~r~~eplacement stock should be reared in groups. Animals in groups should be of similar age and physical size (Jensen and Kyhn, 2000; Bøe and Færevik, 2003).

Whether reared individually or in group pens ~~When in pens~~, each calf should have enough space to be able to turn around, rest, stand up and groom comfortably and see ~~and touch~~ other animals. ~~(see also 1.e).~~

Replacement stock should be monitored for cross-sucking and appropriate measures taken to prevent this occurring (e.g. provide~~sion of~~ sucking devices, revise or modify feeding practices, provide other environmental enrichments ~~use of nose guards or temporary separation~~) (Seo *et al.*, 1998; Jemsem, 2003; De Paula Vieira *et al.*, 2010; Ude *et al.*, 2011).

Particular attention should be paid to the nutrition, including trace elements, of growing replacement stock to ensure good health and that they achieve an appropriate growth curve for the breed and farming objectives.

Outcome-based measurables: morbidity rate, mortality rate, behaviour, especially cross-sucking, altered grooming and lying behaviours, injuries, physical appearance, changes in weight and body condition ~~score~~, growth rate ~~curve, reproduction efficiency~~.

l) Milking management

Milking, whether by hand or machine, should be carried out in a calm and considerate manner in order to avoid pain and distress. Special attention should be paid to the hygiene of personnel, the udder and milking equipment (Barkema *et al.*, 1999; Breen *et al.*, 2009). All cows should be checked for abnormal milk at every milking.

Milking machines, especially automated milking systems, should be used and maintained in a manner which minimises injury to teats and udders. Manufacturers of such equipment should provide operating instructions that consider animal welfare.

A regular milking routine should be established relevant to the stage of ~~the~~ lactation and the capacity of the system. ~~(e.g. For example, cows female in full lactation may need more frequent milking to relieve udder pressure,).~~ ~~All milking cows should be checked for abnormal milk at all milking times.~~

Animal handlers should regularly check the information provided by the milking system and act accordingly to protect the welfare of the cows.

~~Where a milking machine is used, it should be maintained, according to the recommendations of the manufacturer, in order to minimise teat and udder damage.~~

Special care should be paid to ~~*animals*~~ animals being milked for the first time. ~~If possible~~, ~~t~~They should be familiarised with the milking facility prior to giving birth.

Long waiting times before and after milking can lead to health and welfare problems (e.g. lameness, reduced time to eat). Management should ensure that waiting times are minimised.

Outcome-based measurables: morbidity rate (e.g. udder health), behaviour, changes in milk yield, milk quality, physical appearance (e.g. lesions).

m) Painful husbandry procedures

Husbandry practices are routinely carried out in cattle for reasons of management, *animal welfare* and human safety. Those practices that have the potential to cause pain should be performed in such a way as to minimise any pain and stress to the ~~*animal*~~ animal. Example of such interventions include: dehorning, tail docking and identification.

~~Alternative procedures that reduce or avoid pain should be considered.~~

Future options for enhancing *animal welfare* in relation to these procedures include: ceasing the procedure and addressing the current need for the operation through management strategies; breeding cattle that do not require the procedure; or replacing the current procedure with a non-surgical alternative that has been shown to enhance *animal welfare*.

~~Example of such interventions include: dehorning, tail docking and identification.~~

i) Disbudding and ~~D~~ dehorning ~~(including disbudding)~~

Horned ~~D~~dairy cattle ~~that are naturally horned~~ are commonly disbudded or dehorned in order to reduce animal injuries and hide damage, improve human safety, reduce damage to facilities and facilitate transport and handling (Laden *et al.*, 1985; Petrie *et al.*, 1996; Singh *et al.*, 2002; Sutherland *et al.*, 2002; Stafford *et al.*, 2003; Stafford and Mellor, 2005). ~~Where practical and appropriate for the production system,~~ the selection of polled cattle is preferable to dehorning.

Performing disbudding at an early age ~~where practicable,~~ is preferred, rather than dehorning older cattle.

