



Module 11

Livestock Welfare Assessment (Part 2)

Lecture Notes

Slide 1:

This lecture was first developed for World Animal Protection by Dr David Main (University of Bristol) in 2003. It was revised by World Animal Protection scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

Slide 2:

The previous module introduced the main causes of poor welfare – that is, the roles of economics and the farming system, as well as the animal's genetics and the stockperson. Then we highlighted welfare problems in high-production farming of cattle.

In this module we shall review the main welfare problems seen in pigs, poultry and some other livestock, again with emphasis on high-production systems.

We will finish by examining ways to improve the welfare problems we have highlighted in each species. We will focus on examples of:

- genetic improvements
- the use of incentives and enforcement
- your role as a veterinarian working with farm clients.

Slide 3:

High-production systems for pigs may be classified as those for sows, those for unweaned piglets, those for weaned pigs or 'weaners', and those for fattening pigs.

You will recall from Module 10 that any farming system can create welfare problems or have the potential for good welfare, and this depends on welfare inputs, i.e. the husbandry system, the animals themselves, and the stockmanship.

Slide 4:

There are three principal systems for housing sows when they are pregnant and not suckling piglets. The first is a stall system, shown in this slide.

The sows are housed singly in stalls. With some systems, sows are tethered within the stalls by a chain around their neck or body. The sows in the picture are not tethered.

A chain or low gate at the back of each stall keeps the sows in place, and there is a dunging channel there.

The flooring may be fully or partially slatted or solid concrete. There is no bedding.

Food is provided to each sow in the trough at the front.

Slide 5:

The second type of housing for sows is loose housing.

In this system sows are housed indoors in groups, in controlled environment buildings.

Group size ranges from four to over 100, and floors may be fully or partially slatted, solid concrete, or may have scant straw or a deep straw bed. In the picture you see piglets on a deep straw bed.

Feeding may be electronic, whereby a feeder releases the calculated amount of food for each sow when it is triggered by a transponder around the sow's neck.

In other loose-housing systems, sows are fed as a group. There, feed may be scattered in order to encourage rooting behaviour, or it may be provided in troughs within stalls that pigs can enter at will.

Both the electronic system and the group system of feeding limit the amount of food each sow can ingest. However, there are also *ad libitum* feeding systems for sows where the feed is often a liquid mixture of milk and food waste from factories.

Slide 6:

The third type of production system is free range.

Here the sows live outside in groups.

They have shelters bedded with straw, often called arks, shown in the picture. The sows forage by rooting, and they are provided with supplementary food as necessary.

Slide 7:

When the time comes for parturition the arrangement for the sow depends on the husbandry system, i.e. stalls, loose housing or free range.

We noted in the previous lecture that farmers' profit margins are often very low. Consequently, the farmer needs cost-effective farrowing systems that ensure the survival of the piglets.

The most common farrowing system is the farrowing crate because it reduces the number of piglets crushed by the sow, while taking up very little space. These crates also facilitate monitoring of the sows and the piglets.

Farrowing crates are used for sows who are housed in single stalls and for sows in some loose-housed systems.

The sow is taken into a farrowing crate up to a week prior to farrowing. She remains in the crate until the piglets are weaned, which is typically at two, three or four weeks of age.

Slide 8:

We will now consider the welfare issues that each of these husbandry systems may create for sows.

You recall that animal welfare is a complex concept with three overlapping areas of concern, shown on the slide. Also, different sectors of society may value one area of welfare more than the others, and may therefore favour a particular type of welfare input. For example, many consumers would not like the stall system or some of the loose-housing systems because consumers perceive that those systems do not fully satisfy the naturalness aspect of animal welfare. Those consumers generally prefer animals to live outside.

In contrast, some farmers believe that physical functioning is the most important aspect of welfare. Because of economic pressures, they may prefer the stall system.

Slide 9:

We will use the Welfare Quality® framework to consider the welfare of sows in the different systems.

As you know, it has four main welfare areas, with a total of 12 welfare criteria. Please take a minute to review the slide and remind yourself of the different criteria.

Slide 10:

The main welfare problems in sows are shown on the slide. Some of these problems are inherent to the housing systems. Others can be rectified by good stockmanship, and we will look at some in more detail in a moment. But first, the list is:

Area 1 – good feeding. This is a consequence of the sow's genetics. Sows may also be hungry if the feed is scattered among the group, in loose-housed systems, as some sows may not get their share.

Area 2 – good housing. Depending on the system, sows may experience discomfort because of insufficient space or bedding for resting or locomotion. Also, both indoor and outdoor housing can give rise to extremes of temperature or humidity which the sows may not be able to avoid.

Area 3 – good health. Problems here include:

- injuries to the lower limb such as pressure sores, because of lack of bedding
- sows in groups may fight and injure each other, and they may bite each other's vulvas. This can happen if they are overcrowded, or do not have material to root in
- painful diseases can occur in sows, notably joint disorders and muscle weakness; these can result from a combination of restricted movement in single stalls, and the genetics of fast-growing lines of pig
- vaginitis can be common in sows in single stalls, if they are too large for the stalls and sit in their faeces.

Area 4, appropriate behaviour, can include several welfare problems.

Sows in single stalls, or in loose housing that has no bedding or other enrichment can all suffer from the negative emotional state of frustration. This is related to the next behavioural point, i.e. it is because they cannot perform behaviours that are important to them, notably rooting. Sows in farrowing crates experience frustration at being unable to build a nest.

Sows in stalls or groups may experience anxiety or fear because of their inability to avoid other sows who may be aggressive to them.

Sows in any system may also experience fear of people, if they are not handled gently.

Slide 11:

We shall now look more closely at these welfare issues. The first is good feeding.

The problem of hunger in sows is similar to that in dairy cows. In both cases, they are an inherent consequence of the welfare input of the animal's genetics.

We have selected lines of sows who produce piglets which grow very quickly. That makes it possible to get pigs to slaughter in less time. However, this rapid growth is associated with a large appetite.

If the breeding stock were able to eat according to their appetite, they would become fat, less fertile, and be at high risk of becoming lame.

The lameness would arise due to a combination pro-inflammatory endocrine effects from white adipose tissue (German, 2010), and excessive physical strain on the joints, coupled with varying degrees of disordered ossification and leg weakness (osteocondrosis) that many young pigs develop because of their rapid growth rate (van Grevenhof et al., 2012).

