Compassion in World Farming
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ANIMAL WELFARE ASPECTS OF GOOD AGRICULTURAL PRACTICE: PIG PRODUCTION

Compassion in World Farming is the leading international farm animal welfare charity. We work throughout the European Union and worldwide to end cruel factory farming practices, the long distance transport of animals for slaughter and further fattening and inhumane slaughter – for the benefit of animals, people and the planet.

We advocate humane and sustainable farming – our principles for this are achieving higher welfare for animals; ensuring food is safe, high quality and affordable; protecting the environment – wildlife, the climate and the countryside; ensuring nations have an adequate food supply; protecting rural livelihoods; and sustainability, ensuring our ability to provide food for all tomorrow as well as today.

We carry out detailed research using academic and scientific literature combined with the practical experience of farmers and the farming industry. We publish educational resources for use by schools, universities and the general public. Our publications include reports, books, films, factsheets and teaching materials.

Our overall mission is to end factory farming and advance the well being of farm animals worldwide and we have a vision of a world where farm animals are treated with compassion and respect.

Animal Welfare Aspects of Good Agricultural Practice: pig production

2006

written by:

Dr Dale Arey and Phil Brooke
Compassion in World Farming

Good Agricultural Practice

Good agricultural practice is a concept evolved by the Food and Agriculture Organisation of the United Nations (FAO).

Good agricultural practices:

- Produce safe, healthy, high quality food for consumers
- Provide jobs with fair incomes for rural communities
- Are socially and environmentally sustainable
- Provide high standards of animal welfare

Good agricultural practice should help to achieve development that is both humane and sustainable. Compassion in World Farming is concerned that modern intensive systems of pig production cause suffering to pigs. Intensive farming contributes to rural job losses, environmental damage and health and food safety dangers.

This book addresses the animal welfare aspects of good agricultural practice in pig production. It uses a balanced combination of scientific knowledge and practical case studies to document attempts to improve welfare in a range of both indoor and outdoor pig production systems.

Contents:

Section 1. INTRODUCTION TO PIG WELFARE, BEHAVIOUR AND THE DEVELOPMENT OF INTENSIVE PRODUCTION

Chapter 1. Introduction to animal welfare

Human beings have long been concerned about the welfare of animals and this concern is growing. The belief that we have some moral duty to care for animals has led to several attempts to define and conceptualise animal welfare. Three basic approaches have emerged:

- Is the biology of the animal normal?
- Is the animal in a good mental state?
- Is the animal living a natural life?

The first approach is based on the normal biological functioning including the physical and physiological condition of the animal. According to Broom (1986): 'The welfare of an animal is its state as regards its attempts to cope with its environment'. If conditions in the environment become difficult, animals use various methods to counteract any adverse affect. For example, if a sow becomes hot, she can change her behaviour and move into the shade; or she can change her physiology and start to sweat. If these regulatory systems allow her to cope then adaptation is said to occur. If the animal is unable to cope, then the individual is said to be stressed. Stress is an environmental effect on an individual which overtaxes its control systems and reduces its biological fitness (see Chapter 13 on stress physiology).

Normal biological functioning includes health. An animal in poor health is less able to cope and his or her welfare is at risk of being poorer. An animal suffering from high levels of stress is also more prone to diseases (Ekesbo, 1981) because stress can impair the immune system (see Chapter 14 on disease). An animal's welfare can therefore be assessed from a range of indicators including behaviour, physiology and health.

The second approach is based on what an animal actually feels. This involves the subjective experiences of the animal. The view is that positive feelings such as comfort and pleasure should be promoted while negative feelings such as pain and suffering should be reduced. These feelings can be assessed by examining an animal's preferences and motivations.

The third approach calls for animals to be raised in a manner which suits the nature of the species or such that the animal is able to perform his or her full behavioural repertoire. All farm animals have inherited a range of behaviours from their wild ancestors that are created from needs. Inability to fulfil these needs can seriously affect an animal's welfare.

Webster (2005), sums up these different approaches as follows: Good welfare means an animal is 'fit and happy' or 'fit and feeling good'. In other words, in a good physical **and** mental state.

Good welfare is also about the absence of suffering. Suffering has been defined by one eminent welfare scientist to include a 'wide range of unpleasant emotional states' (Dawkins, 2000) including fear, frustration and pain. The World Veterinary Association (2000) have defined animal welfare as a scientific discipline which incorporates 'applied aspects of ethology, bioethics and the concepts of suffering and well-being'.

Photo: © MAEP/CIWF Trust

Traditional African sow and piglet. Able to perform natural behaviour, but are her physical needs well catered for?

Sow in farrowing crate. In good physical condition, but does she suffer from restrictions on her natural behaviour?

Physical and mental states indicative of suffering and well-being can not always be readily measured on farm. To this end, most codes of animal welfare switch the emphasis onto what should be provided for animals.

The *Five Freedoms*

All animals have certain needs that have to be provided for if they are to experience good welfare. These needs are often expressed in terms of the *Five Freedoms*, adopted by the Farm Animal Welfare Council in the United Kingdom.

1) ***Freedom from thirst, hunger and malnutrition*** - by ready access to fresh water and a diet to maintain full health and vigour
2) ***Freedom from discomfort*** - by providing a suitable environment including shelter and a comfortable resting area
3) ***Freedom from pain, injury and disease*** - by prevention or rapid diagnosis and treatment
4) ***Freedom to express normal behaviour*** - by providing sufficient space, proper facilities and company of the animal's own kind
5) ***Freedom from fear and distress*** - by ensuring conditions which avoid mental suffering

Some would draw attention to the **freedom to choose their environment**, whether to go inside or out, whether to eat, drink or rest, whether to scratch their backs or wallow in mud. Animals are all individuals and their needs may not be the same. This freedom is of course qualified by the need to curtail choices which might be injurious to their health and safety.

How far do each of these systems provide for the *Five Freedoms* of farm animals?

The freedom to choose. These animals can wallow to cool down or seek shelter and huddle to keep warm

Stockmanship and welfare potential

System with low welfare potential

System with high welfare potential. Good stockmanship is essential to achieve that potential

The day-to-day responsibility for ensuring that farm animals have all *Five Freedoms* lies with the stockperson. Good stockmanship is therefore a key factor in maintaining good welfare (see Chapter 15 on stockmanship). A good stockperson will often know how their animals are feeling by using observation, experience, common sense and empathy. They will look for evidence of both mental and physical welfare and deal with health and welfare problems intuitively.

Animals can suffer in any system if the stockmanship and management are poor, but systems vary in their **potential** for good welfare. No matter how experienced and conscientious the stockperson, welfare is inevitably compromised in the most intensive systems. There is a limit to what the stockperson can do to overcome the stress caused by close confinement, overcrowding, boredom and early weaning. The role of the stockperson in intensive systems is to ensure that there are no additional stressors.

The best free-range and organic systems can provide well for the behavioural needs of pigs. They are better able to cater for the diverse behavioural and environmental requirements of the animals. Welfare can be compromised in extensive systems but can generally be addressed by good stockmanship and management.

Farm animals deserve good systems as well as good stockmanship. Good stockpeople deserve good systems to give them a proper chance to achieve higher standards of welfare (see Chapter 17 on economic, environmental and social aspects).

Why should farmers care about animal welfare?

Farmers and stockpeople are key welfare professionals

Animal welfare matters because it matters to the animal. They want things. There are other things they will go to any lengths to avoid. They can be excited, content, distressed or terrified. Just ask any stockperson! They can also be hungry, cold, bored or in pain. **Animals are sentient beings**. In other words, they have feelings that matter to them.

Good farmers and stockpeople know that good animal welfare can be good for productivity. For example:

- Giving growing pigs enough space increases their growth rates
- Pigs weaned later often grow better
- Changing to enriched free-range or deep bed systems can reduce cannibalism and tail-biting
- Training stockpeople to understand pigs better and improve their attitudes to them increases productivity

Stressed sows are more likely to savage their piglets. Stressed pigs are more likely to succumb to disease. Good welfare is good for the immune system and can lower mortality rates. Reducing stress levels can improve health and reproductive performance. Furthermore, reducing stress before slaughter improves meat quality (Grandin, 1991).

Happily, there are new markets for high welfare products. Consumers are becoming increasingly aware about the welfare implications of meat production and many are prepared to pay extra for high welfare products (see Chapter 17 on economic and social aspects). This kind of production lends itself particularly well to traditional small-scale farming that generally creates more employment in the rural community. A responsible approach to animal welfare, health and the environment can only be positive in the long run for the status of farming in the wider community.

Good farmers care about the welfare of their animals. The work of the stockperson is far more satisfying if they know the animals in their care are content and thriving.

Good treatment of animals is good for society. There is much evidence that violence to animals often leads to violence to people (Ascione and Arkow, 1999). Conversely, societies which care for the welfare of animals often look after each other better too.

Farm animals comprise the vast majority of domesticated animals. Therefore, farmers and stockpeople probably contribute far more to the welfare of animals, whether for good or ill, than any other professional group.

Summary

The welfare state of an animal can be described as good or high if the individual is fit, healthy, happy and free from suffering. Farm animal welfare depends largely on the following key factors:

- Good stockmanship
- Good environments in which to live
- Good disease control
- Good genetics

Further information about each of these factors can be found in the relevant chapters.

Chapter 2. Introduction to pig welfare

Wild boar – ancestor of the modern pig

More than a billion pigs are produced in the world each year making it the most common mammal reared for meat.

In northern Europe, pigs all originate from the wild boar (*Sus scrofa*) and were domesticated around 8 or 9 thousand years ago.

The living conditions of the wild boar and the intensively reared pig could not be more different. Wild boars are found in a range of habitats but most commonly close to wooded areas and river valleys. Intensive pigs are kept indoors on floors that are made of solid or slatted concrete or of perforated metal that can be either bare or plastic coated. In most systems they are not provided with bedding such as straw because it could interfere with the collection and spreading of liquefied manure.

Social groups are also radically different. Wild boars live in small family groups consisting of 2-4 sows and their young. They can range over hundreds of kilometres. The young are not weaned until they are 13-17 weeks of age. In intensive systems, the piglets are separated from their mothers at 3-4 weeks. The breeding stock sows remain closely confined throughout their lives. The piglets are crowded into small barren pens and stay in these conditions until they are ready for slaughter after 24 weeks.

Modern sows retain many of the behaviours of their ancestors

Yet, despite years of domestication, modern pigs have maintained a range of behaviours inherited from their ancestors; in intensive systems many of the welfare problems stem from the fact that they are unable to carry out many of these behaviours because of restrictions that are imposed by the environment.

The pigs generally do not have access to bedding, or any other forms of organic enrichment. This increases discomfort and problems with injuries. The lack of suitable substrate such as straw, grain husks or ground wood means that they are unable to carry out their foraging activities for which they are highly motivated.

Table 1. Differences in characteristics of the wild boar and intensively reared pig

	Wild boar	Intensively reared pig
Range	Up to 2,500 ha	Closely confined or highly stocked
Social organisation	Family groups	Separation of mother and young
Birth	In farrowing nests	Closely confined
Litter size	6	10
Piglets reared per year	6	24
Weaning	13-17 weeks	3-4 weeks (sometimes 2 weeks in the USA)
Time to reach puberty	18 months	6 months
Urination and defaecation	In demarked sites	Where they stand (sows)
Temperature regulation	Nests, wallows, shades and huddling	Largely unable to regulate (sows)
Diet	Highly varied, fibrous, not easy to find	Concentrate, low in fibre, eaten in 15 minutes

Pigs are very intelligent, highly sociable animals. They are sentient creatures; they can experience pain, fear and frustration and in some tests of intelligence, can even out perform dogs. Attitudes to pigs are beginning to change. This has been born mainly out of greater understanding of the welfare issues by the public and this has given rise to new welfare legislation in many countries.

Pigs are sentient beings – creatures with feelings that matter to them

The role of the stockperson is vital in all farming systems

Summary

Pigs are descended from the wild boar. Despite domestication, pigs have inherited many of the behaviours and ethological needs of their wild ancestors. Many welfare problems arise because modern intensive systems frustrate their natural responses and behaviours.

Chapter 3. Natural behaviour of pigs

Introduction

Studies of domestic pigs who have escaped back into the wild have shown that their behaviour closely resembles that of the European wild boar from which they originated. Even in intensive farming conditions, most of the behaviours can still be observed. An understanding of the natural behaviour of pigs can therefore help us to identify and remedy a range of pig welfare problems.

Wild boar

Range and habitat

Areas inhabited by pigs in the wild will always contain water, feeding areas, resting places, and sites for cooling, rubbing and defaecation. Pigs may range an area from 100 to over 2,500 ha depending on the availability of food. The wild boar is not generally considered to be a territorial animal.

Social organisation

Wild boar and domestic sows with young

Social behaviour is highly developed in pigs. Within hours, newborn piglets begin to form social dominance relationships with littermates and eventually a stable hierarchy is formed. Fighting is therefore rare except when closely matched mature males encounter each other during the breeding season. Aggression may occur during the autumn when food becomes concentrated in patches but it is usually regulated by the 'submissive' behaviour of lower ranking individuals.

The early associations between piglets often persist into adulthood, particularly among females. It is believed that pigs can remember up to 30 other individuals (Meese and Ewbank, 1973), which is consistent with the finding that pigs are rarely observed to congregate in groups of over 20.

The basic social unit consists of one to several females and their offspring with other loosely associated individuals. This organisation remains more or less stable until the beginning of the rutting season in October when the boars join the females. Mature males are relatively solitary but bachelor groups may form in the late summer.

Sows usually give birth in spring though it is known that they can give birth practically all year round. In good feeding conditions, sows can give birth twice a year. In social groups, the breeding is often synchronised.

Birth

Wild boar sow collecting nesting material

Domestic sow collecting nesting material

The gestation for domestic sows is 115 days. One or two days before giving birth, the sow separates herself from the main group and becomes increasingly aggressive towards her own young. Research suggests that her search for seclusion increases the survival chances of her new litter (Jensen, 1988). The sow spends a considerable time looking for a suitable site where she will construct an elaborate maternal nest. This consists of a hollow dug in the earth, which is lined with grass, leaves and twigs, with larger branches to form side and overhead cover.

The average litter size for both wild and feral domestic sows is 5 to 6 piglets though rarely they can give birth to over 10. The piglets are born at approximately 15 minute intervals. The sow spends most of the time lying on her side and, in contrast to most hoofed animals, does not lick her young to remove the embryonal sheath or help the young to stand.

Maternal behaviour

Young piglets are very active and are able to stand within a few minutes after birth. They sample the sow's 14 teats before attaching to one with which they will remain for the rest of the nursing period. Newborn piglets also go up to the sow's nose and sniff. This may be important for future mutual recognition.

It is common for piglets to be born within a range of sizes and for the smaller ones to be born last. The larger, earlier born piglets attach themselves to the more productive anterior teats, which they then vigorously defend. This means that the strongest piglets get the most food, significantly increasing their survival chances at the expense of the weakest. This ensures that, when food is scarce, there is a good chance of some of the piglets surviving. When food is plentiful, they all have a chance.