Thermal cautery of the horn bud by a trained operator with proper equipment is the recommended method in order to minimise post-operative pain. This should be done at an appropriate age before the horn bud has attached to the skull.

Guidance from a *veterinarian* or *veterinary paraprofessional* as to the optimum method and timing for the type of cattle and production system should be sought. The use of anaesthesia and analgesia are strongly recommended when performing disbudding, and should always be used when dehorning. Appropriate restraint systems and procedures are required when disbudding or dehorning.

Other methods of disbudding include: removal of the horn buds with a knife and the application of chemical paste to cauterise the horn buds. Where chemical paste is used, special attention should be paid to avoid chemical burns to other parts of the calf or to other calves. This method is not recommended ~~because pain management is difficult~~ for calves older than two weeks.

Operators should be trained and competent in the procedure used, and be able to recognise the signs of pain and complications that may include excessive bleeding~~,~~ or sinus infection.

~~Where it is necessary to dehorn dairy cattle, producers should seek guidance from veterinary advisers as to the optimum method, use of anesthesia and analgesia, and timing for their type of cattle and production system.~~

~~Performing dehorning or disbudding at an early age, where practicable, and the use of anaesthesia or analgesia, under the supervision of a *veterinarian*, are strongly recommended.~~

~~Thermal cautery of the horn bud by a trained operator with proper equipment is the recommended method in order to minimise post-operative pain. This should be at an appropriate age before the horn bud has attached to the skull. Other methods of dehorning include: removal of the horn buds with a knife and the application of chemical paste to cauterise the horn buds. Where chemical paste is used, special attention should be paid to avoid chemical burns to other parts of the calf or to other calves.~~

Methods of dehorning when horn development has commenced involve the removal of the horn by cutting or sawing through the base of the horn close to the skull. ~~Operators removing developed horns from dairy cattle should be trained and competent in the procedure used, and be able to recognise the signs of complications (e.g. excessive bleeding, sinus infection).~~

ii) Tail docking

~~Research shows that t~~Tail docking does not improve the health and *welfare* of dairy cattle ~~*animals*~~, and therefore it is not recommended~~, as a routine procedure, to dock the tails of dairy cattle.~~ As an alternative, trimming of tail hair should be considered where maintenance of hygiene is a problem (Sutherland and Tucker, 2011).

iii) Identification

Ear-tagging, ear-notching, tattooing, ~~freeze~~ branding and radio frequency identification devices (RFID) are ~~preferred~~ methods of permanently identifying dairy cattle ~~from an *animal welfare* standpoint~~. The least invasive approach should be adopted whichever method is chosen (e.g. the least ~~minimum~~ number of ear tags per ear~~,~~ and the smallest ~~size of~~ notch practical). It should be accomplished quickly, expertly and with proper equipment. ~~In some situations however hot iron branding may be required or be the only practical method of permanent identifying dairy cattle. If cattle are branded, it should be accomplished quickly, expertly and with the proper equipment. Identification systems should be established also according to Chapter 4~~

Freeze branding is thought to be less painful than branding with a hot iron. Both methods should be avoided as alternative identification methods exist (e.g. electronic identification or ear-tags). When branding is used, the operator should be ~~trained and~~ competent in procedures used and be able to recognise signs of complications.

Identification systems should be established also according to Chapter 4.1.

Outcome-based measurables: ~~postprocedural complication rate~~, morbidity rate (post-procedural complications), abnormal behaviour, vocalisation, physical appearance, ~~changes in weight and body condition score~~.

n) Inspection and handling

Dairy cattle should be inspected at intervals appropriate to the production system and the risks to the health and welfare of the cattle. ~~In most circumstances cattle~~ Lactating cows should be inspected at least once a day. Some ~~*animals*~~ animals ~~may benefit from~~ should be inspected more frequentl~~y,~~ ~~inspection~~ for example~~:~~ neonatal calves (Larson *et al.*, 1998; Townsend, 1994), cows in late gestation (Boadi and Price, 1996; Mee, 2008; Odde, 1996, Proudfoot, K., et al. 2013), newly weaned calves, cattle experiencing environmental stress and those that have undergone painful husbandry procedures or veterinary treatment.