Such consequences of feeding sows to appetite would be a welfare concern and they would be costly, given the small profit margins of pork production. Consequently, farmers must restrict their sows' food intake.

Restriction may be in the form of not feeding the sows at all on one day every week – this may be done in systems where sows normally eat *ad libitum* liquid feed.

Another method is always to feed a restricted amount; this amount can be tailored to each sow in stall systems and in loose-housed systems where sows wear electronic collars to trigger the release of their feed. However, where sows are fed as a group, there will be competition for the available food. This is made worse by the fact that sows naturally tend to eat as a group. Under that type of loose-housed system, feeding sows as a group can make hunger worse for sows who cannot get their share of food.

In all cases, frustration may occur if sows cannot respond to their hunger by performing natural food-seeking behaviour, i.e. rooting.

Overall, the sow's genetics create an inherent welfare problem with regard to hunger.

Stalls also have an inherent limitation because they are not large enough to allow the sow to show rooting behaviour in response to her feelings of hunger. However, each sow is sure to get her allotted share of food.

Loose-housing systems can be modified to overcome this. For example, the sows may have electronic feeders and access to rooting material.

So, in regard to the welfare problem of hunger, loose housing offers higher welfare potential than stalls. Free-range systems are probably the best of the three systems here, because of the rooting they allow. However, note that the problem of competition for food may be similar to those in loose housing unless there is careful planning.

Slide 12:

The second area of welfare concern is good housing.

Stalls are very confining. They provide limited room for sows to modify their position and maximise their comfort. As with cubicles for cows, if the housing is old, the stalls may be too small for the newer generations of sows, who are bred to be larger. Also, because stalls prevent sows from walking around, many sows develop muscular weakness in the legs which can cause discomfort when they get up and lie down.

Farrowing crates are also very confining, and do not have the space to allow sows to build a nest, which is an important behaviour for them. However, farrowing crates do protect piglets from crushing. We will look at these in more detail later on.

Stalls and some loose-housed systems do not provide bedding. Lying on concrete can cause discomfort. However, slatted floors are also associated with high levels of lameness in sows, as well as piglets and growing pigs. In sows, prolonged lying on hard surfaces is associated with calluses and development of fluid-filled swellings over prominent joints, a condition called bursitis.

Outdoor systems include shelters with straw bedding. However, if the ground is stony, sows may suffer discomfort when they walk about outside.

Sows in both outdoor and indoor systems may suffer thermal discomfort.

Outdoor sows may not have access to wallowing areas to allow them to cool down if it is very hot or humid. Exposure to sun can cause sunburn.

Outdoor sows also need well insulated shelters to protect them from very cold, wet or windy weather.

Sows in stalls or loose-housed systems may suffer from extreme heat, cold or humidity if the ventilation system is poor, or if there are interruptions to the electricity supply.

Most of these problems can be rectified by simple changes in housing and stockmanship. However, stalls have the lowest welfare potential in regard to overall housing, because they lack space and bedding and that is inherent to the stall system. So, overall we can say that loose-housing or outdoor systems have higher welfare potential than stalls with regard to good housing.

Slide 13:

Next we consider good health.

None of the three husbandry systems can provide completely disease-free, pain-free care to sows. However, with good biosecurity (defined in the OIE's *Terrestrial Animal Health Code* as measures to prevent the introduction and spread of infectious disease (OIE, 2011)) and conscientious stockmanship, disease should not be widespread in any system.

The main disease problems in sows are listed on the slide.

Sows who do not have soft material underfoot can develop foot disorders which cause pain, which manifests as lameness. This can be a problem for sows in single stalls and sows in loose-housed systems which do not provide bedding. Lameness tends to be more common in sows kept on slatted floors, although it is not clear why.

Outdoor sows may also develop foot disorders if they are kept on stony ground.

In all these cases, part of the underlying problem can be the sow's genetics. If sows have been selected to produce piglets who grow quickly to a large size, adult sows will also tend to be large and have relatively high muscle mass. This can predispose them to joint disease in any system.

Urinary tract infections (UTIs) are relatively common in sows kept in stalls, particularly if the stalls are not long enough. When those sows are lying down, their perineal area is in their urine and faeces, which causes ascending infections of the bladder and the vulva/vagina.

Sows who are chained in their stalls may also develop sores on their neck.

Slide 14:

Note that monitoring sows for signs of disease is easiest in the stall system. In loose-housed or free-range systems it takes more time for the farmer to visit each group of sows and check each one for signs of disease.

Painful procedures are not routine in sows. However, in some outdoor systems, sows are given nose rings to prevent the sow from rooting too much and destroying the pasture.

Rings may be placed through the septum or in the outer edge of the nose. Little research has been carried out into this, but the nose is a sensitive area and local anaesthesia should be used. It may be that rings in the outer edge of the nose cause more pain when sows root than a ring in the septum so, on balance, the septal ring is better.

Overall, despite ease of monitoring, we can say that stalls offer the lowest welfare potential for overall health, because foot disorders and urogenital infections are inherent to that system but can be avoided by stockmanship and husbandry in the other systems.

Slide 15:

Moving on to the fourth area of welfare concern, appropriate behaviour, sows may experience fear – because of aggression by the sows next to them, in the stalls, or aggression from other sows in the group if they are loose housed or outside.

Rough handling by the stockperson can also cause fear.

A second very common negative experience for sows in some high-production systems is frustration. This can arise from not having materials to root in, and not having materials to nest in at the time of parturition. Those are both very important behaviours for sows.

Rooting is how pigs naturally acquire their food if living in the wild, and part of how they explore their territory. When pigs do not have access to rooting materials, they can experience varying degrees of frustration.

This frustration is most marked in sows in stalls and can result in redirected bar biting behaviour that becomes persistent and stereotyped. The frustration may cause other sows in stalls to become very passive and sit on their haunches, being unresponsive for much of the time.

These behaviours indicate that the environment is or has been very inadequate; however, the behaviours may also be adaptive such that other sows in the environment who do not show the behaviours may in fact be coping less well than the sows who are bar biting or sitting passively.

Sows in groups who do not have access to rooting materials may tend to fight or to bully each other, which in turn can create fear.

Apart from a lack of rooting material, another source of frustration occurs when sows are approaching parturition if they cannot build a nest – we will consider this with the next slide when we look at farrowing crates.

However, we can say that loose-housing and free-range systems have no inherent constraints on the performance of rooting or nesting behaviour because they both offer space which can accommodate those materials. Stall systems do not have the space to provide those materials. Therefore, inherently, stall systems have lower potential than the other two in regard to behaviour.