The piglets then develop a pattern of alternating between suckling every hour or so and sleeping. To begin with, the sow spends more time lying on her side and grunts softly to encourage the piglets to come and suckle. After a few days the piglets initiate most of the suckling by coming up to the sow, squealing and attempting to massage her udder. The piglets keep warm by huddling together close to the mother's udder for the first few days of life during which the sow remains relatively inactive.

Suckling

Before standing and lying down, the sow and the piglets co-ordinate their behaviour to prevent the piglets from being laid upon. The sow goes through the ritual of rooting through the nest to disturb the piglets which may be nudged out of the way. Preparing to suckle, the piglets then group on one side of the sow and the sow lays her hindquarters on the other side of the group. If a piglet is laid upon, he or she will utter a loud squeak and the sow will instantly change position or stand up and grunt. If there is no reaction from the sow, the piglet is sometimes able to get free by vigorous struggling (Schmid, 1991).

After one or two days, the sow begins to leave the nest for short periods. A couple of days later, the sow incites the young to follow her and they remain very close. After a week, the piglets become more independent. During this period the sow can

become very protective and attack potential intruders. The sow finally leaves the nest between 7 and 14 days depending on weather conditions.

Young pigs start sampling solid food objects after about 3 weeks. After a few weeks, the sows and their litters begin to re-group and they may tend to their offspring together. Social interaction between different litters thereby begins gradually from an early age. In social groups, sows usually synchronise nursing behaviour.

The young piglets are gradually weaned between 13 and 17 weeks. The young will remain in the family group until the following year when the sows are due to farrow again. Before beginning the search for a suitable nest site, the sows will chase away their offspring. Quite often, daughters will return to the family groups once they begin reforming.

Suckling

After a few days, piglets initiate suckling by massaging udder

then the sow briefly ejects milk

Each piglet has his or own teat which they will defend against each other

Transition to solid food

Piglets start to eat solid food from the age of about 3 weeks

Piglets gradually eat increasing amounts of solid food before weaning at 13-17 weeks old

Activity patterns

Mid-day siesta. Pigs are mainly active during the morning and early evening

Pigs have two peaks of activity, one in the early morning, the other in the evening. They are usually found resting once dusk has fallen, though it has been suggested that some wild boar have developed nocturnal habits to avoid disturbance from people. In social groups, periods of feeding and rest tend to be synchronised between group members. Pigs construct simple nests for sleeping, particularly when the weather is cold.

Pigs are frequently seen to use trees for rubbing and wallows for rolling in. These behaviours keep the skin in good condition and help to remove parasites. Wallowing also serves to cool the animals during hot temperatures. Pigs lack sweat glands, apart from on the disc of their snout. Intensively kept pigs sometimes have to resort to wallowing in their own dung and urine when they need to cool down.

Pigs like to keep in physical contact with each other. During sleep and rest, they are frequently all seen lying together. This huddling serves to reduce heat loss.

During periods of activity, most of the time is spent looking for food.

Temperature control

Wallowing

Huddling

Seeking shade

Feeding

Pigs are omnivorous opportunists and will eat almost anything. The food they eat is usually highly varied, high in fibre and takes a long time to find and consume. Most foraging is directed to objects at ground level which are investigated by sniffing, rooting and chewing before finally being eaten.

In spring and summer, pigs forage on more open grassland and marshland where they feed on grass, roots, tubers and invertebrates. Most feeding in autumn occurs in woodland where they will gorge on acorns, nuts and berries to last them during the sparse winter months. Pigs also eat a large range of vertebrates including frogs, snakes, turtles, the young and eggs of ground nesting birds and have been known to prey on small rodents. Carrion is also devoured.

Iberian pigs feasting on acorns in autumn

Defaecating and urinating

Pigs usually select specific areas for defaecating and urinating. These are commonly natural corridors between bushes and trees. Under farm conditions, pigs prefer to defaecate and urinate away from their lying area unless they are suffering from heat stress (AHAW, 2005).

Rooting behaviour in farmed wild boar and domestic pigs. Other feeding strategies include browsing and grazing

Some traditional breeds have pigmented skin to protect against the sun. Wallowing in mud can provide solar protection for light-skinned breeds.

Summary

Sows:

- Usually live in groups of a few females with their offspring
- Leave the group and make a nest in an isolated spot for farrowing
- Return to the group with their piglets one or more weeks later

Piglets:

- Compete for the best teat and then defend it
- Start to eat solid food at 3 weeks old
- Are finally weaned at 13-17 weeks old

Pigs:

- Are omnivorous opportunists
- Will forage for several hours a day
- Usually eat considerable amounts of high fibre food including roots
- Choose specific areas for defaecating and urinating which are separate from their lying areas
- Understanding pig behaviour is essential to understanding the needs of pigs and to remedying welfare problems

Chapter 4. The development of intensive pig production

Sow stall cage

Traditionally, pig keeping was a small scale operation. Rural households would each own a few pigs and fatten them up on scraps and leftover food. In the autumn, they would commonly be herded into the woods to feed on oak and beech seeds. This still happens today in some traditional farming systems in developing countries. Over time pigs were increasingly confined to sties and indoor units in larger herds. They were fed more grain and other concentrated foods.

Slatted floors that allow dung and urine to pass through have been used since the 1840s and confinement of the sow at farrowing was known in Roman times. However, the intensification of pig production did not seriously begin until the 1950s. The intensification process has been characterised by a reduction in the amount of space per animal to reduce capital costs and to ease management. This has enabled units to become larger so that each stockperson looks after an increasing number of animals thereby reducing labour costs.

Intensive pig production that has now been adopted around the globe takes place indoors on floors that are either slatted or perforated with no bedding. The breeding sows are closely confined throughout their lives and the fattening pigs are crowded into small barren pens. New building layouts and mechanisation helped to make procedures more routine making it possible to substitute lower cost, unskilled employees for qualified, experienced stockpersons.

Since domestication, people have selectively bred pigs for desirable characteristics such as larger bodies with more meat and fat. Recent breeding has tended to concentrate on faster, more efficient growth and less fat (see Chapter 10 on selective breeding).

Tamworth pigs. Thought to be a close relation of traditional UK forest breeds

Dry sows and gilts

The breeding stock consists of 'gilts', female pigs that have not yet given birth and 'sows' that have given birth to one or more litters of piglets. To get the breeding stock pregnant, they are first mated with or 'served' by a boar that is a mature male pig. Alternatively, boar semen is introduced manually by the stockperson using a process known as artificial insemination (A.I.). During this phase, the sows are sometimes referred to as 'dry sows' as they are no longer producing milk for their piglets. After service, both gilts and sows are kept in either sow stall cages, sometimes called gestation crates, or tether stalls.

Farrowing sows

Around 3-5 days before they are about to give birth, the sows are transferred to 'farrowing crates'. The sows give birth to their piglets or 'farrow' in the crates and remain there until the piglets are 3-4 weeks old. At this age, the piglets are taken away from the sow or 'weaned' and the sows are returned for mating to repeat the cycle or they are sent away for slaughter ('culled') after giving birth to an average of 3-5 litters.

In the United States, a large percentage of intensively raised pigs currently are weaned at 1.5 to 2 weeks of age so that the sows can be rebred

sooner. These 'naive' weaned pigs are taken to a separate site during the 'nursery stage'.

Farrowing crate

Weaners, growers and finishing pigs

In the EU, the weaned piglets or 'weaners' are transferred to 'flat deck' cages where they are usually mixed with other litters. Management practices will vary from farm to farm, but at around 60 days of age, when they weigh about 20kg, they are transferred to 'growing pens' at a lower stocking rate. At around 100 days of age, when they weigh 30-40kg, the stocking rate is reduced again when they are transferred to finishing pens. They may be sent for slaughter at around 170 days of age when they weigh about 100kg, although most countries slaughter at a slightly heavier weight. Minimum stocking rates, listed in Table 2, are the minimum space requirements stated in EU law (see Chapter 16 on legislation).

Table 2. Minimum EU stocking densities for growing pigs (Commission Directive 2001/93/EC) European Community (2003)

Live weight (kg)	Space allowance (m^2)
<10	0.15
10-20	0.20
20-30	0.30
30-50	0.40
50-85	0.55
85-110	0.65
>110	1.00

In the US, there is no legislation about stocking density. The National Pork Board makes recommendations in its *Swine Care Handbook* (see Table 3). These are based on the minimum space required to achieve maximum performance. In other words, if you give them less space, pig welfare and growth rate are likely to suffer. In practice, most pig producers in the US allow less space than this. For example, one survey showed that the stocking density for finishing pigs in the US varied from 6.8-8.0ft^2 (0.63-0.74m^2) per pig with an average of 7.2ft^2 (0.67m^2) (Brumm, 2005).

In the US, partial or total slatted floors are also common. Groups of 10-20 piglets are commonly placed in nursery pens after weaning. At 50 lb, they are transferred to finishing pens (National Pork Board, 2002).

Weaners and growing pigs

Table 3. Recommended US stocking densities for growing pigs (Swine Care Handbook, Table 3) National Pork Board (2002)

Live weight (lb; approx kg in brackets)	Space allowance (ft^2; approx m^2 in brackets)
12-30 lb (5.4-13.6 kg)	1.7-2.5 ft^2 (0.15-0.23 m^2)
30-60 lb (13.6-27.2 kg)	3-4 ft^2 (0.27-0.37 m^2)
60-100 lb (27.2-45.6 kg)	5 ft^2 (0.46 m^2)
100-150 lb (45.6-68.0 kg)	6 ft^2 (0.55 m^2)
150 lb–market (68.0 kg–market)	8 ft^2 (0.74 m^2)

The growing and finishing pigs may be mixed with unfamiliar pigs on several occasions during their lives. Throughout their lives, the growing pigs have free access to food and water though some units may restrict feed at the latter stages of finishing.

Boars

In intensive production, breeding boars are generally kept individually in small pens. These are usually large enough to house the boar and one or more female sows that are there to be served or mated. Some boar pens are bedded to provide good foothold while the boar is serving the sow.

In the United States, many boars are kept in stall cages and removed only when taken to a pen for semen collection or herded past recently weaned sows to detect females in heat.

Boar accommodation

Summary

Traditionally, pigs were kept in small groups and were fed on scraps and food they could forage for themselves. Growth rates were often similar to those of their wild ancestors. In today's intensive pigmeat production:

- Pigs have been selectively bred for faster growth with less body fat
- They are fed on specially grown concentrated feeds
- Sows are often kept in confinement systems such as sow stall cages and farrowing crates
- Growing pigs are often kept at high stocking densities in slatted cages and finishing pens

Section 2. WELFARE ASPECTS OF THE MAIN STAGES OF MODERN PIG PRODUCTION

This section addresses the key welfare issues for each of the five main categories or life stages of the commercial pig's life-cycle:

- Dry sows
- Farrowing sows
- Piglets up to weaning
- Weaned, growing and finishing pigs
- Boars

In each section, the key welfare problems associated with the intensive farming of pigs are examined. Methods of addressing these problems both for indoor and outdoor systems are then considered.

Suggestions for good practice are based on a combination of scientific research and practical case studies. Information from case studies uses the knowledge and practical experience of farmers and stockpeople who are dedicated to keeping their animals in welfare-friendly conditions.

Chapter 5. Dry sows

Sow and tether stalls and their welfare implications

Sow stall

Tether stalls

As intensive pig farming developed, stocking densities were increased to reduce space and housing costs. Unfortunately, crowded conditions increased levels of aggression, resulting in injuries and stress (see Chapter 12 on aggression). Close confinement systems such as the sow stall and tether stall were developed to prevent sows from fighting and injuring each other.

The sow stall consists of a steel cage that completely surrounds the animal. In tether stalls the sow is tied by a belt around the neck or girth.

It is argued that this restriction on movement simplifies management and veterinary treatment. Sow stalls have a feed trough to the front and a slatted floor to the rear that simplifies feeding and waste disposal, so reducing labour costs.

Welfare concerns

Despite these advantages, the sow suffers as a result of not being able to carry out her natural behaviour. She is unable to:

- Walk and exercise
- Turn around
- Interact properly with other pigs
- Perform other important behaviours such as foraging

- Urinate or defaecate in a separate area to her lying space
- To control her temperature significantly through behaviour

Furthermore, sows in stalls usually have no access to any form of substrate such as straw bedding. Bedding is important for physical and thermal comfort. It also gives sows the opportunity to carry out their highly motivated foraging activities (see Chapter 11 on enrichment). Straw provides fibre and can help reduce the hunger caused by feeding sows a limited ration.

Hunger

Sows are fed a 'maintenance' ration that maintains their body weight and the growth of their unborn piglets. However, pigs have been bred to have high growth rates and large appetites and would normally eat 2-3 times this amount if given the opportunity. Furthermore, the daily ration of food takes them just 15 minutes to eat, has very little fibre and leaves the sows feeling constantly hungry. In the USA, laxatives are added to dry sow feed to prevent constipation and compensate for the lack of both exercise and fibre in the diet.

Hungry sows will go to great lengths to get more food. In one experiment, sows were trained to press a panel to obtain extra food. The sows were prepared to use more energy pressing the panel than they obtained from the food, contrary to the normal scientific expectation. This suggests that they were suffering from considerable hunger (Hutson, 1989).

Abnormal behaviour

The restricted food ration and lack of opportunity to perform foraging behaviour leads to the development of 'stereotypies'. These are relatively invariant sequences of movements that appear to serve no purpose. These stereotypies are widely considered 'abnormal' behaviour and indicate reduced welfare. Sows in stalls may perform stereotypies such as bar-biting and sham-chewing for up to 22% of their active time (Jensen, 1980).

As a result of close confinement in a barren environment, sows become less active and 'apathetic' or less responsive to their environment. These have been likened to them showing signs of clinical depression (Broom, 1986; 1987).

Bar-biting

Sham-chewing

Temperature control

Pigs adjust their temperature to a large extent through behaviour. They will huddle and use bedding material to keep warm. They will seek a cooler area or wallow to cool down. In confinement systems, sows may have difficulty achieving a comfortable temperature unless the buildings have good temperature control.

Urination and defaecation

Pigs are naturally hygienic animals. Given the space, pigs always select an area separate from their resting and activity areas for the disposal of wastes. The sow stall does not provide for this behavioural need.

Professor Ingvar Ekesbo, veterinarian and Emeritus Head of the Department of Animal Hygiene, Swedish University of Agricultural Sciences (private communication) found that when he released a poorly looking sow from her stall, she immediately went to the side of the shed and relieved her bladder of 3-4 litres of urine. He believed that the

sow was in discomfort because she had held on to her urine for several days.

Sows are observed to try and move forward in the stall to pass dung which then misses the slats. The solution to increase the slatted area has meant that sows are even more prone to foot injuries.