Dairy cattle identified as sick or injured should be given appropriate treatment at the first available opportunity by competent ~~and trained~~ *animal handlers*. If *animal handlers* are unable to provide appropriate treatment, the services of a *veterinarian* should be sought.

Recommendations on the handling of cattle are also found in Chapter 7.5. In particular handling aids that may cause pain and distress (e.g. ~~sharp prods,~~ electric goads) should be used only in extreme circumstances and provided that the animal can move freely. Dairy cattle should not be prodded in sensitive areas including the udder, face, eyes, nose or ano-genital region. Electric prods should not be used on calves (see also point 3 of Article 7.3.8.).

Where dogs are used~~,~~ as an aid for cattle herding~~,~~ they should be properly trained. *Animal handlers* should be aware that presence of dogs can stress the cattle and cause fear and should keep them under control at all times. The use of dogs is not appropriate in housed systems, collection yards or other small enclosures where the cattle cannot move freely away.

Cattle are adaptable to different visual environments. However, exposure of cattle to sudden ~~or persistent~~ movement or changes in visual contrasts should be minimised where possible to prevent stress and fear reactions.

Electroimmobilisation should not be used.

Outcome-based measurables: human-animal relationship, morbidity rate, mortality rate, behaviour, especially altered locomotory behaviour, vocalisations. ~~reproductive efficiency, changes in weight and body condition score, changes in milk yield.~~

o) Personnel training

All people responsible for dairy cattle should be competent according to their responsibilities and should understand cattle husbandry, animal handling, milking routines, reproductive management techniques, behaviour, biosecurity, signs of *disease*, and indicators of poor *animal welfare* such as stress, pain and discomfort, and their alleviation.

Competence may be gained through formal training or practical experience.

Outcome-based measurables: human-animal relationship, morbidity rate, mortality rate, behaviour, reproductive efficiency, changes in weight and body condition ~~score~~, changes in milk yield.

p) Disaster management

Plans should be in place to minimise and mitigate the effect of disasters (e.g. earthquake, flooding, fire, hurricane). Such plans may include evacuation procedures, identifying high ground, maintaining emergency food and water stores, destocking and humane killing when necessary.

~~Plans should be in~~ ~~place to minimise and mitigate~~There should also be plans to address the effects of ~~natural disasters or~~ extreme climatic conditions, such as ~~heat stress,~~ drought, blizzard and flooding. ~~Humane *killing* procedures for sick or injured cattle should be part of the emergency action plan~~. In times of drought, animal management decisions should be made as early as possible and these should include a consideration of reducing cattle numbers.

Humane *killing* procedures for sick or injured cattle should be part of the disaster management plan.

Reference to emergency plans can also be found in points 1 g) and 2a) iii) of Article 7.X.5.

q) Humane killing

For sick and injured cattle a prompt diagnosis should be made to determine whether the animal should be treated or humanely killed.

The decision to kill an ~~*animal*~~ animal humanely and the procedure itself should be undertaken by a competent person.

Reasons for humane killing may include:

– severe emaciation, weak cattle that are non-ambulatory or at risk of becoming non ambulatory ~~downers~~;

– non-ambulatory cattle that will not stand up, refuse to eat or drink, have not responded to therapy;

– rapid deterioration of a medical condition for which therapies have been unsuccessful;

– severe, debilitating pain;

– compound (open) fracture;

– spinal injury;

– central nervous system *disease*;

– multiple joint *infections* with chronic weight loss; ~~and~~

– ~~premature~~ calves that are premature and unlikely to survive, ~~or calves that~~ have a debilitating congenital defect, or otherwise unwanted ~~calves; and~~.

– as part of disaster management response.

For a description of acceptable methods for humane *killing* of dairy cattle see Chapter 7.6.

— Text deleted.

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