Slide 16:

We shall now consider farrowing crates. Sows have been selected to have large litters, so it may be hard for sows to see and avoid all their piglets if they live in a more open system. Sows kept in stalls or in some loose housing typically give birth in farrowing crates which are used to prevent piglets from being crushed in their first weeks of life. You can see from the picture that the flooring is uneven and contains no substrate.

Another reason why sows may crush their piglets is that the sows themselves are large, because of genetic selection, and may have leg weakness and foot disorders, partly because of earlier confinement in stalls.

The crate shown in the slide also has an area that the piglets can 'escape' to, to avoid the sow when she is lying down. This greatly protects piglet welfare.

However, the necessity to use the crate also reflects some inherent welfare problems of sows, i.e. leg weakness resulting from genetics and, in the case of the stall system, lack of normal locomotion.

Slide 17:

Welfare problems for the sow in the farrowing crate occur mainly in areas 2 to 4 of welfare.

First, good housing: comfort is restricted as the sow has little room to move and she cannot turn around. Also the crates may not provide much bedding.

Health is also a problem with farrowing crates, because restricting the sow's movement can increase the likelihood of dystocia. Sows who farrow in crates may also suffer more from UTIs.

Perhaps the biggest problem is in area 4, appropriate behaviour. There is strong scientific evidence that sows are as motivated to build a nest as to eat in the 36 hours prior to farrowing. However, nesting behaviour is not possible in farrowing crates because of the lack of space and the lack of substrate for nesting.

A further negative welfare aspect is that a sow in a farrowing crate is unable to bond normally with her piglets.

Slide 18:

You now have an overview of the main types of high-production sow husbandry and the welfare potential of each type. Overall, stall systems do not have as high potential for good welfare in all areas as the other systems do, and many countries have banned them, e.g. the Philippines and EU member countries. However, note that the welfare potential of each of the three systems is enhanced or reduced by stockmanship and the animal's genetics. For example, a well-managed stall system could provide better overall welfare than a badly managed outdoor system where the pigs are not adapted to the local climate.

Note also that market pressures may cause farmers to choose stalls over the other systems despite their inherent welfare problems. That is because stall systems can be the most efficient financially, e.g. they make the best use of space; there is no need for bedding; there is greater ease of monitoring each sow.

We shall now move on to consider the welfare of piglets in high-production systems.

Slide 19:

The main welfare problems in piglets are shown on the slide. Again, some of these problems are inherent to the housing systems. The list is:

Area 1 – good feeding. Hunger: when there are large numbers of piglets in the litter, there may not be enough teats for all the piglets to feed from. As sows only let down milk for limited periods, when all their teats are occupied, this may mean that some piglets do not have the access or the time to feed sufficiently.

Area 2 – good housing. We have seen that piglets risk being crushed by the sow, which may injure or kill them. If there is insufficient bedding, or no heat lamp, piglets may suffer from cold. This is a potential problem with outdoor systems. Conversely, if there is poor environmental control in indoor systems, the piglets may be too hot.

Area 3 – good health. Problems here include:

- injuries from being crushed by the sow
- lameness when the piglets have been weaned and are moved to pens with slatted floors. This type of flooring tends to be associated with high levels of foot injuries
- diarrhoea as a result of early weaning
- painful procedures, i.e. castration, tail docking and teeth clipping.

The fourth area, appropriate behaviour, is perhaps less problematic in piglets. Potential concerns are:

- fear of people if piglets are not handled gently
- fighting over teats causing anxiety
- possibly, attack by other sows if they live in a group system.

Slide 20:

Diarrhoea following weaning is common in piglets in high-production systems.

In the wild, piglets are weaned at between seven and twelve weeks of age. However, in order to increase the number of piglets produced by each sow each year, in high-production systems, piglets are typically weaned at between three and four weeks, or sometimes as young as two weeks old. They are typically moved into 'flat deck' pen systems that have slatted floors but may have no bedding. Litters of piglets may be mixed together.

Early weaning may help to reduce the risk of the piglets getting a disease from the sow, by separating them before the maternal immunity derived from colostrum diminishes. However, the abrupt change from suckling to a solid diet often causes diarrhoea. Also, the stress of the abrupt loss of maternal contact and mixing with other piglets in new and barren environments may all increase piglets' susceptibility to enteric disease.

Slide 21:

Painful surgical procedures are an important welfare concern in piglets. You are now familiar with the pain pathway and you know that performing surgery without analgesia causes pain at the time and for some days afterwards.

First, teeth-clipping. As you may know, piglets are born with fully erupted canine teeth. The teeth are sharp and help the piglets to compete with each other for teats, and then establish and maintain the teat order. This competition arises in part because sows only let their milk down for about 20 seconds at a time, at intervals of just under an hour.

Unlike most other domestic animals, piglets cannot suckle ad lib and must quickly secure a teat in order to feed. In this process, the piglets' teeth can damage the faces of litter mates and the teats of the sow which is why some producers clip the teeth.

The procedure is performed at two to three days of age, without an anaesthetic, using pliers or an electrical grinder. The procedure is painful and it should not be routine, as it may be unnecessary.

Tail docking is often also performed at two to three days of age. This is done to prevent tail biting as the piglets get older, as this can cause infection and spinal abscesses.

Tails may be 'tipped', where just the tip is removed, or 'short docked', leaving a short stump. Local anaesthesia is not usually used.

There are many aspects of pig husbandry that are suspected of contributing to tail biting, among which are barren environments (fully or partly slatted floors with no substrate) and high stocking densities, although occasionally tail biting may occur even in straw yards at low stocking densities.

Castration is the third painful procedure of concern. It is typically performed without anaesthesia or analgesia, when piglets are two to three days old. This is done to prevent 'boar taint', a strong characteristic flavour and odour that is caused by sexual hormones present in the meat of male pigs at slaughter.

Some vets and farmers argue that, because it hurts to inject local anaesthetic, it is better not to use it. This argument is not supported by research, which indicates that the pain caused by injection is much less than that caused by castration without analgesia.

We will now move on to discuss the welfare issues for growing pigs.

Slide 22:

This slide lists the common welfare problems in growing pigs in high-production systems.

Indoor systems may have slatted floors, or they may have a solid lying area and slatted dunging area.

Other systems may have straw, sawdust or other bedding that the pigs can also root in and manipulate as shown in the picture.