Injuries and disease

Though sow stalls were adopted partly to prevent injuries caused by fighting and behaviours such as vulva biting which can occur in loose-house systems, sows in stalls can be more susceptible to disease and other injuries. A particular problem in confined sows are urinary disorders (Tillon and Madec, 1984). Due in part to the lack of exercise, confined sows have a poorer level of cardiovascular fitness and suffer from weaker bones and muscles that can lead to lameness. As many as 20% of stall housed sows may have leg disorders (Smith and Robertson, 1971). Confinement can also lead to more reproductive disorders including taking longer to reach puberty, failure to show oestrous and failure to conceive (Jensen et al, 1970; Fahmy and Dufour, 1976).

Good Agricultural Practice – addressing the welfare needs of dry sows

The welfare of dry sows can be improved by:

- Providing space to exercise
- Providing separate areas for activity, resting and defaecation
- Providing an enriched environment
- Access to high-fibre food such as straw at all times
- Keeping sows in small stable groups
- Reducing stocking densities and providing escape areas
- Devising feeding systems which reduce aggression
- Providing areas for temperature regulation where required

Exercise is good for health and sows need to be active for part of the day to avoid boredom. Giving them access to edible and fibrous bedding enables them to forage to alleviate their hunger and gives them something to do (see Chapter 11 on enrichment).

Sows naturally live in small groups, often of sisters. Aggression can be a problem, especially at feeding time and when unfamiliar sows are mixed. Ideally sows should be kept in small stable groups with mixing kept to an absolute minimum. When sows are mixed it is essential that they are provided with plenty of space so that weaker sows can escape from aggression whilst dominance hierarchies are established (see Chapter 12 on aggression).

Many countries have now banned the sow and tether stalls and require sows to be kept in groups (see Chapter 16 on legislation).

Indoor systems

Indoor systems can be designed to meet many of the sows' behavioural needs for space, exercise and foraging. Separate areas for rest, activity and for urination and defaecation should be provided.

The best way to satisfy the need for access to fibrous food is to provide a deep bed of straw, wood chips or other material. Sows will spend hours foraging, giving them something to do as well as satisfying their hunger. EU rules now require all

Dry sow system at Schleithal, France

sows to be provided with access to fibrous food and material they can forage through at all times. Straw bedding can increase the labour required to clean out the pens. This can be reduced with good design, by allowing space for sows to select separate areas for bedding and defaecation, and by straw flow systems.

Sows foraging

Provision of straw or other fibrous food can also reduce aggression at feeding time, presumably since the sows are less hungry. Aggression can also be reduced by providing plenty of space. Barriers that sows can escape behind can also help weaker sows to escape during conflicts over dominance. Any particularly aggressive sows should be removed from the group. Even temporary removal will often solve the problem.

Aggression can be a particular problem at feeding time as hungry sows try to make the most of restricted rations. Fighting can cause injuries and weaker sows may not get enough to eat. To overcome the problems with aggression at feeding, ideally all sows should be separated from each other and fed at the same time. A number of group feeding systems have been developed to provide different solutions.

Feeding systems designed to reduce aggression

Feeding stalls allow sows to feed simultaneously whilst protecting them from each other. After feeding, the sows are released to rejoin the group. This system practically eliminates the problems with aggression whilst enabling extra feeding for sows that are out of condition. A drawback is cost, but many farms choose to use this system at least for the pens used after mixing when aggression problems are at their worst.

Electronic sow feeders (ESF) provide one feed station for each group of sows that can be accessed by each sow in turn. The advantage is that each sow can feed in isolation and sows in poor condition can be given extra feed. One disadvantage is that sows prefer to feed at the same time and, in poorly designed systems, aggression including vulva-biting can occur as the sows queue up to access the feeder.

Scatter feeders can distribute the food over a large floor area to reduce competition for food. This fulfils the natural instinct of sows to feed together and extends the feeding period as sows forage for the last morsels of food. The disadvantages are that weaker sows may not get enough to eat and that aggression can still occur once the food starts to run out or if it is not fully distributed. **Dump feeders** drop food onto the ground in a similar way, but without scattering it.

Trickle-feed systems have also been devised which keep sows apart during feeding. Each sow is kept at their own station by the steady trickle of food pellets. Trying to muscle in on another sow's feeder risks losing more feed from their own.

Lockable feeding stalls at Schleithal in France eliminate aggression at feeding time. Sows can also use the stalls to avoid aggressive interactions with each other

Sparsholt College, UK. Features small group size, straw flow system and lockable feeding stalls. Sows can rest on the straw for comfort and warmth. They can lay or wallow on the damp concrete to cool down

Trickle-feed system, Glenesk, Australia. Provides slow steady flow of food pellets separately for each sow

Case Study

Cannington College, United Kingdom

Enriched large group system with dump-feeders

When Cannington College needed to update their old pig system, following the ban on sow stalls in the UK, they decided to set up a new system designed for high welfare. They put all the dry sows together in a large group with a deep-bedded straw area. They were fed once a day from a food-dumping system in the ceiling (see picture). The purpose was to give the sows plenty of space to exercise and to encourage natural foraging that is otherwise difficult to achieve in an indoor system. After food was dumped from the ceiling, the sows would spend up to four hours foraging for morsels of food that had become mixed in the straw.

A drawback of this system is that it required frequent mixing of sows. Every time piglets were weaned, a group of sows had to rejoin the main group. This can result in aggression as dominance hierarchies in a large group are sorted. However, this was not a major problem with the Large-White/Landrace/Meishan cross which they were using at the time which were not particularly aggressive. Indeed, helped by the presence of 25% Meishan in the cross, the unit won several awards for productivity. However, the high fat content of the meat didn't suit the UK market and they reverted to more orthodox Large White/ Landrace genetics.

With the new crosses the units had more problems with aggression. There was an increase in sows coming back into oestrous after mating, presumably as a result of re-absorption of embryos. When the unit was de-stocked to eliminate disease problems such as PMWS, they divided up the dry-sow unit into smaller groups of about six sows. This approximates more closely to the sows' natural social unit. Problems with aggression and embryo reabsorption were reduced.

New system with smaller groups

The sows are still provided with a deep bed of straw and they spend hours each morning foraging through it, though not as long as they used to in the previous system. This case study illustrates how, in indoor systems, lack of space requires compromise between the different aspects of the needs and natural behaviours of sows.

See Pig Case Study United Kingdom 2 for a fuller account

Prezzotto, Southern Brazil. Artificial shelters are used as protection from the sun

Addressing welfare needs in outdoor production

Outdoor systems have the highest potential for sow welfare. Advantages of the best outdoor systems include:

- Sows have plenty of opportunity to exercise and forage
- Sows can eat a range of fibrous foods like grass and roots to help them cope with hunger
- Sows have space to escape from aggressive encounters
- Food can be widely scattered to reduce aggression at feeding time
- It is easier for sows to regulate their body temperature by changing their behaviour

Outdoor systems can have economic advantages too, requiring much less capital to set up (see Chapter 17 on economic and social aspects). As a result, more than 30% of UK sows are now housed outdoors. There are also niche markets for outdoor reared and organic pork in a range of countries, as well as for specific slow growing breeds such as the Iberian pigs of Spain or the Mangalicas of Hungary.

One problem with outdoor systems is that pigs, being rooting animals, can quickly destroy the vegetation in their paddocks. Common solutions to this are to either put a ring through the septum in the nose or to put several rings, usually three, through the disk of the snout to discourage rooting behaviour. Unfortunately, this is a very painful procedure. In preventing rooting, the ring frustrates an important natural behaviour. For these reasons, ringing is not a good answer from a welfare point of view.

Ringed sow (septum ring)

The use of multiple-rings in such a sensitive spot is particularly stressful

Das Palmeiras, Southern Brazil. Sows are only allowed out at night-time to preserve the pasture without the need for ringing. They were allowed out early to allow this picture to be taken!

Destruction of the vegetation can be reduced, without the use of rings, by a combination of:

- Giving the sows plenty of space with a low stocking density
- Rotating sows between different pens or fields to give the vegetation time to recover
- Choosing a breed like the Saddleback which grazes more and roots less
- Providing additional forage or high-fibre food
- Allowing access to pasture for only part of the day or during certain seasons

Providing additional forage such as silage, sugar-beet pulp or spent mushroom compost can reduce time spent grazing and rooting, as can ploughing the sows' food into part of the paddock (Edge *et al* 2004, Bornett *et al* 2003). In practice the provision of high-fibre forage will only slightly slow down pasture damage, but remains a good welfare practice in providing gut-fill for hungry sows. Proper space allowance and rotation remain essential.

One farm in Brazil effectively maintained forage cover by only letting the pigs out at night. It is essential for good welfare that, if pigs are only given access to pasture for part of the day or year, that they have access to straw or other edible fibrous material at other times as in good indoor systems.

Another approach is to turn the rooting of pigs to advantage. Some organic farms turn pigs on to the fields in the autumn to plough them up ready for planting. Pigs are also used in woodland management to clear the undergrowth to enable new trees to germinate. Some organic farms also grow "green manure" forage crops for the pigs to turn over and consume.

Otway, Australia. The sows are moved to stubble fields after harvest, helping to prepare the soil for the next crop

Temperature regulation

Wallow in outdoor system, Brazil

Outdoor pigs may need to be able to cope with extremes of temperature and weather, according to local climatic conditions. It is important that:

- Shade and wallows are provided for pigs in hot weather
- Shelters with a deep dry bed of straw or other similar material are provided in cold weather
- Breeds are kept which are adapted to local conditions

As a general rule, most breeds of pig find heat more difficult to deal with than cold. Most modern breeds are pale-skinned and need to wallow to keep cool and protect their skin. Shade can be provided by trees or shelters. One Swedish farmer noted that his sows would emerge from their hut in most weathers. They only stayed in if it was simultaneously both very wet and very windy.

The woolly Mangalica pig, a rare breed from Hungary, is well adapted to the extreme winters of Central and Eastern Europe. The combination of a hairy coat and a very thick fat layer insulates this breed from the cold (see Pig Case Studies Hungary 1 & 2). In Southern Spain, the Iberian pig has a dark pigmented skin which helps to protect against sun-burn, as do many traditional African breeds. Some African breeds are also smaller. As a general rule, smaller animals are better able to lose heat more easily; larger animals are better at keeping warm.

Sow and piglet, Ivory Coast. Small, dark-skinned pigs can be better adapted to hot climates

Otway, Australia. Sow shelters need a thick layer of dry straw

Fernleigh Organic Farm, Australia. Pigs consuming forage/green manure crop

Soukroma Organic Farm, Czech Republic. Local anti-pollution regulations require the outside run to have a concrete base. Soil and forage are provided on top of the concrete to enrich the environment and provide dietary fibre

Summary

Confinement systems such as sow stall cages and tether stalls restrict a range of normal behaviours for dry sows including:

- Exercising
- Foraging
- Socialising
- Thermo-regulating
- Excreting away from the lying area

Restrictive diets combined with a lack of fibrous food cause severe hunger and frustration. Together with boredom, this leads to abnormal stereotypic behaviours such as bar-biting and sham-chewing.

Lack of exercise can weaken bones, muscles and the cardiovascular system. Excreting in their own lying space can lead to urinary infections.

It is Good Agricultural Practice to provide all dry sows with:

- High fibre food, available at all times, to prevent hunger
- Access to water for drinking and keeping cool
- Bedding for comfort, warmth and foraging
- The company of other sows with whom they are familiar and comfortable
- Enough space for exercise, rest, excretion and escaping from other sows

Aggression can also be reduced by:

- Keeping sows in small stable groups at low stocking densities
- Dispersing food well or separating sows at feeding time
- Removing aggressive sows from the group if necessary

Outdoor pigs also require:

- Insulated shelters with plenty of bedding
- Access to shade and wallows in hot weather

Breeds should be chosen which are adapted to local conditions. Pastures should be rotated to ensure a continued supply of rooting material and prevent the build-up of disease. Light well-draining soils are best.

Chapter 6. Farrowing sows

Intensive and free-range farrowing systems

A key objective of modern pig farming is to maximise the number of surviving piglets produced by each sow each year. For both production and welfare reasons, farmers aim to keep piglet mortality as low as possible.

A common cause of mortality is the accidental crushing of piglets by their mothers. In a natural environment, the sow would normally build a nest lined with material that would help to prevent this. Suitable nesting material is not commonly provided in intensive production systems.

Furthermore, modern sows are much larger than their wild relatives and the size ratio between the mother and piglets is almost 100:1. This factor increases the risk of crushing, as does the selection for larger litters. Sows now produce litters with over 10 piglets, which is twice that of wild and feral swine. This can increase the number of smaller and weaker piglets that find it difficult to survive. In addition, selection for productivity may sometimes be associated with reduced mothering ability. Some farmers believe that selection for longer and leaner pigs can be associated with a clumsier sow.

Farrowing crates

In intensive production, almost all farrowing sows are housed in farrowing crates. The sow is completely surrounded by steel bars. The floor is either solid concrete, slatted or part slatted, often with no bedding.

Farrowing crates were designed to restrict the sow's movement and reduce the risk of her accidentally crushing her piglets. Farrowing crates lower costs by limiting the amount of building space required and by simplifying management of the sow. The sow can be easily fed, watered and her dung removed. It is also argued that any supervision or veterinary treatment to the sow or her piglets can be safely and readily given.

Although farrowing crates can simplify management and save piglets, the sow cannot appreciate this and scientific evidence suggests she may suffer as result of not being able to carry out her natural behaviour (Jarvis *et al*, 1997). She is unable to:

- Walk
- Turn around
- Interact with other pigs
- Perform other important behaviours such as building a nest
- Satisfy her instinctive drive to urinate or defaecate in an area separate from where she rests

The farrowing crate severely restricts the sow's natural behaviour

Effects of confinement on behaviour

The sow is placed in a farrowing crate 5-7 days before farrowing. One of the most uncontroversial needs of any animal is to be able to stand up and lie down. However, one study has shown that out of 23 crate designs, none gave enough width and only one gave enough length to allow normal lying (Baxter and Schwaller, 1983). Clearly the farrowing crate does not cater for even the basic requirements of the sow.

When first placed in the farrowing crate, sows show acute signs of restlessness and frustration (Vestergaard and Hansen, 1984). They appear to continually fight against the crate by biting, chewing and attempting to root. The discomfort causes them to continually change position. Sows are much quieter when they can move freely.

These are all signs that sows placed in farrowing crates suffer from increased behavioural stress. This stress increases as the sows approach farrowing and the sow would normally be preparing a nest for her piglets.

Natural nest building behaviour

Nesting behaviour

The nest building behaviour of sows closely resembles that seen in wild boar sows, and it is a powerfully motivated behaviour. Scientists have investigated the importance of nesting material to sows (Arey, 1992). In one experiment, sows were trained to press a panel to obtain food. Sows are highly motivated to obtain food and were prepared to press the panel hundreds of times to obtain some. They also learned to press another panel to gain access to straw bedding. At farrowing, they were also prepared to press the panel for straw hundreds of times. This shows that straw is of considerable importance to sows just before farrowing.

Pre-farrowing stress

In farrowing crates, sows still attempt to carry out these nesting activities by rooting and pawing the floor and bars. This frustration causes the production of 'stress hormones' such as cortisol. The stress response becomes less marked as the sows get older. It cannot be reduced by providing straw alone to sows in farrowing crates; it is important that they are also able to move around.

Other signs of stress include:

- Bruising
- Cuts and scratches
- Exhaustion
- Higher body temperature

The birth process is in itself stressful and the frustration of preventing nesting can add to this. Stress can mean that it takes longer for the sow to farrow. The longer it takes to farrow, the greater the risk there is of the piglets being stillborn. The effects of stress on the birth process are complex and not completely understood.

Longer-term welfare problems

Sows stay in the farrowing crate until the piglets are weaned by taking them away at 3-4 weeks. Just prior to this, sows show another peak in the production of the 'stress hormone' cortisol. It is believed that the sow being unable to get away from the constant attentions of the piglets causes this. The barren pen gives the piglets very little to do and, as a result, they can start biting and chewing at the sow (Arey and Sancha, 1996). The inability to escape can also lead to the piglets over-milking the sow, which puts enormous pressure on her limited energy reserves.

In a natural environment, the sow begins to leave the nest for brief periods after 1 or 2 days. Final abandonment of the nest occurs after 7-14 days. After a few weeks, she will return to the main group of sows with her piglets.

Attempts to reduce stress in farrowing crates

Attempts have been made to try and reduce the stress to sows in farrowing crates with little success. A farmer in Essex, UK has attempted to overcome some of the stress caused by confinement by providing straw in the farrowing crates so that the sows can build a nest. However, research has shown that this is not enough; sows also need to have freedom of movement (Jarvis *et al*, 2002).

Some farms use farrowing crates for the crucial first few days when the piglets are at most risk. After three days the farrowing crates is opened to make a pen so that the sow can move around. In Brazil, Concordia technical school farm also uses farrowing crates for the first three days. After this, the sow is moved to a multi-suckle system along with other sows and litters. In Sweden, farrowing crates may only be used for a maximum of a week (see Chapter 16 on legislation). The problem is that the sow is confined during the nesting and birth phases when behavioural restriction causes the most stress.

Concordia Technical School – sows and their piglets are moved to an enriched environment at 3 days old

Farrowing crates on a farm in Hampshire, UK, are just used for the first pregnancy. This enables the stockman to provide her with extra care while she is learning about motherhood. Unfortunately, stress caused by confinement at farrowing is greatest on the first farrowing. A better solution may be to keep gilts in individual pens (see page 30).

Good Agricultural Practice – addressing the welfare needs of farrowing sows

Alternatives to the farrowing crate

The best alternatives to the farrowing crate allow the sow freedom of movement and bedding so that she can build a nest. The main problem with alternative systems that do not closely confine the sow is that the piglets are at more risk of being crushed or trampled. To overcome this, attention must be given to the following points:

- Choice of breeds and selection for sows that make good mothers
- Excellent stockmanship
- Provision of plenty of straw or other bedding material for nesting
- Provision of safety areas for the piglets
- Individual penning of sows around farrowing (sows naturally seek out a secluded area to farrow)
- Providing separate shelters for farrowing where sows are kept in groups

Research suggests that sows will choose a fairly restricted nesting area. However, it is important that it is not too restrictive. A sow needs space to manoeuvre so that she can co-ordinate her behaviour with her piglets to avoid crushing them when she lies down to suckle (Schmid, 1991).

Indoor systems

Farrowing pen, Cannington College, UK

System at Schleithal, France

Sows naturally live in stable groups, but they will seek a secluded spot in which to farrow. There is a balance to be struck between the benefits of keeping the sows in natural groups and the need for seclusion. In a natural environment, sows would have plenty of space to get away from their companions at farrowing time. After one to five weeks the sow would return to the group with her piglets (see Chapter 3 on natural behaviour).

Alternative systems replicate different aspects of natural farrowing. The 'Swedish group system' allows the farrowing sow freedom of movement at all times. Each sow has her own box to farrow in but is able to leave her piglets and carry on normal behaviour with the other sows. Although good production figures have been attained, problems can arise with sows entering each other's boxes leading to higher piglet mortality.

Individual pens have been developed to overcome the problems with group systems whilst meeting the sow's need for seclusion. The better designs have good piglet protection devices such as piglet escape areas and anti-crush bars. The system in Schleithal, France, also has a central pole to restrict the sow's movement in the nest area (see Pig Case Study France 1). At a system designed for two teaching colleges in the UK, Cannington and Sparsholt Colleges, the pen provides an additional area so that the sow can get away from her piglets from time to time (see Pig Case Studies United Kingdom 1 & 2).

At Soukroma organic farm, Czech Republic, the sows are removed from their group at farrowing to spacious indoor pens with plenty of straw bedding and piglet safety areas. This is a late-weaning system with the piglets remaining with their mother until 12 weeks old. At four weeks the sows and their piglets are grouped again into a family unit. The family unit is provided with thick layers of straw inside with access to outdoor runs (see Pig Case Study Czech Republic 1).

EU legislation requires that farrowing sows are provided with bedding material for nesting, provided that this provision is compatible with the slurry system (see Chapter 16 on legislation). Unfortunately, the risk of blocking slurry systems often prevents this basic provision.

Outdoor systems

Outdoor systems with huts for shelter and farrowing have the highest welfare potential of all. In the best systems, pigs can express most of their natural behaviours. In the UK, sow mortality and replacement figures are lower for outdoor than for indoor systems (see Table 4). This may be due to better welfare resulting in better health.

However, there are also drawbacks. Outdoor pigs may be exposed to the extremes of the weather and piglet mortality can be high. Nevertheless, outdoor farrowing systems in the UK are now reporting lower mortality and rear a similar number of piglets per litter per year as indoor systems (see Table 4). This is despite the fact that outdoor systems do not use farrowing crates whereas indoor systems generally do.

Table 4. Outdoor vs indoor breeding pigs

Annual UK averages for years beginning September 1999 - 2003
(calculated from Meat and Livestock Commission Pig Yearbooks 2001-5)

	Outdoor herds	Indoor herds
Breeding sows:		
Average number sows and gilts per herd	703.80	339.20
Sow replacements annually (%)	37.80	43.14
Sow mortality annually (%)	2.84	5.92
Piglets:		
Litters per sow per year	2.17	2.23
Pigs born alive per litter	10.75	10.92
Pigs born dead per litter	0.79	0.96
Mortality of pigs born alive (%)	9.46	11.60
Pigs reared per litter	9.74	9.64
Pigs reared per sow per year	21.14	21.49

Farrowing hut with bedding, Fittleworth, UK. Barrier prevents escape of recently born piglets

Characteristics of the best outdoor systems include:

- Enough space for the sow to manoeuvre
- Individual huts with plenty of bedding for farrowing
- Shelter from all extremes of weather
- Light well-draining soil
- Breeds that make good mothers and are well adapted to the outdoor environment
- Excellent stockmanship

An advantage with outdoor systems is that the huts do not have solid floors. With a good supply of bedding, the piglets are less likely to be fatally crushed if they do get trapped under the sow. All of these factors help to explain low piglet mortalities in extensive systems in countries such as the UK.

As with indoor systems, some outdoor systems farrow in groups whereas others use individual farrowing pens. Eastbrook organic farm in the UK keeps the sows in individual pens, separated by a simple electric fence, in order to reduce piglet mortality. At Fittleworth farm, UK, the gilts farrow in individual pens to reduce the risk of them entering each other's huts. The more experienced sows farrow in groups (see Pig Case Studies United Kingdom 3 & 4).

Individual farrowing pen, Eastbrook farm, UK

Group farrowing pen, Fittleworth farm, UK

Gnesta, Sweden and Xanxerê, Brazil - systems for different climates

In cooler climates, the huts must shelter the piglets from the cold. There is only one opening to prevent draughts. It is essential to provide plenty of bedding and to replace it if it gets wet.

In Gnesta, Sweden, the farrowing arcs are situated on gently sloping paddocks with a free draining soil. This helps to keep the bedding dry.

In the UK, the arcs are often treated with a reflective paint to prevent over-heating in summer. In tropical countries, over-heating presents a much bigger problem. One system at Xanxerê in Brazil has an insulated, reflective roof and sides that can be rolled up to improve ventilation. It has a walk-through design which also increases ventilation, though makes it more prone to the effects of wet or windy weather (see Pig Case Study Brazil 5).

In the UK, many outdoor farms use crosses with the Duroc breed for hardiness, meat quality and mothering ability. Some farmers are returning to the older breeds such as Gloucestershire Old Spot, Saddleback and Tamworth that make better mothers and have smaller litters. Piglets from smaller litters are likely to be stronger and to have increased survival chances.

Summary

In intensive systems, sows are confined in farrowing crates to reduce piglet crushing rates. Unfortunately, farrowing crates are as restrictive to the sow as the sow stall (see previous chapter). The farrowing crate also restricts or prevents the sow from:

- Building a nest (a powerful instinct)
- Proper interaction with her offspring
- Getting away from her offspring for a break

Frustration of basic maternal instincts can lead to a build-up of stress hormones.

It is Good Agricultural Practice to provide all farrowing sows with:

- Material to build a nest
- Space to perform normal behaviours
- Excellent stockmanship and care

The need to protect piglets from crushing is covered in the next chapter. The best outdoor systems achieve lower piglet mortality rates without using farrowing crates. Good indoor alternatives are also now available.

Chapter 7. Piglets

The main welfare problems for piglets up to weaning age are caused by:

- Accidental crushing by the mother
- Savaging by their mother
- Barren environments
- Mutilations such as castration and tail-docking, often carried out without anaesthetic or analgesic
- Early weaning

Crushing

In intensive pig production nearly all piglets are born and reared until weaning age in farrowing crates. Despite the fact that the sow is closely confined to restrict her movements, 10-15% of piglets are accidentally crushed or trampled to death by the sow (Arey, 1997). There are a number of factors that contribute to these deaths including:

- The large difference in size between the sow and piglet
- Large litter sizes
- Hard concrete floors without bedding
- Crushing also causes painful and disabling injury

Although farrowing crates are designed to reduce crushing, there is evidence that gilts are more restless and frustrated when confined, making them more likely to crush or savage their young (Hansen & Curtis, 1980).

The modern sow has been bred to be very much larger than her piglets

Savaging

Piglets are also at risk of being savaged by their mothers. This can seriously harm and even kill the piglets. Although the behaviour is not completely understood, it is more common in gilts that have no experience of motherhood and in sows that are stressed. Savaging by gilts has been found to be more common in farrowing crates than loose-housed sows. This may be because the farrowing crate thwarts interactions between the sow and her piglets (Jarvis *et al*, 2004). Gilts in crates who are restless during farrowing are more likely to go on to become savagers. This restlessness may be related to an individual's inability to cope with restrictive environments around farrowing (Ahlström *et al*, 2002).

Total mortality

As we saw in the previous chapter, total piglet mortality in the UK is lower in outdoor systems which don't use farrowing crates than in indoor systems. The Danish Pig Board have researched into free-farrowing systems. They reported that, though crushing mortalities were 1.9% lower in farrowing crate systems, culling rates of weak pigs or ones which did not thrive were 2.7% lower in systems with loose farrowing sows (National Committee for Pig Production, 2004). Weaning weights were also significantly higher in the systems with loose sows. The Danish Pig Board expect to see fast developments in the design of loose farrowing systems in the next few years.

A survey in *Pig Progress* of the Danish Pig Board research suggests that an indication that sows might be more comfortable in free farrowing systems was an increase in their feed consumption. This probably meant that more milk was produced for the litter, explaining increased piglet weaning weights. The survey goes on to suggest that a key to reducing piglet mortality is to breed for better mothering abilities. It is suggested that development of separate breeding lines for mothering ability explains the low mortalities in UK outdoor systems referred to in the previous chapter. In Switzerland, free farrowing systems based on the Schmid crate showed lower piglet mortality at day 32; 11.3% for free farrowing as opposed to 12.2% for the farrowing crate (Dunn, 2002; see also Schmid 1991).

Barren environments

In a natural environment, 3 week-old piglets start to develop their foraging behaviours by beginning to sample solid food items. The lack of suitable foraging material in the farrowing accommodation means that the piglets may start biting and chewing at the sow causing discomfort, irritation and, sometimes, serious injury. The lack of bedding leads to increased restlessness, aggression and injuries amongst the piglets.

Piglet mutilations

Piglet mutilations are carried out in an attempt to overcome some of the problems caused by intensive pig production. Shortly after birth, the piglets have their tails docked, their teeth clipped and in most countries the males are castrated, all of which cause acute physical pain.

Piglets are tail-docked to reduce the incidence of tail-biting which is mainly caused by pigs being housed in barren, overcrowded pens with no bedding or substrate at which to direct their highly motivated foraging behaviours (see Chapter 11 on enrichment). Tail-docking can lead to the development of neuromas which occur when the severed ends of nerves attempt to regrow (Simonsen *et al* 1991). The neuromas may cause chronic stump and 'phantom' pains, such as those suffered by human amputees.

Tail-docking may cause chronic stump and phantom pains

The piglets' teeth are clipped to prevent them from causing damage to each other and to the sow's udder when defending their teat. These disputes are made worse by large litters, problems with the sow producing milk and cross fostering. In cross fostering, piglets from large litters are fostered onto sows with small litters.

Male piglets are castrated to reduce 'boar taint' which in sexually mature animals can leave an unpleasant taste in the meat. Castration causes considerable pain and distress. This is the common experience of stockpeople. It is also backed up by scientific evidence. The rate of squealing increases during castration (Weary *et al*, 1998); so does the pitch (Wemelsfelder & van Putten, 1985). The latter study also showed that recently castrated piglets are less active and more likely to tremble, shake their legs, slide or jerk their tails. For 2-3 days after castration, piglets took longer to lie down and lay in a way that indicated their hindquarters were sore. Healing could take up to two weeks.

The pain and stress of castration can be reduced through the use of anaesthetics. Application of anaesthetic reduces both the frequency of calls and the increase of heart-rate during castration (White *et al*, 1995). Unfortunately, castration is usually carried out without anaesthetic. For as long as castration is practised on piglets, there is also a need to license and use suitable analgesics to deal with post-operative pain. A European Commission Directive requires the use of anaesthetics and additional prolonged analgesia by a veterinarian where castration or tail-docking are performed on piglets more than seven days old (European Community, 2003). It should be noted that the assumption that very young piglets are less sensitive to the pain and other ill-effects of castration has been brought into question by one important recent survey (AHAW, 2004).

Castration

Early weaning

Piglets are weaned by taking them away from their mothers at an extremely early age of 3-4 weeks. In the US it can be as early as 1-3 weeks. This is so that the sow can be mated with the boar again to increase the number of piglets she will produce. If allowed to do it naturally, weaning would not occur until the piglets were 13-17 weeks of age.