Outdoor systems are also used.

Slide 23:

This slide shows the main welfare problems seen in growing pigs.

Area 1 – good feeding. Prolonged thirst can occur if there is a problem with electronic watering systems. If these fail, pigs may develop problems with osmotic regulation which can cause brain oedema and death. Growing pigs have large appetites, partly due to their genetics.

Prolonged hunger may occur if there is competition for food when it is scattered among the group, in loose-housed systems. Note again that the pigs' genetics make them grow very quickly and so have a very big appetite: therefore, not getting enough food may make their hunger relatively severe.

Area 2 – good housing. If pigs are kept at high stocking densities they may become too hot, and aversive levels of ammonia may occur in the air, from their urine and faeces.

Partially slatted or concrete floors may be uncomfortable. Thermal comfort may be difficult to maintain in both hot and cold weather.

Area 3 – good health. Problems here include injuries, which may occur because of large or unstable groups that fight. Tail biting can cause infection and pain, sometimes resulting in spinal abscesses and hind limb paralysis.

If there is no bedding, pigs may develop pressure sores or abrasions from lying on the hard floor. Slatted floors in particular are associated with higher levels of bruised feet and lameness than systems with deep bedding or outdoor systems.

Respiratory disease can also be a problem in growing pigs, sometimes resulting in extreme distortion of the turbinate bones and snout.

Joint disorders and muscle weakness are common because of the pigs' very rapid growth. As we noted for beef cattle, muscle weakness and lameness may be exacerbated if pigs are given excessive amounts of beta-agonist growth promoters during the last weeks of growth.

Possible problems in area 4, appropriate behaviour, can include fear and anxiety as a result of bullying, and fear of humans.

Generally, all these problems can be reduced by adjustments such as managing group size, ensuring there is a good alarm system on the water supply, and providing bedding that the pigs can root in. So, we can say that bedded or outdoor systems have higher welfare potential than those without bedding.

Slide 24:

Before we leave pigs, you can see that there are many welfare concerns.

As a vet visiting a client, your work will include watching out for all these problems using your observations of welfare outputs and welfare inputs.

You can use your observations to work out why the bad welfare outputs may be occurring. As we have seen, often the causes are a complex interaction of overriding economic pressure, unsuitable genetics, and housing, none of which can be easily changed. However, there will also be related aspects of stockmanship, which will be easier to change.

You will then need to inform the farmer of your findings and suggestions, and to support him/her in making changes. In Module 17, we look at the issue of communication with farm clients in a little more detail.

Slide 25:

We shall now look at the welfare problems seen in poultry – mainly hens and chickens.

Breeding flocks (those who produce the eggs that will hatch into laying hens, or into meat chickens) are mostly kept in houses similar to the barn systems of laying hens, so many of the welfare problems are similar.

Slide 26:

The primary husbandry systems for laying hens are:

1. Battery cages – in some countries this includes ‘furnished cages’. Those are designed to provide for behavioural needs and they include a nest box, a perch, a dust-bathing substrate, and a little more space per bird.
2. Barn systems – here hens are not confined and live in groups of hundreds or thousands within a barn that has deep litter (e.g. sawdust) or straw on the floor. To make use of vertical space, some barn systems have tiers of platforms where the stockperson can walk too, or simply tiers of perches. This is known as an aviary; if the aviary provides perching areas, it is called a perchery system.
3. Free range and organic free range – depending on the local definition, ‘free range’ can simply mean a barn system (indoors). However, the public understands ‘free range’ to mean that the hens live outside for some or all of the day.

Most of the eggs consumed in the world come from one of these types of systems, most typically battery cages. However, note that in many countries (e.g. India) smallholder farmers may keep 10–100 hens either housed or in their back yards.

The eggs are especially important for the health of the poorest rural communities, which may be too remote for them to access eggs that are produced in more commercial, caged systems.

Eggs produced in smallholder conditions may also be important for the income of people living in some cities.

In all smallholder systems, the hens' welfare problems may concern issues of health and malnutrition, more than the other issues that we will now focus on in more high-production systems. However, restrictive dark housing and feather pecking may also be a concern in some smallholder units.

Slide 27:

Before we look at the most common welfare problems of hens in high-production egg systems, we will see how every husbandry system has the potential for good or bad welfare.

Battery cages are shown in the picture on the left. In this system, hens are typically kept in small cages, in groups of 4–10 birds and without natural light. The system enables the stockperson to see the birds individually and to monitor health, hygiene and production relatively easily. Also, hens are better adapted to living in small groups than in the groups of hundreds or thousands found in non-caged systems.

However, the lack of space and environmental complexity within cages are inherent problems. This means caged systems have low welfare potential in the areas of naturalness and associated feelings, but high potential in the area of physical function.

The picture on the right shows a hen in a free-range, outdoor system. This has high welfare potential in the areas of naturalness and associated feelings because it provides space and environmental complexity.

Free-range systems are more demanding for the stockperson. They can also create higher risks of parasitism, predation and thermal discomfort, unless the hens have access to shade and are securely fenced in. The risk of intestinal parasitism is increased because unlike in caged systems, the bedding / litter of barn systems, and the grass and soil of outdoor systems become contaminated with faeces.

This enables intestinal parasites, such as the roundworm *Ascaridia galli*, to complete the stages of their life cycle, so that infective stages are available for ingestion by the hens. This increases the birds' intestinal load and resulting egg output by the parasites, further contaminating the area.

When the intestinal load of parasites is high enough, it can overwhelm local immunity and result in disease with e.g. blood loss, reduced feed conversion efficiency and increased risk of aggressive behaviour (Gauly et al., 2007).

However, these welfare problems can usually be resolved through improved design or management. This means that, overall, a well-managed free-range system has higher welfare potential than a well-managed cage system.

Slide 28:

The main welfare problems in laying hens in the various high-production systems are shown on the slide.

Area 1 – good feeding. In some countries hens may be subject to a ‘forced moult’ at the end of their laying cycle. Then, feed, water and sometimes light are severely restricted for up to two weeks in order to stop laying. Subsequently, the birds are brought back into lay. This maximises egg production per bird and can be economical for the farmer because of the pricing structure of the local market. However, a forced moult imposes severe restrictions on hens. Also, because of the need to control light, it is only used with caged hens, who do not have the space or facilities to express their motivation to eat (e.g. by foraging).

Consequently, forced moulting is illegal in several countries on the grounds of animal welfare.