Figure 1. Vocal response of piglets to castration

It has been claimed that the squealing of piglets during castration is just a response to the fear of handling. This study showed that the rate of high pitched calls in piglets being castrated is far greater than those of piglets being handled in the same way but not castrated. The latter gradually calm down during the process.

Using data from Weary *et al* 1998

This premature separation causes the piglets to be severely stressed for a number of reasons:

- Removal from their mother
- Change in diet
- Mixed with other unfamiliar piglets
- Taken away to an alien environment
- Transport in some cases to another farm

Early weaning can mean several stresses at once for piglets

At weaning, the piglets abruptly lose the security of having their mother to feed, nurture and protect them. As a result of these sudden changes, the piglets stop feeding for a few days and begin to lose weight. There can also be a number of problems for the piglet's digestive system caused by the abrupt change in diet. The mixing with unfamiliar piglets causes serious fighting as the piglets establish their social rank order.

The stress caused by early weaning can have a harmful affect on the piglet's immune system making them more prone to disease and increasing the use of antibiotics. It can also affect the behavioural development of the piglet. The piglets continue to attempt suckling behaviour and this leads to belly-nosing and navel-chewing. These areas then become sore and swollen. The behaviours may also be linked to the development of more harmful social behaviours later in life such as tail biting.

Heated escape area with bedding reduces risk of crushing

Good Agricultural Practice – addressing the welfare needs of piglets

The welfare of piglets can be improved by:

- Systems which reduce the risk of crushing
- Systems which don't require the mutilation of piglets
- Using methods which reduce the pain and stress associated with piglet mutilations
- Providing enriched environments
- Later weaning

Reducing the risk of crushing

The farrowing crate was devised to reduce the risk of crushing, but it does so at great cost to the welfare of the sow (see previous chapter).

The risk of crushing can be reduced in a range of ways which don't have to involve confinement of the sow. Piglets can be provided with safety areas to which the sow does not have access. Thick bedding and an infra-red lamp encourage the piglets to rest in these areas, away from the risk of crushing. Safety rails should also be provided around the sow's quarters. Breeds should be used which make good mothers, and breeding companies should select for strains less likely to crush piglets.

It has been noted that unconfined sows go through an elaborate procedure before lying down to reduce the risk of crushing her piglets. She grunts to alert them to her presence and usually approaches them with her snout. The sow roots through the nest to disturb any piglets that may be lying under the bedding. The sow first kneels at the front and then slowly lowers the hind portion of her body, laying her hind quarters on the opposite side of the piglet group. If a piglet is in the way and gets caught, he or she begins to scream and the sow either stands or lifts the appropriate part of her body (Halverson, 2001, describing research by Schmidt, 1991).

Warm piglet safety area at back

Good stockmanship is essential in reducing piglet mortality, ensuring careful management of the farrowing quarters. A sensitive and conscientious approach is required to ensure that the sow is supervised during farrowing without stressful disturbance. Keeping a close eye on the condition and nutrition of sows can help to ensure that piglets are properly nourished. It is the common experience of stockpeople that weaker animals are more likely to suffer from crushing.

Sows with larger litters tend to produce smaller, weaker piglets. For this reason, it is suggested that breeders should concentrate less on producing large litters and more on producing healthy piglets (see Chapter 10 on selective breeding). Indeed, several producers in the UK are returning to older breeds that produce heavier piglets in smaller litters. This can reduce mortality rates because the piglets are fitter and the sow can more easily take care of them.

Having smaller litters also reduces competition so there is less need to clip the piglets' teeth. Many farms have not been clipping teeth for several years now and have seen no sign of damage to the piglets or the sow's udder. If problems do arise, it is possible to use a grinder that just blunts the tip of each tooth. This reduces pain and the risk of damage. As a result, tooth infection leading to chronic toothache is less likely.

Male pigs in the UK are slaughtered before they become sexually mature which means that they do not have to be castrated. On Schleithal farm, France, the pigs are killed at a heavier weight and the farmer believes that local market conditions currently require that piglets be castrated. Each piglet receives a local anaesthetic, which takes just 30 seconds to inject. Pain caused by castration is therefore much reduced. Post-operative pain is still likely for up to a week after castration. This should be reduced by providing analgesics for post-operative pain relief.

Later weaning

Pigs do not wean naturally until 13-17 weeks

Many farmers are now considering later weaning to:

- Ensure piglet health without routine use of antibiotics
- Reduce death-rates from PMWS
- Increase piglet growth rates

- Reduce piglet feed costs
- Improve piglet welfare

From 2006, the EU has banned the routine use of antibiotic growth promoters. To ensure piglet health without the use of antibiotics, many farmers are planning to wean piglets later. New EU rules prevent weaning before 28 days for most pig-rearing systems (see Chapter 16 on legislation). Average weaning ages in the UK have increased since the new legislation and are widely expected to increase further following the routine antibiotic ban (see Figure 2). In Denmark, a tendency to increase weaning age from 4-5 weeks has been reported (National Committee for Pig Production, 2004).

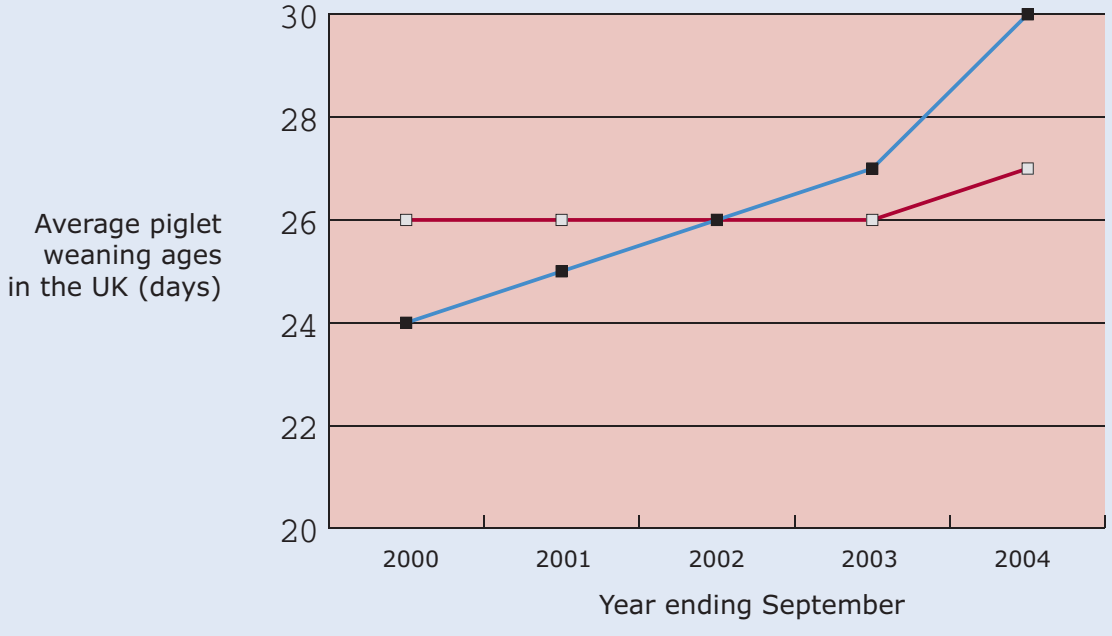
PMWS (Post-weaning Multi-systemic Wasting Syndrome) is a lethal disease exacerbated by stress (see Chapter 14 on disease). UK farmers with high levels of the disease often delay weaning to 32 days. Reducing stress by delaying weaning can significantly reduce death-rates. The Danish Pig Board report that delaying weaning from 4-5 weeks reduces mortality from PMWS significantly (National Committee for Pig Production, 2004). Mortality in the weaner period amongst pigs weaned at 5 weeks was 1.9%. Amongst pigs weaned at 4 weeks, mortality was 4.1%.

Organic farmers generally wean piglets later. It is part of the organic philosophy to keep animals healthy through natural rearing and high welfare systems. Antibiotic use is kept to a minimum. EU organic rules delay weaning until at least 40 days. The Soil Association, the UK's leading organic body, recommends that piglets should be weaned at 8 weeks old or later. It adds that they may only be weaned once they are taking enough solid food. Later weaning means that the farrowing quarters need to be larger and this can further benefit the sow.

However, one leading Professor of Animal Welfare is concerned that later weaning, though good for the piglets, may be bad for the welfare of the sow (Broom, personal communication). Sows have been bred to have larger litters, increasing the demands for milk production (see Chapter 10 on Selective Breeding). Continuing to suckle after 4 weeks causes a loss of condition to the detriment of both sow and future litters.

Tony Connolly of Eastbrook organic farm has a similar concern. He believes on the one hand that weaning at 3 weeks is a particularly bad time for the piglets since their immune system is at its lowest ebb. The 40 day minimum required on organic farms is better for the piglets, but is a bad

Figure 2. Increases in weaning ages for UK piglets



time for the sow since she has lost condition at this stage. As a result, he believes "thin-sow syndrome" can potentially be a problem on organic farms which wean at 40 days. This problem is made worse with hybrid sows which have been bred to be leaner in order to produce pigmeat for a health-conscious market. Carrying less fat, they are less able to cope with the pressures of suckling.

Eastbrook farm deal with this problem in two ways. Firstly they keep Saddleback sows which have a thicker layer of fat and are better able to sustain suckling. Secondly they delay weaning further until 8-10 weeks. By this stage the sow is eating more, has started to reduce the frequency of suckling and is beginning to recover condition. Meanwhile the piglets are now eating significant amounts of solid food and are becoming more independent of their mother. They now tend to rest and sleep as a group away from the sow. Weaning as late as this has benefits for both mother and piglets. Crossing the Saddleback sows with a leaner Large White/Landrace boar helps to keep the offspring reasonably lean (see Pig Case Study United Kingdom 4).

Eastbrook organic farm

Soukroma organic farm

Soukroma organic farm in the Czech Republic delays weaning till 12 weeks. The sows farrow indoors in individual straw-covered pens. At six weeks, they are joined together into family groups. This ensures that the stress of mixing does not coincide with the stress of weaning.

The key function of early weaning is to reduce the time it takes for the sow to become pregnant again, so increasing productivity. In these two farms, the boar is introduced to the family groups of sows and piglets in order to minimise this productivity loss.

Indoor systems

Providing an enriched environment both before and after weaning can have beneficial effects for the welfare of piglets. For piglets, the best forms of enrichment also provide thermal comfort because they are prone to chills. They also encourage play and the development of natural foraging behaviours. Providing an opportunity to forage can reduce the pressure they put on their mother.

Wood chip bedding encourages exploration and reduces pressure on the mother

In different parts of the world, several different forms of substrate have successfully been used including:

- Straw bedding
- Wood shavings
- Rice hulls
- Peanut straw

Providing an enriched environment later in life significantly reduces the risk of tail-biting, making tail-docking unnecessary.

Outdoor systems

The most enriched environments for piglets can be found on good outdoor farms. The piglets have plenty of room to run around and play with their littermates. There is also lots of opportunity for them to explore and investigate. Where piglets are raised outdoors, it is rarely considered necessary to dock their tails.

Outdoor piglets need protection from the cold and predators. They need shelters with plenty of dry bedding. Many outdoor pig-farms in the UK have a secure electrified fence around the perimeter to keep predators such as foxes out. A barrier is often placed around the entrance of the huts to prevent the piglets escaping until they are at least three weeks old. This provides additional protection from cold and predators, and helps to prevent piglets from becoming separated from their mothers.

Summary

Welfare problems for piglets include:

- Being crushed or savaged by their mother
- Mutilations such castration, tail-docking and tooth clipping without anaesthetic or pain relief
- The stress of early weaning
- Unenriched environments

It is Good Agricultural Practice to:

- Provide good piglet safety areas in indoor systems with plenty of bedding
- Avoid mutilations wherever possible
- Use anaesthetic and pain-relieving analgesics wherever castration and tail-docking are practised
- Wean piglets as late as possible
- Provide bedding and foraging material
- Piglets born outdoors need good shelters with extra bedding for warmth. Hardy breeds, adapted to the local climate, should be used

Chapter 8. Growing pigs

In intensive production, the majority of growing and finishing pigs are housed indoors and grouped into pens. The pigs are crowded into these pens at very high stocking rates. The floors are usually fully perforated or slatted, some are part slatted and others have solid concrete floors. The pens contain no straw bedding and rarely have any other form of environmental enrichment.

The pigs are crowded together to save on space and costs. The floors are perforated so that the urine and dung passes out of the pens into collecting tanks below. Straw bedding cannot be used because it would block the perforations.

During the growing phase, the pigs are frequently re-grouped into new pens with unfamiliar pigs. This leads to fighting and the pigs can inflict serious injuries on each other (see Chapter 12 on aggression).

The main welfare problems for growing pigs are caused by the lack of bedding and overcrowding.

Injuries and disease

Concrete floors can cause cuts and grazes to the pig's knees, fetlocks, hocks, and elbows. On slatted floors, their feet develop cracks which can rapidly become infected leading to lameness. Pigs also develop bursitis, which is the swelling of the hock joint. Bursitis can affect 96% of pigs compared with 4% of pigs reared with straw bedding (Smith and Smith, 1990). The Danish Pig Board report that lameness is 1.8 times higher on solid floors, and 2.4 times higher on fully slatted floors, compared with deep litter (National Committee for Pig Production, 2002).

Aggression, concentrated feed and fast growth rates can all contribute to a high incidence of ruptures and hernias. The high rates of growth can also cause metabolic stress leading to problems with ulcers, heart failure and lameness.

Tail-biting

In pens without bedding, the biting and chewing behaviours become re-directed towards pen fittings and other pigs (see Chapter 11 on enrichment). Pigs housed without straw perform more massaging, rooting, nibbling and chewing of pen-mates than those with straw (van Putten and Dammers, 1976).

Under natural conditions, growing pigs are too busy foraging to think of biting each other's tails

The chewing of pen-mates can lead to serious outbreaks of biting which are directed at the ears, flanks and most commonly the tails of other pigs. The wounds attract other pigs so that the behaviour can quickly spread throughout the whole group.

Tail-biting is one of the greatest welfare concerns. It is also one of the greatest causes of economic loss because the carcasses of tail-bitten pigs are often condemned. Up to 29% of pigs on slatted floors can have bitten tails (Madsen *et al*, 1980). The Danish Pig Board report that the risk of a pig having a tail-bite was 3.5 times higher in a unit without bedding. Mixing pigs after introduction to the herd also increased the risk 1.5 times (National Committee for Pig Production, 2002).

Although there are several factors involved in tail biting, most are connected with welfare deficiencies. The most important factor is the lack of bedding or other suitable substrates. The situation is not helped by the fact that pigs are crowded together and unable to escape. Some genetic lines are more prone to tail-biting than others. Pigs should also be fed a diet with adequate nutrients, particularly salt and protein to reduce the risk of tail-biting from spreading. Tail-biting is more common when pigs are uncomfortable, for example, because of poor air quality or poor flooring. It is also more common when pigs are frustrated, for example, by poor access to the feeders. If an outbreak occurs, time should be taken to isolate both the victims and the culprits.

Although tail-docking can reduce the incidence of tail-biting, this painful procedure deals with the symptoms of the problem, not the causes. To this end, EU directives require stockpeople to change environments and stocking densities where there is a tail-biting problem before resorting to tail-docking.

Growing pigs usually have continuous access to food which satisfies appetite but the diet is low in fibre and feeding occupies very little of the pigs' time. Straw and other substrates can provide a good source of fibre for growing pigs but the main benefit is the occupational value. Bedding is also important for both the physical and thermal comfort of the pig.

Good Agricultural Practice – addressing the welfare needs of growing pigs

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The welfare of growing pigs can be improved by

- Trying different forms of substrate to keep the pigs occupied and reduce the risk of tail-biting
- Reducing stocking density
- Providing escape areas for subordinate pigs to avoid aggression
- Keeping the mixing of pigs to an absolute minimum (see Chapter 12 on aggression in pigs)
- Breeding and feeding programmes to reduce the incidence of ruptures, other injuries and metabolic health problems

Indoor systems

Various studies have shown that the provision of even a handful of straw per finishing pig provides occupation for over an hour and substantially reduces conflict and cannibalism (van Putten, 1980; Ekesbo, 1973). Indeed, EU rules now require all pigs to be provided with access to such material to enable proper investigation and manipulation activities.

A range of other fibrous materials can serve the same purpose. In Northern Ireland, several farms have experimented with providing racks that contain spent mushroom compost. The pigs are able to help themselves to the compost and spend much of their time chewing and nibbling on the substrate. Tail-biting has not occurred where these racks have been used.

Some farmers have experimented with non-edible objects such as footballs, tyres and chains. While these can reduce aggression, they soon lose their novelty value. Because they are not edible, they do not fulfil the full foraging behavioural repertoire (see Chapter 11 on environmental enrichment). Sparsholt College supplied footballs in their old pig unit. The pigs took an interest in these for a few minutes and then returned to aggressive activity. In their new pig unit they now provide a deep bed of straw. The pigs spend hours foraging through the straw and there is now very little aggression. One recent study supports the claim that straw occupies pigs for much longer than a range of toys and other enrichment objects. The forms of enrichment investigated provided less than 12% of the occupation time compared with that provided by straw bedding (Scott and Edwards, 2005).

On Schleithal farm in France, the growing pigs have a deep bedded run which is open on one side for plenty of daylight and fresh air. The pigs have plenty of space for frolicking and play. Accommodation for growing pigs in large tents with walls constructed from straw bales can be provided relatively cheaply and can also be moved. The floor is deep bedded with straw and the pigs have access to an outdoor run (see Pig Case Study France 1).

Chains and footballs provide temporary enrichment, but pigs soon lose interest

As pigs grow, conditions can become more crowded leading to aggression. Some farms reduce group sizes to avoid this problem. However, this can involve further mixing of pigs, itself leading to aggression. This is a problem if, for example, group sizes are reduced from 30 to 20, some pigs will have to be re-mixed. Sparsholt College solve this problem by splitting each group in half from 40 to 20 when the pigs reach 40 kg at 12 weeks old. This way no further mixing is required. An alternative could be to move the pigs to larger pens or start them off in smaller groups.

Deep bed systems

There is a recent trend across the world towards deep bed systems for all stages of the life-cycle, especially for weaners and growing pigs. Interest centres on the economic, social, environmental and animal welfare benefits of this system. It has been developed amongst others by the Brazilian research institute EMBRAPA. At least 100 pig farmers in the South of Brazil have now adopted this system.

The system uses a layer of fibrous material up to 50cm thick. A range of materials can be used including rice hulls, peanut hulls, straw and ground wood. The substrate absorbs the wastes of the pigs. Energy from its decomposition helps to evaporate water and to keep the substrate dry. In hotter countries, where less bedding is required to keep the animals warm, a layer of 30cm may be enough. However, if the substrate becomes too damp, more material should be added. Some farmers turn the material over once a week.

The system is reported to have fewer problems with cannibalism and lameness than is found in intensive systems. With plenty of opportunity to forage, piglets are much less likely to think of biting each other's tails. One farm at Sitio Sao Luiz in Brazil has experimented with a deep bed system using peanut hulls for half of their weaned pigs. Compared to weaners kept on slats, the farmer found that the litter kept the piglets warmer and that there was less huddling. He also found that it reduces the incidence of diarrhoea. The piglets on the litter are more active and less fearful (see Pig Case Study Brazil 1).

Deep-bed system using peanut hulls

When a deep bed system has become damp, more material should be added to absorb and evaporate the moisture

EMBRAPA estimates that the capital costs of the system are 40-60% lower than slatted systems. Emissions of ammonia are 50% lower, and there is a reduction in hydrogen sulphide and other odorous gases. The system produces much smaller quantities of waste. The waste it does produce makes better fertiliser and requires less labour to transport (full details of the system are described by de Oliviera *et al*, undated). The system is suitable for small-scale producers. It can be used for all stages of the pigs' lifecycle, but is especially used for growing pigs.

Examples of systems using deep beds are described in *Pig Case Studies Brazil 1, 3, 4 & 6*

Outdoor systems

Gnesta, Sweden

Outdoor systems have the highest welfare potential for rearing pigs. In outdoor systems there can be plenty of opportunity for natural foraging. Since there is usually plenty of space:

- Stocking densities are usually lower, reducing the risk of aggression
- Subordinate pigs can more easily escape from aggressive encounters
- There is no need to alter group composition as the pigs grow

Outdoor growing pigs in the UK show better growth rates and lower mortality than those kept indoors, another possible sign that reduced stress and better welfare are good for production (see Table 5).

Outdoor pigs will spend hours grazing and rooting. As they grow, they will need plenty of space or they will quickly eat everything! The natural rooting behaviour can be very damaging to pasture. Davidsta farm at Gnesta, Sweden, get around this problem by providing a generous space allowance and by rotating pastures before they get destroyed. Electric fencing is used to keep the pigs in the paddocks and this can be easily moved to new sites.

At Hånsta Östergärde organic farm in Vattholma, Sweden, the pigs are kept for part of the year in woodland. The pigs remain with their mothers throughout their lives. During the summer, they are transferred from their farrowing paddocks to recently felled woods. They are contained by electric fences in 1 ha paddocks. The pigs natural foraging behaviour helps clear the area around the felled trees. It also helps the re-generation of natural woodland. After one area has been cleared, they are moved onto a new one. This continues until mid September (see Pig Case Studies Sweden 1 & 2).

Pigs at Sheepdrove organic farm help to prepare the ground for growing crops

Table 5. Outdoor vs indoor growing pigs

Annual UK averages for years beginning September 1999 - 2003
(calculated from Meat and Livestock Commission Pig Yearbooks 2001-5)

	Outdoor systems	Indoor systems
Mortality (%)	4.50	5.50
Feed conversion ratio	1.74	1.84
Daily weight gain (g)	480.20	438.60
Feed cost per kg gain (GB pence)	30.46	34.99

NB. Growing pigs in outdoor systems were born and reared outside. Growing pigs in indoor systems were born in either outdoor or indoor systems, then reared indoors.

Swedish pigs clearing felled woodland

Pigs naturally inhabit forested areas. The forest environment provides plenty of opportunity for both the sows and their litters to engage in foraging behaviour. The pigs evidently receive plenty of nutrients from the forest as their food ration can be reduced to almost 75% of what they would get in conventional production. During winter, they are taken to the fields where their rooting behaviour assists in preparing the soil for re-planting in the spring.

Pigs were traditionally kept in woodland and, in Spain, the tradition survives. In Andalucia, growing pigs of the Iberian breed are reared in extensive oak woodlands. From September to March, they obtain most of their food by foraging. They take 18 months to reach maturity, roughly the same as their wild boar ancestors. The pigs are sold for speciality ham and receive a good premium. A diet based on acorns results in a fat content similar to olive oil. The higher the proportion of acorns in the diet, the better the premium for the ham. This encourages a lower stocking density, which is good for the health and welfare of the pigs (see Pig Case Studies Spain 1, 2 & 3).

Summary

Intensively kept growing pigs can suffer from increased lameness, tail-biting and cannibalism as a result of welfare problems including overcrowded and barren living conditions. Aggression results also when unfamiliar groups of pigs are mixed.

It is Good Agricultural Practice to keep growing pigs in stable groups in a rich environment with:

- Plenty of bedding and foraging material
- Plenty of space with a low stocking density
- In stable groups which are not mixed during the growing period

Outdoor systems have the highest welfare potential for all stages of pig production, especially traditional woodland-based systems. Pastures should be rotated to prevent disease build-up and to ensure a ready supply of vegetation to forage.

Iberian pigs feeding on acorns

Chapter 9. Boars

Boars are too often kept in isolation without bedding

In some intensive farms in certain parts of the world, boars receive similar treatment to sows. Some are kept in stalls and bedding is often not provided. Another problem for boars is that they are often kept isolated from other pigs.

Lack of bedding can have two consequences for welfare. Firstly, boars may lose their foothold while serving the sow and this can lead to leg damage. Secondly, boars are fed a maintenance ration like sows to prevent them from becoming overweight. Boars are therefore likely to suffer from the same problems of hunger as experienced by sows. In stalls they are also, like sows, likely to suffer boredom and health problems as a result of not being able to perform many natural behaviours.

Boars are often kept singly because problems caused by fighting and aggression are the most severe with boars. If fights break out, a subordinate boar needs space to escape from aggression. This is not normally possible in indoor systems.

"Teaser" boar next to sows in sow stall, Brazil – boars are often given more space but, outside the EU, are also often kept in stalls

Good Agricultural Practice – addressing the welfare needs of boars

Boar accommodation (on right) at Sparsholt College, UK. EU rules require boars to be provided with space to turn around, access to manipulable materials such as straw and to be able to hear, smell and see other pigs

The welfare of boars can be improved by:

- Giving them plenty of space to exercise and carry out natural behaviours
- Providing bedding for easy foothold, comfort, hunger relief and occupation
- Ensuring visual and, where possible physical, access to other pigs at all times

Across the world, many intensive farms do not keep their boars in stall cages, but keep them in small pens with some freedom of movement. Boars often receive better treatment because they are the most

highly valued animals on the farm. This is because boars are used to improve the genetics of the herd. They have therefore been bred to carry the latest genetics for whatever the desired characteristics are.

Although boars can live with each other if they have been brought up together since birth, they are usually housed separately to prevent fighting and aggression. The pens are usually large enough to house the boar and one or more female sows that are there to be served or mated. Some boar pens are bedded to provide good foothold while the boar is serving the sow.

On most farms, boars have visual access to other pigs (usually the sows). This is primarily so that it is easier for the stockperson to recognise any sows that have returned on heat. Sows returning on heat will spend a lot of their time close to where the boar is. However this is not always the case. EU law now stipulates that boars must not be visually isolated from other pigs.

In Soukroma organic farm in the Czech Republic boars are introduced, one at a time, to the family groups of sows and their piglets. Boars are rotated between the different family groups since sows vary in their mating preferences!

Boars also need access to high fibre food to prevent hunger

Family group system, Soukroma organic farm, Czech Republic

Outdoor systems

Team of boars in dry sow enclosure, Fittleworth farm, UK

Again, outdoor systems can have the best potential for good boar welfare. Some outdoor farms allow 'teams' of 2-3 boars to live together in large paddocks with recently weaned sows. Risks of aggression are reduced by using groups of boars which have grown up together and by ensuring that any subordinate boar has plenty of space to escape from aggressive encounters.

Problems arise when one or more boars die or have to be removed from the group. Introducing a new boar cannot be recommended. Eastbrook farm never introduce new members to a boar-team. Where a single boar is "left over" from a boar team, he is grouped with sows which have recently been mated as a precaution in case any of them come back into oestrus.

Brothers can often be reared together amicably in free-range systems

Boar in family group enclosure at Eastbrook organic farm, UK

Summary

Boars in intensive systems may suffer from:

- Hunger due to restricted diet and lack of high fibre food
- Confinement in stalls (less common than for sows)
- Isolation from other pigs
- Barren environments

Boars in extensive systems can suffer serious aggression and injury from other boars, especially if mixed with boars they are not familiar with.

It is Good Agricultural Practice:

- To provide boars with space for exercise
- To provide plenty of bedding for comfort and foraging
- To keep boars in the company of other pigs and, where this is not possible, to ensure close visual and nasal contact with other pigs

Boars can be kept in groups if reared together and given plenty of space to escape aggression.

Section 3. GENERAL ASPECTS OF PIG WELFARE

Chapter 10. Selective breeding

From an early age, breeding programmes were directed at improving reproductive performance, reducing aggressiveness and lowering the pig's fearfulness of man. Modern breeding has increased growth rates, food conversion efficiency and increased the leanness of meat. Unfortunately, selective breeding for these factors has often come at a cost to welfare.

Large White/ Landrace cross

Modern breeds in the west are now largely based on the genetics of two breeds, the Landrace and Large White. Compared with their wild ancestors, these have been selected for the following traits:

1. High reproductive performance. Modern sows produce litters with over 10 piglets which is twice that of wild and feral swine. Unfortunately, this can increase the number of smaller and weaker piglets that find it difficult to survive.
2. Producing large litters can put a strain on the sow to produce enough milk to feed them. With early weaning, this is less of a problem. However, later weaning would be much better for the health and welfare of the piglets and this creates a problem of balance. Late weaning of a large litter could cause the sow to lose condition and this may compromise the productivity of future litters.
3. Faster growth rates and increased efficiency with which pigs convert food to muscle. This involves them having large appetites which leads to hunger when adult breeding stock have to be placed on restrictive diets.
4. Increased growth rates also put pressure on the pig's metabolism. High levels of oxygen are required, putting pressure on the heart and lungs. The combination of higher metabolism and larger muscle blocks results in greater heat generation and can make it harder for the pig to keep cool (AHAW, 2005).
5. Leaner carcases with less back fat. Extra muscling in the back legs brought with it the undesirable trait of greater stress susceptibility. Reduced back fat has also led to fertility problems. Having fewer reserves of fat can make it harder for a sow to produce enough milk for a large litter without losing condition, further compounding the problem raised in no 2.
6. Longer bodies to increase the amount of meat. This can also put pressure on legs and backs.
7. It is apparent that the modern breeds have lost much of their resistance to disease through years of application of veterinary treatment (Hartung, 1994). This is likely to have reduced selection pressure for good immune systems.
8. The lighter skin of modern pig breeds can increase susceptibility to sunburn in extensive systems.
9. Reduced snout length to lower the amount of rooting and digging.

Although pigs have been selected for certain valued characteristics, domestication has had little effect on the biology and most importantly the behaviour of the pig. The similarities between wild and domestic pigs remain more striking than the differences. Many welfare problems which arise in modern farming are due to a failure to address behavioural and biological needs which pigs have inherited from their wild ancestors.