Area 2 – good housing. Cage systems and densely stocked barn systems may both cause discomfort. For example, in a cage each hen typically has an area of space that is no bigger than a standard piece of A4 office paper, and often may be even less than that. This lack of space does not permit the birds to move or rest comfortably, or to perform highly motivated behaviours such as nesting. Cages also do not provide litter. Instead they typically have wire floors; these may cause foot lesions and do not provide a soft resting area.

In barn systems, if the litter or straw are not replenished so that they stay dry and clean, the birds may not have adequate dry resting space.

In all indoor systems, air quality, especially the concentration of ammonia, may be a concern. Dust levels are a concern in barn systems. High levels of dust and ammonia may predispose the birds to respiratory disease.

Hens in outdoor systems may suffer from extremes of temperature if there is not enough shelter.

Area 3 – good health. In all systems, laying hens are at risk of several health problems.

The first is injury caused by cannibalism. This is found in all systems, and may tend to occur less in caged systems than in barn or free-range systems. It tends to occur as a sudden ‘outbreak’ at any stage in the laying cycle, and may kill 10–15 per cent of birds. The causes of cannibalism are not fully understood. It seems to follow from feather pecking and a degree of group learning.

One of the reasons for feather pecking may be the lack of opportunity to forage easily. That is, hens would not normally live in the very large, crowded groups found in barn or some free-range systems. Nor would hens normally live in the very small, crowded groups found in cages. Neither condition leaves them free to forage without being crowded. Under all these systems, birds may tend to redirect their foraging behaviour at each other, by pecking, and

they may peck at one bird in particular. This pecking can progress to cannibalism, with high levels of injury or death.

Because of the serious consequences of pecking, beak trimming is common for hens in all the systems.

Another problem for laying hens is broken bones secondary to osteoporosis. Osteoporosis is a pathology of the bones that results from chronic loss of calcium; that loss can occur for a combination of reasons, including lack of exercise coupled with a high metabolic need for calcium. Laying hens are bred to produce approximately one egg per day, producing a total of about 300 over a period of 12–14 months. After that, their productivity is too low and they are taken for slaughter – unless forced moulting is used to start a second laying period.

It is impossible for the hen's gut to absorb all the calcium that is needed to produce egg shells so frequently. Instead, the calcium is drawn from their bones. Over time, this makes the bones weak and they fracture easily (e.g. when they are handled for slaughter at the end of their lives). This problem of weak bones is made worse when the birds are in cages where they do not have much opportunity to exercise using their legs and wings. However, injuries secondary to osteoporosis may be more common in barn systems: if hens do not know how to land or perch, they may easily fracture their keel bone when they fly up to perch.

A study of 102 hens from four farms that used percheries found that birds with keel fractures produced fewer eggs, rested more, and could not access food and water easily.

On the parent farms, the prevalence of keel fractures varied from 15–30 per cent; i.e. between 1,500 and 3,600 hens on each farm had a keel fracture. Based on the data, this means that those birds produced 5 per cent fewer eggs over seven days than birds without fractures. The parent farms had between 7,000 and 20,000 birds: you can imagine how difficult it must be for the stockperson to spot and attend to birds who might have keel fractures. In contrast, the cage system does not have the space to cause those kinds of fractures, and the stockperson can identify injured birds more easily.

A further point is that the relatively high level of keel fractures in percheries can be an example where 'bad' has become normal – it is almost an inherent part of the perchery system unless the birds are trained as chicks to use perches. More generally, high egg-production rates have made osteoporosis a normal consequence of most husbandry systems for laying hens.

Disease is always a risk for housed animals, especially at the high stocking density of high-production systems. Biosecurity is important, with appropriate vaccinations, anti-parasitic treatments, etc. Without these, hens in all systems can suffer diseases from organisms such as *coccidia*, and *salmonella*.

Birds living in barn systems or living outside can suffer from the ectoparasite *Dermanyssus gallinae* (red mite). This is a significant problem around the world: the mite causes blood loss and may be a vector for other diseases. The mite also causes itchiness and reduces egg production.

Finally, we have seen that hens in all systems typically undergo beak trimming because it prevents the worse problem of cannibalism. However, beak trimming is a painful procedure that may also cause chronic pain.

Slide 29:

In many countries, beak trimming is typically done at one day of age using a heated blade (thermocautery), as shown in the picture. The upper beak is cut back and research indicates that the procedure is very painful.

If a large amount of beak is removed, this is more painful and can create feeding problems for the adult bird. If the thermocautery is done when the chicks are older some birds may suffer from chronic pain that continues throughout adulthood.

This chronic pain occurs because the beak is richly innervated, and neuromas may form at the cut end making it painful for the bird to use her beak at all. Neuromas are clusters of cells that develop at the cut end of a nerve and they can be a source of extreme pain so it is best to minimise the risk of them forming.

There is currently no clear evidence to show that trimming done at one day of age causes prolonged acute pain or neuromas. That is one reason why trimming by thermocautery at one day of age is preferred. However, a drawback of the procedure at that age is that the beak can regrow.

The length of remaining beak and any pain from neuromas can create feeding difficulties because of pain and because the shortened upper beak makes it difficult for the birds to prehend the meal that they are fed, and the meal may tend to gather in their nostrils.

An alternative to thermocautery trimming is the use of an infra-red beam, which cuts the tissues without contact. Infra-red trimming has largely replaced thermocautery in some countries. A study published in 2012 suggested that the infra-red method is unlikely to cause chronic pain or neuromas (McKeegan & Philbey, 2012).

While more research is needed, the increasing weight of evidence suggests that the infra-red method is more humane.

Slide 30:

The fourth area of welfare concern, appropriate behaviour, includes several problems.

First, hens suffer the negative emotional state of recurrent frustration if they do not have the opportunity to show nesting behaviour in the hours before they lay an egg. This is a species-typical behaviour that is highly important for them and in that sense it is comparable to nesting behaviour for farrowing sows. Traditional cages do not permit nesting behaviour, but furnished cages do permit it. Free-range and barn systems provide nesting areas and have the advantage that the hen has a choice of nesting sites.

Second, hens can suffer anxiety and fear if they are picked on by others during episodes of feather pecking and cannibalism. These problems may be related in part to social distance and the group size either being too small and crowded (cages), or too large and perhaps crowded (barn systems).

In both cases, when hens are pecked they typically respond by becoming very still and limp. This is a typical response to attack by a predator, and in the wild may cause the predator to go away or allow the hen to subsequently escape. However, in domestic birds, becoming still makes them more of a target.

Third, hens will perch and dust bathe if they can. Traditional cages do not allow these behaviours and so they do not permit the birds the opportunity to experience the positive emotion of pleasure.

The perches in furnished cages are sometimes too close to the floor for birds to be able to use them comfortably, and we have seen that perchery systems can be associated with high levels of keel fractures.

As with all farmed species, rough handling by stockpeople and lack of experience of handling by humans can create fear in hens in any system. When birds have osteoporosis, correct handling becomes especially important.

Slide 31:

We shall now move on to consider the welfare of chickens who are reared for meat. Another name for these birds is 'broilers'. They are typically reared in barns with deep litter or straw, in large groups. Meat chickens are generally kept in a controlled environment, in dark buildings at high stocking densities. Broilers are typically slaughtered at 6 weeks of age when they weigh an average of 2 kg. This is a very, very rapid growth rate.

Note that cannibalism is very uncommon among broilers – unlike with group-housed laying hens, who are kept together for much longer – so broiler birds do not have their beaks trimmed.

Slide 32:

The main welfare problems are shown on the slide.

Area 1 – good feeding. Prolonged hunger is a concern for the same reasons as in growing pigs and their parent stock: that is, meat birds have also been bred to grow very quickly, so they have big appetites. The breeding stock have to have their food intake restricted otherwise they would become overweight and suffer joint disease. Among the growing broiler birds, competition for access to food in large groups may result in some birds being hungry. Also, we will see below that lameness is common in broiler birds. This can prevent them from accessing food and water; some are therefore dehydrated.

Area 2 – good housing. Depending on the stocking density, birds may have relatively little space to move around as they grow bigger. Dust and ammonia levels are other potential problems and can predispose the birds to respiratory disease.

Area 3 – good health. Broiler birds are prone to significant health problems. Their rapid musculoskeletal growth results in a bird with relatively high muscle mass, but immature, cartilaginous leg bones and an immature circulatory system. The consequences of this can be leg deformity, in the joints, bones and tendon, which can be very painful. Related to this, if the stocking density is very high, the litter can be wet and heavily contaminated with bacteria. Lamé birds lie in this contaminated litter, and the ammonia in it causes dermatitis of the feet, hocks and chest area, where the bird comes into contact with the litter. Bacteria can easily enter skin lesions, causing disease, especially bone infections.

Another problem related to the high growth rate is that the need for circulation to the rapidly developing muscles puts a strain on the heart, which grows more slowly. Consequently, broilers can develop cardiac insufficiency, causing breathlessness.

Although broiler birds do not exhibit cannibalism and do not need to have their beaks trimmed, the situation is different with the breeding stock, who produce the broiler chicks. The hens and cockerels used for breeding hens (for eggs) and broilers typically have their beaks trimmed to avoid cannibalism. In addition, the breeding males (cockerels) may have their toes and spurs routinely removed to reduce damage to hens during mating, and to reduce fighting within their groups. Cockerels may also have their combs and wattles cut off, to reduce damage to them in feeding systems. Note that, again, because of the naturally fast growth and high appetite of broiler chickens, the adults must have their feed restricted, which may be done by covering the feeding area with grids which would damage the male's combs and wattles.

Some male broiler birds may be castrated, as this makes them have more fat cover, and it is a preferred meat in some markets. All of these procedures cause pain, and some are illegal or tightly regulated in certain countries. For example:

- Beak-trimming of hens—whether breeding stock or commercial laying stock— is prohibited in Norway, Finland and Sweden.
- In Norway and Sweden, the removal of cockerels' toes and spurs is allowed but is tightly regulated (Fiks van Niekerk & de Jong, 2007)

Slide 33:

The fourth area of welfare concern, appropriate behaviour, is an area of relatively low concern in meat birds because they do not undergo the movement, transport and mixing that pigs and cattle do, and because in their short lives they do not go through different stages of maturity with different environmental needs. Even so, the over-simple housing typical of commercial conditions limits behaviour, and this is even more important for breeding stock.

However, human handling at the time of transport and slaughter is a major potential area of concern as the birds have relatively little interaction with humans. We will return to this in the modules about slaughter and transport (16 and 25, respectively).

Slide 34:

We shall now move on to consider the welfare of other livestock.

Slide 35:

Around the world, many species of animal are farmed for their meat, their milk, and their skin. There has been relatively little or, in some cases, no research into the welfare of many of these species. For example, we do not know all the behaviours that may be most important to each species, or the best ways to house and feed them so that all three aspects of welfare are met under different husbandry systems.

The slide lists some examples of these other species. Some are species which are farmed on a small scale, e.g. in parts of South America smallholders may keep guinea pigs in the home, for meat. Some species are domesticated and have been farmed intensively for some decades, but there has been relatively little research on their welfare as a whole. Examples here are guinea pigs, rabbits and sheep.

However, other species are relatively undomesticated and are being farmed to satisfy high-value markets that are still quite new in many countries. Examples here are crocodiles, peccaries, deer, ostrich, rhea and many species of fish.

In this lecture, we cannot examine all the welfare problems that may occur in all those animals, although modules 23 and 24 discuss the welfare of farmed fish and shellfish.

Slide 36:

If you should work with any of those species when you are in practice, you will probably be asked most about physical functioning, especially disease control and production. However, you now know that you always need to consider feelings and naturalness, partly because improving these areas may also improve an animal's physical functioning.

When you work with the animals for your clients, you can still use the twelve-point welfare framework shown on this slide to help you provide your client with the most scientific, feasible and humane recommendations for his or her animals.

Note that you will want to keep your clinical faculties alert as you use this framework, especially in regard to good feeding. The criteria in the framework were developed for animals in high-production systems where balanced feeding is usually the norm. However, with other systems, such as subsistence farming, malnutrition or, possibly, over-nutrition may be a concern.

Slide 37:

Using that framework, here are some examples of potential welfare concerns in the species we have just listed: sheep may suffer prolonged hunger in extensive systems or in situations where their economic value is so low that the farmer does not provide supplementary feed.

In some countries geese are force-fed grain for several weeks before slaughter because this induces a fatty liver which in French is 'foie gras'. The liver is used to make a meat paste or foie gras pâté, which is a high-status delicacy in many countries.