Good Agricultural Practice – selective breeding for better welfare

Selective breeding could be used to improve the welfare of pigs. The following traits could be selected for:

Saddleback

- Smaller litters of stronger and healthier piglets which can be weaned later without compromising the condition and health of the mother
- Breeds which make good mothers and are less likely to crush their young
- Resistance to stress and disease
- Reduced aggression

- Animals adapted to outdoor rearing in different climates

Improvements to welfare which might follow from this would have benefits for productivity.

Selection for free-range and organic systems

The Landrace x Large White crosses used in intensive systems are not always appropriate for free-range and organic systems. Generally, they are less well able to cope with outdoor conditions where there can be more extremes of weather and less control over disease.

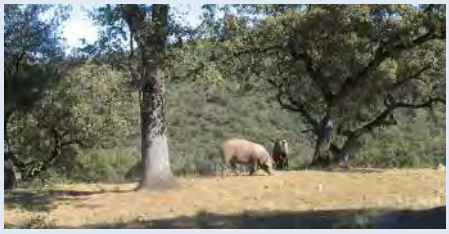
It may be more appropriate to use traditional and more local breeds that are better adapted. In the UK for example, traditional breeds such as Gloucester Old Spot, Berkshire, Saddleback and Tamworth are hardier pigs, more suited to outdoor conditions and more resistant to disease. They have smaller litters and generally make better mothers. The Duroc breed also has some of these qualities and is widely used in crosses for extensive systems.

Local breeds may be more adapted to the prevailing climatic conditions. In cold climates, the Mangalica pigs from Hungary have thick fur coats making them more suited to the outdoor winter conditions. Many traditional breeds retain the darker pigmentation of their ancestors, helping to protect against sunburn in hotter climates. This includes the Spanish Iberian pig, the Sicilian Black and a range of traditional African breeds. These breeds are also suited to a semi-feral existence, foraging for food in pasture and woodland. The meat of slow-growing traditional breeds can also often be sold at a premium price based on its flavour, quality and fatty-acid composition (see Pig Case Studies from Hungary, Spain & Ivory Coast).

Many traditional and local breeds are at risk of becoming extinct. According to the International Livestock Research Institute (ILRI), 30% of the world's livestock breeds are endangered. These breeds may contain genes valuable for the future development of sustainable pig production as they may be adapted to different environments. For example, the curly-haired, lop-eared Turopolje pigs from Croatia are well adapted to harsh climates and can survive cold winters in marshy lands on a minimal diet. Unfortunately, only 50 of these animals remain in existence.

Four traditional breeds adapted to different climates

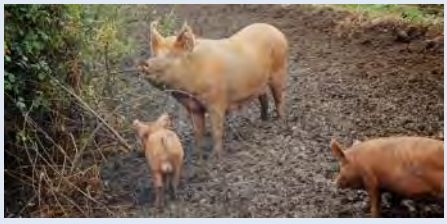
Spanish Iberian pig grows slowly on acorns to produce premium hams



Mangalica, Hungarian woolly pig, adapted to cold Eastern European winters

© Lars-Erik Sipos/CIWF Trust

Tamworth, traditional British pig



Traditional African pig, Ivory Coast

© MAEP/CIWF Trust

Summary

Selective breeding for performance and meat quality can have a range of unintended welfare consequences including:

- Increased metabolic pressure on both sows and growing pigs
- Increased stress susceptibility
- Increased hunger
- Reduced disease resistance
- Weaker legs and backs

Larger litter sizes are likely to result in higher piglet mortality.

The increasing predominance of a few breeds worldwide reduces biodiversity. Rare and traditional breeds are at risk of extinction. Genetics which adapt pigs to particular environments may be lost for ever.

Breeding can select for traits which are beneficial for welfare including:

- Resistance to stress and disease
- Reduced aggression
- Better maternal qualities
- More sustainable levels of productivity

Rare and traditional breeds should be preserved.

Chapter 11. Environmental enrichment

Introduction

The natural environment of pigs is complex. They interact with other individuals of all ages. They eat a wide range of foods using a wide range of behaviours. Pigs face a range of temperatures and weather, which they use a range of behaviours to cope with. They have opportunities to rest, but will be active for much of the day.

Growing pigs in barren environment

By contrast, intensive environments are often barren. For example, social interactions are less varied, the environment is less changeable and there is much less opportunity for foraging. Intensive systems often fail to address the needs of pigs to perform natural behaviours.

The social and physical environment of pigs can be enriched by:

- Keeping pigs in more natural social groupings
- Positive handling and social contact with stockpeople
- Provision of bedding and fibrous materials for foraging
- Provision of toys such as tyres, chains and footballs (this is much less effective)
- Providing access to the outdoors

Social enrichment

Recently weaned piglets are often fearful of people and are easily panicked by a range of novel stimuli. Both research and the common experience of stockpeople suggest that social and environmental stimulation helps pigs to stay calm when faced with novel experiences including handling and transport.

In one piece of research, Landrace cross piglets were exposed to a range of enrichments including regular interaction, regular handling and petting by the stockpeople and the provision of rubber-hosing to play with. Compared to controls, all these treatments reduced the excitability of the piglets, especially the social interaction with stockpeople (Grandin, 1988). This is likely to be beneficial later on during handling and transport to slaughter. Reduced stress is likely to be beneficial for meat quality.

Two systems compared at Sitio Sao Luiz, Brazil - social and environmental enrichment reduces fearfulness in piglets

These findings tie in with the experience of stockpeople. Josi Nelson Camiloti at Sitio Sao Luiz, Brazil, experimented with a deep bed system based on peanut shells for his weaned pigs. He found they were more active and less fearful than piglets reared on slats. Tony Connolly, pig manager at Eastbrook organic farm in the United Kingdom, believes that free-range piglets travel much better than intensive piglets due to the greater complexity of their life experience. Josef Skenlár, of Sasov organic farm in the Czech Republic, visits and interacts with his pigs several times a day. He attributes the fact that not a single pig has died on the way to slaughter in the last three years to regular handling and friendly contact between pigs and humans. Their social environment is also enriched by very late weaning and social contact with boars as well as a group of sows. Their physical environment is enriched by the provision of plenty of straw and access to an outside run.

Physical enrichment

© Colin Seddon

Enrichment of the physical environment for comfort, nesting, foraging and diet can make a significant contribution to the welfare of pigs. For these reasons, the EU have made it compulsory to provide pigs with bedding (see Chapter 16 on legislation).

Comfort and nesting

Bedding makes a significant contribution to the physical comfort of pigs at all stages. When lying, as little as 10-20% of a pig's total body surface area comes into contact with the floor (Baxter, 1984). The amount of strain on these areas of the body, especially the bony parts, will obviously be high and increase with body size.

Bedding also provides thermal comfort and can reduce the temperature requirements of growing pigs by as much as 6°C (Bruce and Clark, 1979). In natural environments, pigs construct nests for sleeping, particularly in cold and wet conditions.

Dung and urine are absorbed by bedding, reducing the contact between these residues and the animal and providing a good foot-hold. Bedding reduces injuries, particularly the leg injuries and infections that cause lameness.

Fibrous bedding helps sows to deal with their hunger

Shortly before farrowing, sows construct elaborate nests in which they give birth and rear their young. Sows that are prevented from building a maternal nest become highly stressed. The bedding in these nests helps improve piglet survival by keeping them warm and also reducing the risk of being crushed by the sow lying on top of them.

Foraging and diet

Tamworth piglet foraging for bracken roots

Sitio Sao Luiz, Brazil - peanut shells also make a good foraging substrate

In natural environments, pigs are omnivorous opportunists. Their diet is usually highly varied, high in fibre and generally takes several hours to find and consume. Even when their daily food requirements are provided, they can still spend more than half the daytime foraging (Stolba and Wood-Gush, 1984). Most foraging is directed to objects at ground level which are investigated by sniffing, rooting, chewing before finally being eaten. Intensive housing systems provide little or no opportunity for these activities. As a result, pigs develop abnormal behaviours such as:

- Belly-nosing and navel-sucking in piglets
- Tail-biting in growing pigs
- Boredom and stereotypies in sows

In modern husbandry systems, sows are usually fed a daily ration, which contains little fibre and takes just over 15 minutes to eat. Generally, the ration meets their daily nutritional requirement but leaves them feeling hungry. Bedding can promote foraging behaviour and compensate for the lack of fibre. EU rules require that pigs should have permanent access to material such as straw for investigation and manipulation (see Chapter 16 on legislation).

Enrichment can be provided by a number of different materials. These include straw, hay, wood shavings, sawdust, spent mushroom compost and

The sow's lying-down routine

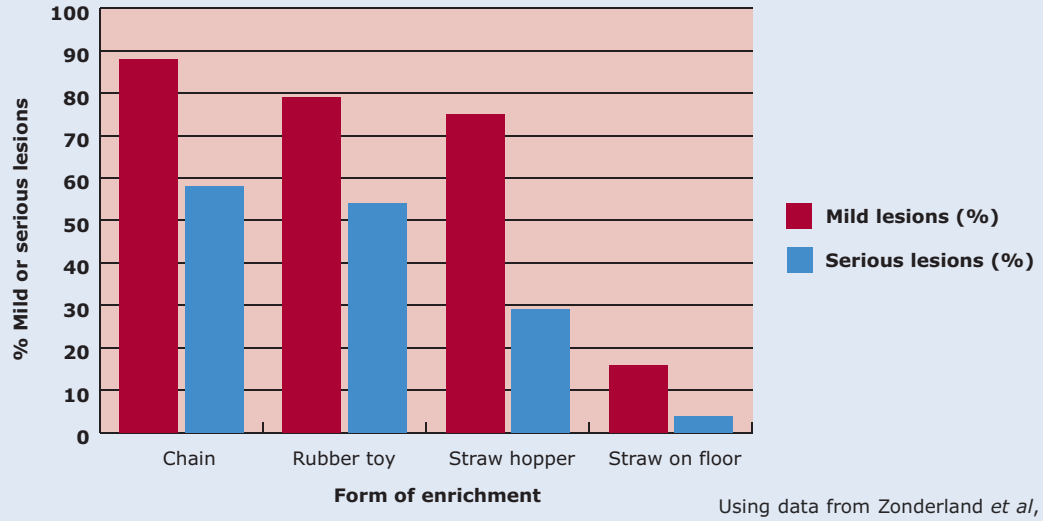
By pushing downwards and forwards on a soft substrate, sows can make themselves comfortable. Pigs kept on a hard substrate like concrete will sometimes attempt to do this, but with less satisfying results

peat. Each substrate can have different benefits but it is important that the substrate fulfils all the components of foraging including investigation, manipulation and consumption. Artificial enrichment such as rubber tyres, chains and footballs are less effective because they fulfil too few of these foraging components. They soon lose their novelty value, whereas pigs will root through straw for hours.

In one study (Zonderland *et al*, 2004), undocked weaned piglets were provided with a range of enrichments including a suspended chain, suspended rubber toy, access to a straw hopper (5g per piglet per day) and the provision of 10g of straw on the floor per piglet twice per day. The effect on the appearance of minor and serious tail lesions was recorded. The results are shown in Figure 3. The provision of a reasonable quantity of straw on the floor was clearly the most effective method of reducing tail-biting.

The best form of environmental enrichment is to provide access to the outdoors. Free-range pigs can forage for a range of foods including grasses, roots and worms. They can exercise and experience a range of environmental conditions.

Figure 3. Effect of environmental enrichment on tail-biting in piglets



Using data from Zonderland *et al*, 2004

Chains lose their novelty value; organic substrates will keep piglets occupied for hours

Summary

Pigs are adapted to complex physical and social environments. They benefit from good relationships with people and other pigs.

Access to pasture, or to deep bedding in indoor environments, provides opportunities for:

- Comfort
- Nesting
- Temperature control
- Exercise
- Foraging

Keeping pigs occupied helps reduce aggression, tail-biting and cannibalism. Providing environments adapted for the pig can be good for production, health and welfare.

Chapter 12. Aggression in pigs

Injuries following mixing of sows

Introduction

When unfamiliar pigs are mixed with each other they will attempt to establish a social hierarchy or pecking order by avoidance, aggression and fighting. Once the hierarchy is established, future disputes between animals can then be settled with minimal aggression. Any further outbreaks of aggression are usually much less intense unless resources such as food or space become limited.

Domestic pigs have retained the same fighting tactics as the wild boar that are broadly similar for all age groups of pigs (Rushen and Pajor, 1987). They attempt to bite their opponents, particularly the head region, whilst avoiding being bitten. This gives rise to the commonly observed 'head to tail' or 'inverse parallel' posture. In established groups, aggression is regulated through an 'avoidance order' whereby the display of certain behaviours can limit the attacks made by dominant individuals (Jensen, 1982). In general, larger/older members of the group initiate and win most fights.

Aggression can have serious consequence for the welfare of the individual. In addition to the injuries caused by fighting, it can lead to the production of 'stress' hormones such as adrenaline and cortisol. The high level of both physical and psychological stress associated with aggression has lead the UK Welfare Codes to recommend that 'pigs should be kept in stable groups with as little mixing as possible'. The stockperson should ensure that persistent bullying, leading to severe injury or food deprivation, does not take place.

It is therefore important to avoid mixing wherever possible. This can be done by keeping pigs in their original groups. When sows are weaned, they should also be returned to their original groups as far as possible.

Where mixing is unavoidable, the key point is to reduce the level of aggression by allowing losers of fights and weaker pigs to flee from, and avoid, the dominant pigs. The following general points should be considered:

- Reduce group size so there are fewer hierarchy positions to settle and hence less fighting
- Provide more space so that pigs have a greater chance of fleeing attacks and avoiding aggression
- Provide dividers or barriers to increase the chance that pigs can flee attacks and avoid aggression
- Provide good ventilation because pigs can quickly overheat during fighting
- Provide straw bedding to ensure good foothold thereby reducing injuries
- Ensure that any sharp projections, e.g. drinkers, are protected
- Ensure that weaker individuals can get access to food, particularly where it is restricted
- Provision of bedding and high fibre food reduces hunger in food-restricted sows and may reduce the tendency to aggression at feeding time
- Feeding sows separately and dispersing food widely also reduce aggression at feeding time

According to the Danish Pig Board, hunger caused by restrictive feeding is likely to be a reason for unrest and aggressive behaviour amongst group-housed, gestating sows. They found that sows fed ad lib had significantly fewer bites than those restrictively fed (National Committee for Pig Production, 2003). There are good health and production reasons for not providing concentrated food ad lib, but access to high-fibre food and bedding they can root in is likely to make sows less aggressive. This may explain the belief of some free-range producers that their sows are calmer because they are kept outdoors with access to pasture they can root in.

Case Study

Eastbrook farm, United Kingdom

Eastbrook organic farm reduces the stress of mixing by placing sows, before farrowing, in individual pens which are separated by an electric fence. The piglets are free to move between the pens since they can pass underneath the electric wire, and the groups can get to know each other at their own time and rate.

When the piglets are five weeks old, the fences separating the pens are removed and the families are free to mix. This mimics the natural system where sows introduce their piglets to the family group at a few weeks old, and helps to minimise the stresses of mixing.