In clinical terms, 'fatty liver' is a pathology because the organ does not normally store fat. When the liver becomes fatty, this impairs liver functioning in the long term (i.e. over months or years). The geese are fed by a tube inserted into their stomach through their mouth, so that grain is fed directly into the stomach. This over-feeding of grain causes diarrhoea and may damage the oesophagus. It is illegal in some countries. However, the birds probably do not live long enough to suffer any physical consequences from having a fatty liver.

Moving on to area 2, good housing: rabbits are often farmed in cages with no enrichment, inadequate floor space and not enough space to stand and hop normally.

Area 3, good health: turkeys tend to have the same problems with their limbs and heart as broiler chickens do. This is because of the rapid growth rate and disproportionately large pectoral muscles of meat birds.

Area 4, appropriate behaviour: an example in this area is the farming of peccaries, a type of wild pig found in tropical parts of South America. In the wild, these animals forage over a large area. As livestock, they are typically confined and may spend a lot of time resting, i.e. doing nothing. However, a study where the animals had access to an enriched feeding device increased the time they spent exploring, and decreased the time they spent resting. It seemed that a more complex environment would make their experience of confinement more positive.

Slide 38:

We end this lecture by considering how we can improve livestock welfare.

Slide 39:

The following principles apply to improving the welfare of any species of livestock, including all the ones we have just mentioned but cannot examine in detail.

First, the three welfare inputs can usually be improved. We will start with the husbandry system. You now know that every system has the potential to provide good or bad welfare (although some have more potential for good welfare), and that often this depends on market forces and other economic factors. Module 12 looks more closely at the effect of economics on animal welfare.

The second welfare input that can provide better animal welfare is the animal's genetics.

You have seen in dairy cows, pigs and chickens how breeding for productivity alone can have serious adverse consequences on physical functioning and mental state/feelings. Also, this focus on productivity can necessitate restrictive housing that does not fulfil the naturalness aspect of welfare.

The third welfare input is the stockperson or farmer – his or her knowledge, understanding and attitude. Incentives and penalties may cause the stockperson to improve his or her animals' welfare. Incentives may be social, in the form of the farmer's personal pride in his or her animals, or the opinion of peers.

Incentives may also be economic, e.g. consumers' willingness to pay more for products from high-welfare systems creates more money for farmers who meet the standards required. That is the basis for quality assurance schemes, as we discussed in Module 9.

Penalties might also be social – if a farmer was not seen by his or her peers to have a high standard, they may be ostracised. However, a more likely penalty would be loss of access to the high-priced market.

Legislation may also play a role in improving animal welfare.

Many countries require minimum standards for a given husbandry system, and they may prohibit certain systems. If the laws are enforced, this creates another sort of penalty.

Note that the effectiveness of any incentives, penalties and legislation depends very much on wider public concern within a given country. The level of that concern may in turn depend on many factors, such as average income level, public awareness and culture. For example, countries may have laws about farming but no money to provide inspectors to enforce the law. Module 5 (on legislation) explores this in more detail.

As vets in practice, you can always advise and help farmers to improve their welfare inputs.

You will find that some farmers and stockpeople are unwilling to follow your advice. There may be many reasons for this, some of them related to human factors such as temperament and communication. Research on this is only just beginning, and will need to be done in each country, as the cultural and other factors concerned will vary. However, many farmers are open to your advice. They will want to use incentives and to observe the law to ensure their animals enjoy good welfare.

We shall now apply all these principles to the welfare of the main livestock species we have looked at.

Slide 40:

We will start with improving the welfare of pigs.

For the farming system, we saw earlier that the stall system for sows has inherently low welfare. In general, for sows, piglets and growing pigs, group housing is best, so long as there is a stable group structure. Outdoor or indoor systems with deep bedding and no unexposed slatted floors are best of all. Within each system, each animal must receive his or her share of food without aggression from the other animals; for example, electronic feeding systems for sows, with individual feeding stalls. Also, feeding high-fibre food may help to reduce feelings of hunger in sows.

'Manipulable' materials are important in all indoor systems so pigs can express their exploratory and rooting behaviours. Some systems provide growing piglets with chains hanging from the ceiling for manipulation, but no material on the floor. Deep bedding that animals can root in and manipulate with their snouts is better.

All indoor flooring systems can cause problems with lameness, but slats seem to be the worst here. Deep bedding on a solid floor is probably best in that regard.

Generally, it may be possible to avoid the use of farrowing crates by using breeds and individual genetic lines of sow who show good mothering. They typically can farrow and raise piglets successfully in pens with plenty of straw and enough room for the sow to turn around and see where the piglets are when she lies down. The pens do not have to be big, but have a low rail at the front and sides, so that piglets can get away from the mother when she is lying down or moving about.

A final welfare addition in any farming system is the hospital pen, so that a sick animal can rest undisturbed and be monitored easily. It can be very important for pigs, as sick animals may be bullied. However, a study of pig farmers in Canada (Millman, 2007) indicated that many were unaware of the importance of a hospital pen and did not provide one.

Slide 41:

Moving on to the genetics of pigs: the rapid growth rate underlies very significant problems of joint disease, pain and hunger at different stages of the life cycle. As it has been possible to breed for the rapid growth rate, it is also possible to breed for a slower growth rate, or to use strains with a lower growth rate. While food is generally the highest cost in any farming system, and these strains need longer to grow, this can sometimes be offset by increased meat quality, or by other advantages of such strains such as heat tolerance.

Other traits where selective breeding could contribute to improved welfare may include aggression, tail biting, mothering (as noted earlier), and boar taint, which is one of the main reasons for castrating male piglets.

The stockperson can contribute a great deal to pig welfare by, for example, gentle handling of the pigs at all stages of life, and biosecurity. Within this area, note that boar taint may be prevented by a vaccine against gonadotrophin-releasing factor (GnRH). This is available

commercially. However, note that the attitudes of stockpeople and farmers towards the need to change their own behaviour or their husbandry system are complex and they may not change easily. For example, a study of Dutch farmers who were part of the Welfare Quality® project indicated that farmers who had not yet adopted group housing – which will become a legal requirement in all EU countries in 2013 – had less knowledge and skills concerning group housing than farmers who had already changed.

That example brings us to the other areas where pig welfare might be improved: incentives, penalties and legislation. For example, from 2013 farmers in EU countries may no longer keep sows in stalls. In 2000 the Philippines implemented wide-ranging, minimum legal standards for pigs. This included providing pigs with enough trough space for them all to eat at once (necessary because pigs naturally eat as a group and may fight if there is inadequate space at the trough when food arrives).

As a veterinarian to a pig farm you may be faced with many of the welfare challenges that we have outlined in today's lecture. However, now that you understand some of the inherent and external factors that can improve welfare, you also have the background to engage with your clients and understand their concerns, so that you can explore solutions that will improve the pigs' wellbeing. For example, Improvac, the GnRH vaccine that prevents boar taint, is now marketed in over 50 countries. You could open a discussion with your farm client about whether she or he has considered using it, and what the advantages and disadvantages of doing so might be in their case.

Slide 42:

Moving on to the improvements that can be made for chickens. For the farming system, we saw earlier that the traditional cages that are used for laying hens have inherently low welfare. In general, barn or free-range systems can offer much better welfare because they permit foraging, nest building, dust bathing and perching. Furnished cages provide nesting, perching and dust-bathing areas, so they do improve hens' welfare. However, they still do not allow birds to forage, and they do not provide enough space for the hens.

Note that many consumers assume that changing from a cage system to an organic free-range one has to be the best solution of all. However, both free-range systems can create welfare problems, as we have seen. These may be a particular problem for free-range broilers in organic systems. In particular, organic systems may require broiler birds to be aged eight weeks at slaughter instead of six weeks. If your farm client tries to improve welfare (and access the premium price of the organic market), but she or he still uses birds who are genetically selected for high-production systems, the fast growth rate of these birds may make them particularly hungry.

Similarly, those birds may require the addition of micronutrients to the diet to overcome metabolic causes of lameness resulting from higher growth rates. Organic standards prohibit the inclusion of synthetic nutrients in the diet and, again, your client may experience more birds with leg problems in the organic system if she or he is using a fast-growing breed. Using appropriate breeds or lines of birds will prevent these problems.

We have seen the many health problems that can arise in broiler birds in traditional systems. A hospital facility does not make sense in high-production poultry systems, either for breeding stock or for egg-producing birds, because of the low market value of the birds and eggs.

Slide 43:

This brings us to other aspects of how genetics can help improve chicken welfare.

Even in high-production systems, broiler birds would benefit from genetic selection for slower-growing lines of bird, for the same reasons as in pigs.

Aggressivity and cannibalism may have a genetic component. So although these problems occur in all egg-production systems, they may be reduced by using certain genetic lines. Fearfulness may also have a genetic element. Using low-fear lines of birds reduces the risk of injuries during handling.

Eggs and chicken meat have relatively low value and the stockpeople may have low wages, long working hours, and they may be paid for every bird they handle (transporting them for slaughter), instead of per hour of work. These factors can contribute to careless handling of birds and lack of monitoring. Conversely, better conditions for workers can help to improve the care of the birds. As with all species, education about handling and biosecurity also helps maximise the birds' welfare.

The same issues apply to incentives, penalties and legislation, as we discussed earlier in the section on pigs, and your role as the vet remains significant here.

Slide 44:

Finally, we return to cattle. The previous module examined the welfare problems seen in high-production dairy cows, dairy calves and beef animals. We saw that all indoor systems for cows can create problems of mastitis and lameness, so it is not easy to give general recommendations here. However, a survey in New Zealand – which has a very temperate climate – indicated that farms there would not benefit economically, and cows would not benefit in terms of welfare, if the cows were housed. This was because there were so few days when the animals needed protection from severe weather, but if the farmers had invested money in housing they would want to keep the cows housed, which would create problems of lameness and mastitis that outweighed any benefits of shelter.

We saw in Module 10 that young calves have better welfare if they are housed in groups, with nipple-drinkers. The feedlot system for beef cattle does not have any easy alternatives. We saw that very extensive systems can create many welfare problems too. With all of them, stockmanship and issues of mixing and vaccination are very important.

A hospital pen is also important for cattle at all stages, so that they are not injured by others in the group and so that they can receive proper monitoring and care.

Genetics can help improve cattle welfare. Starting with dairy cows, farmers used to breed them for temperament and good conformation of the limbs and udder. However, economic pressures have meant more attention to production traits such as milk fat, milk protein and milk yield, rather than the animal as a whole. By including factors such as longevity, fertility and health in the breeding index, countries such as Sweden have been able to improve herd fertility and resistance to mastitis. However, these traits may result in reduced milk yield.

However, the improved health and longevity of cows compensates for that.

In beef and some dairy breeds, the need to dehorn calves creates the problems of pain and fear. The need for this may soon be avoided by using polled lines or breeds, i.e. animals without horns.

In 2009, Australian researchers won the annual Voiceless Eureka Prize for Scientific Research that Contributes to Animal Protection for the development of a test to detect a DNA marker for the polled gene in Brahman bulls. However, it should enable farmers to select polled animals within the Brahman breed. The same technology might then be developed for use in other breeds. See <http://eureka.australianmuseum.net.au/38D751CD-35ED-11DE-8E7E8D299F3A8972/displayPageEntry> for more details.

Slide 45:

We now move on to the stockperson and the other factors of incentives, penalties, and your role as the vet. As with all farmed species, the knowledge and attitudes of the stockperson are essential in order to maximise the welfare of cattle of all types. We start with the stockperson: gentle handling of dairy cows reduces their stress, and improves milk letdown and milk yield. Module 30 on human–animal interactions will discuss this in more detail.

We also see in Module 32, on the role of the veterinarian in animal welfare, that research on dairy farmers indicates that farmers may have a range of internal motivations for following your advice or ignoring it.

Finally, Module 10 gave an example of research into British dairy farmers, which indicated that they were generally not good at detecting lameness in their cows.

You can see that stockperson factors are important for dairy cow welfare, and that they may also be complicated. However, most cattle farmers are likely to be open to your advice and they are likely to want to use incentives and to observe the law, to ensure their animals have good welfare.

Slide 46:

This concludes our lectures on some of the welfare issues that you find in high-production livestock systems, why they occur, and what can be done about it. There are two final points: first, as a vet, you may only be called out if there is particular disease problem. In helping the farmer to treat and care for the affected animals, you can advise him/her about the value of a hospital pen for the recovery of his or her animals, and to help him/her create pens where possible.

Second, remember that the World Organisation for Animal Health (OIE) has a Terrestrial Animal Health Code (at www.oie.int/en/international-standard-setting/terrestrial-code/). This Code provides minimum standards for the care of livestock, which may help you in your work with your farm clients.