When the piglets are weaned at 8-10 weeks old, they are kept together as a group. This system not only minimises the stress of weaning and mixing; it also ensures that these two stressful experiences do not happen simultaneously.

Case Study

Davidsta farm, Gnesta, Sweden

Davidsta organic farm avoids unnatural mixing entirely by keeping the sows in their natural groups. Before farrowing, they are transferred to farrowing paddocks. Each is provided with a farrowing arc deep bedded with straw. A restraining barrier keeps the piglets inside the arc.

When the piglets are seven days old, the barriers are removed and the piglets can mix as they would naturally do. When they are weaned at eight weeks old, the piglets are kept in stable groups without mixing. The sows also remain in their permanent groups.

See Case Studies United Kingdom 4 and Sweden 1 for fuller accounts

Summary

Some aggression is natural in pigs, but is usually kept within reasonable bounds provided:

- A dominance order has been established
- Subordinate pigs have space to escape from aggression
- Essential resources like food are not restricted

Problems with aggression in domesticated pigs can be increased by:

- Mixing groups of unfamiliar pigs together
- Keeping pigs in unnaturally large groups
- Stress caused by lack of space and hunger
- Provision of unnaturally concentrated food, poorly distributed

Aggression can be reduced, without undue confinement, by:

- Keeping pigs in stable groups as far as possible
- Keeping group size and stocking density low
- Providing space and escape areas
- Avoiding hunger by providing access to straw or other high-fibre foods
- Various techniques for keeping sows apart at feeding time

Chapter 13. Stress physiology

Pregnant sows in stalls suffer chronic stress from hunger and confinement

Most animals are able to make a number of changes when challenged by their environment. For example, an animal that is too hot may start to sweat. This is a physiological response to the challenge. Pigs don't sweat, but can wallow or seek shelter from the sun. In this case, the animal has made a change in his or her behaviour to try and cope with the environment. Both behavioural and physiological changes serve to return the animal to some optimal state or equilibrium.

Pigs challenged by heat can adapt by seeking the shade or wallowing

When environmental conditions become difficult and the animal fails to cope, we describe it as being under stress or as having poor welfare. Failure to cope reduces the animal's fitness and this can be measured. If the animal succeeds in coping then the amount that the animal has to do in order to cope can also be measured. If coping is easy, then there is little effect on welfare. For example, pregnant sows are kept on a restricted diet. This prevents obesity but they suffer from hunger. If the sow has access to fibrous bedding or pasture she can cope with the stress of hunger through increasing gut fill without putting on excessive weight.

Some scientists argue that stress in itself isn't necessarily bad, provided that the animal can cope with it. Suffering occurs when an animal faces a stress that he or she cannot cope with.

Opportunity to root enables sows on a restricted diet to cope with hunger

Environmental factors that lead to stress are called stressors and the individuals under stress show stress responses. Stress responses depend on the type, intensity and duration of the stressor and on the characteristics of the animal. Responses to stress have been divided into acute, or short-term,

and chronic, or long-term, responses. An example of an acute stressor might be the approach of a predator or an attack made by a pen-mate. A chronic stressor might be the close confinement of sows in stalls for several months during pregnancy.

Information about a stressor is processed in the brain, which then informs the body how to respond via the nervous system or by the release of hormones. The most commonly measured physiological responses to acute stress are the increased secretion into the blood of:

1. Glucocorticosteroids from the hypathalamo-pituitary-adrenal axis e.g. cortisol
2. Catecholamines from the sympatho-adrenal system e.g. adrenaline

Action by the sympatho-adrenal system is much quicker than the hypathalamo-pituitary-adrenal axis. Catecholamines can increase heart-rate and prepare the animal for 'fight or flight' as first demonstrated by Canon in 1914. The hypathalamo-pituitary-adrenal response was first recognised by Selye in 1932.

Although the regulation of these systems can also be affected by chronic stress, they are more difficult to measure because of efficient feed-back mechanisms. Chronic stress can however, affect the regulation of these systems. This is most noticeable if an animal suffering from chronic stress then becomes subject to an acute stressor. For example, sows that have been housed in sow stalls and then transferred to farrowing crates suffer from chronic stress caused by close confinement. The process of farrowing is an acute stressor and this on top of the chronic stress can have serious consequences for the regulation of several hormones including cortisol and adrenaline. This in turn can have detrimental effects on the birth process itself (Baxter and Petherick, 1980)

Both acute and chronic stress can affect changes in a range of other hormones including:

- Insulin
- Prolactin
- Growth hormone
- Vasopressin
- Opioid peptides

Stress can lead to an increase in body temperature, a decrease in weight gain and suppression of the immune system. Stress can therefore have a direct bearing on the animal's health. Several studies have shown that animals suffering from stress are more susceptible to diseases (Broom, 1987).

The elimination of stress for farm animals is therefore not only important from an animal welfare point of view, it is also important from an economic point of view. This is because stress can reduce health status, decrease growth rates and impair reproductive functioning.

Piglets naturally stay with their mother until 13-17 weeks old. Early weaning is highly stressful

In intensive pig production, the early weaning of piglets at 3 to 4 weeks is recognised as a highly acute stressor. This is due to a number of reasons:

- Removal from their mother
- Change in diet
- Taken away to an alien environment
- Mixed with other unfamiliar piglets

At 3 to 4 weeks of age, immunity that is passed on by the mother via her colostrum is beginning to wane. At the same time, the natural immunity of the piglet is still very immature. As a result, they are very prone to disease at this stage. The acute stress caused by weaning is enough to further suppress the already weakened immune system and many piglets fall ill. In many cases, the illnesses can lead to bouts of diarrhoea from which the piglets usually recover. However, in recent times a new disease has been affecting weaned pigs across the world. The disease is called Post-weaning Multi-systemic Wasting Syndrome (PMWS) and can cause very high rates of mortality (see Chapter 14 on disease).

Producers have responded by trying to reduce the stress suffered by piglets. Three examples illustrate the point:

1. The disease has lead some pig producers to postpone weaning till at least 32 days so that the piglets' immune system is more able to cope with stress caused by weaning.
2. Many pigs in the UK are bred in outdoor units and then transported after weaning to rearing units. The stress of transport led to high mortality amongst pigs with PMWS. It is now common to rear the piglets for several weeks after weaning until they are better able to cope with the stresses of transport.
3. Sparsholt College used to segregate piglets with the disease to prevent it from spreading. They found that the stress of isolation resulted in a very high death rate. They now keep the piglets in their original groups.

These examples illustrate the importance of reducing stress to the health of piglets. They also show how stressful isolation and early weaning can be, especially if followed by transportation. All should be avoided on health and welfare grounds wherever possible. In the United Kingdom, the Meat and Livestock Commission (2002) have published advice on controlling PMWS, PDNS and other diseases which includes:

- Limiting mixing
- Reducing stocking density
- Reducing group size
- Avoiding tooth clipping
- Providing good nutrition
- Improving air quality

This advice is designed to reduce stress in pigs, whilst improving biosecurity and nutrition. All should be seen as good practice whether or not a farm has a PMWS problem.

Summary

Animals try to adapt when challenged by their environment. Stress and poor welfare result when they cannot adapt. Stress hormones appear in the blood.

Many causes of stress and poor welfare have been described in this book such as:

- Hunger
- Early weaning
- Crowding
- Mixing
- Aggression and
- Confinement

Stress can reduce immunity to disease, growth and reproduction.

A number of measures to reduce stress have been recommended for farms with diseases like PMWS, a condition which makes piglets very sensitive to stress. These measures can also be recommended for all farms, irrespective of disease status, to reduce stress and improve welfare.

Chapter 14. Disease

Strict biosecurity rules including restricted access and disinfectant foot-baths are an integral part of intensive pig farming

Disease is one of the most important factors that can affect welfare as well as productivity. Many modern breeds of pig are not well able to cope with disease. If they catch a disease, it can soon spread through the whole herd. This can lead to reduced production, considerable suffering and eventually death.

The most important consequences of diseases for welfare are the pain and stress that they cause. Welfare is affected by both the severity of pain and the duration. Diseases can differ greatly in the amount of suffering they cause. However, the clinical signs of disease and the rate at which they change are poor indicators of how much pain or stress is experienced by an individual pig. In some cases, the degree of suffering can be assessed from changes in the pigs' behaviour.

Pigs in poor health are less able to cope with their environment and therefore in general have poorer welfare. Disease can affect all the *Five Freedoms* by preventing the animal from behaving normally. The incidence of disease can be reduced by:

- Good biosecurity and hygiene practice
- Good stockmanship
- Vaccination and good veterinary care
- Good environmental control
- Good nutrition
- Reducing stress
- Improving welfare through social and environmental enrichment
- Selectively breeding for disease resistance

Good biosecurity and hygiene practice can greatly reduce disease. It is often common practice for farms to refuse entry to visitors who have been near pigs in the previous three days. Most use disinfectant foot-dips for anyone approaching the pigs. In all systems, good stockmanship involves monitoring disease using on-farm observation, medical records and information from the abattoirs.

Sick animals should always be appropriately treated with antibiotics if necessary, but prevention is better than cure. The routine use of antibiotics should be avoided for reasons of human health. Dependance on antibiotics may also have allowed breeders to place less emphasis on disease resistance. Vaccination is one appropriate method of prevention for many diseases.

Vaccination

The health of pigs is highly influenced by environmental factors such as temperature and humidity. Keeping stocking density low can be vital in controlling these. It also helps to reduce stress.

Pigs with poor welfare are more susceptible to disease because stress can reduce the functioning of their immune systems (see Chapter 13 on stress). Along with better biosecurity, late weaning to reduce stress has been key to controlling disease in Sweden since the ban on the routine use of antibiotics in 1985. It is likely to become more common in Europe after the EU ban comes into force in 2006.

Pig herds across the world are continually being challenged by new outbreaks of disease such as Classical Swine fever and Foot and Mouth disease. Post-weaning, Multisystemic Wasting Syndrome (PMWS) is an emerging health problem in the USA and Europe. It is linked with the Porcine Circovirus Type 2 Virus and, as yet, there is no known cure. It is also thought to be linked with poor natural immunity that is further challenged with the stress associated with both early weaning and poor environments. It starts in pigs between 6 and 16 weeks though most commonly around week 10.

Pigs show chronic wasting, pale skin colour, jaundice and a decreased growth rate. The proportion of weaners affected varies but the mortality in those that are affected is high.

Stress can also be caused by long-term discomfort or by persistent fear and distress through poor stockmanship. Good handling and environmental enrichment can do much to improve the health, welfare and productivity of pigs (see Chapters 11 and 15 on environmental enrichment and stockmanship).

Intensive systems

Intensive production is seen by some as the solution to disease problems. Others believe that, without widespread antibiotic use, intensive farming wouldn't have been possible

It was long held that intensive production systems provided an opportunity to reduce the risk of disease. The environment could more readily be controlled and animals could be more effectively separated from their dung. Biosecurity systems that limit the transmission of disease could be more readily put in place. With intensive production came a rise in the potential of using antibiotics and vaccines to control disease. However, in practice, one set of disease risks has been replaced by another.

Modern breeds of pigs have not been selected for strong immune systems. This makes them more prone to disease. One survey in 1994 showed the extent of disease in intensive pig production. It showed that many suckling pigs and weaners died from viral gastroenteritis or coli enterotoxaemia. Of all growing pigs, 21% suffered from pneumonia, and 34% of fattening pigs losses were due to cardiovascular failure. At slaughter, only 29% of finishing pigs were found to be disease-free (Hartung, 1994). Although there have been some improvements since then, disease levels in intensive production remain a major concern.

Pigs housed intensively often have to cope with a greater number of stressors. These stressors further impair their immune system. They include close confinement, overcrowding, lack of bedding and prevention of normal feeding, defaecating and resting behaviour.

In intensive buildings, it can be difficult to control the heat, humidity and air-bourne pollution that allow the agents that cause disease to thrive. Pigs have a limited ability to control their body temperature and yet many are confined to houses designed to maintain a temperature at the upper limit of their thermal comfort zone.

Intensive pig farming has become very dependent on the routine use of antibiotics with potential risks for human health

These factors have lead to an increasing dependence on antibiotics and vaccines in intensive systems. Antibiotics are widely used in intensive pig production. In fact, some have argued that the use of antibiotics has made intensive farming possible. On many farms, antibiotics are routinely given to healthy pigs as a form of insurance policy to prevent them getting a disease. They are also given to pigs to promote growth. However, there is growing concern about increasing bacterial resistance to antibiotics and the consequences for human health. The use of all antibiotics as growth promoters in the EU was banned from January 2006.

For diseases that cannot be controlled by these means, intensive pig production is almost entirely dependent on preventing the disease from entering in the first place. This has meant greater dependence on strict biosecurity and hygiene regimes.

A poor physical environment can directly affect the health of pigs, as discussed in previous chapters. Urinary infections can be more common in confinement systems where the sow's natural hygienic behaviour is restricted. Conditions such as lameness are more frequent in systems without bedding.

Extensive systems

In extensive systems, the control of disease has taken a different approach. This is because in free-range and organic systems, they are less able to control the transmission of disease by using biosecurity techniques. Indeed, the philosophy of the organic movement is that disease should be controlled more by natural immunity rather than relying on medicines.

Organic farming has a completely different approach to disease control

Organic standards outlaw the routine use of antibiotics and lay down strict rules about the use of vaccines. Vaccination is only permitted where there is a known risk of a disease, which cannot otherwise be controlled. Instead, organic farmers are encouraged to use complementary or natural therapies where they are appropriate. Where they are not appropriate, antibiotics and other conventional medicines should be used when a veterinary surgeon considers them necessary.

The organic farmer is potentially more exposed to disease and does not have recourse to the large range of veterinary medicines that are available to intensive farmers. However, a number of other methods can be used to control disease.

Most free-range and organic systems use, or are encouraged to use, local or traditional breeds of pig. These generally have a stronger immune system and therefore are more resistant to disease. Keeping a range of breeds is good for biodiversity. The current reliance on Landrace and Large White genetics could make the global pig industry susceptible to new outbreaks of disease and their spread. The trend towards keeping imported breeds which are more productive but less resistant to disease is a particular concern for developing countries (see Chapter 17 on economic, environmental and social aspects).

One of the main goals in organic farming is to produce all replacement stock on farm rather than importing them from elsewhere. This helps ensure that the replacement stock continue the immunity to cope with local conditions that have been built up by their parents. It also reduces the risk of imported stock bringing in disease.

Free-range and organic systems also practise rotation where animals are moved onto new pasture each year. This can break the life cycle of the organism causing the disease, so that the build up of a disease in one area does not occur.

Herd and group sizes are generally smaller and stocking densities are lower in free-range and organic systems, which helps reduce the transmission of diseases between individuals. Free-ranging pigs have greater behavioural freedom which generally means that they have lower levels of stress. This reduces the risk of disease.

Organic systems place a high emphasis on good stockmanship. This is to ensure the factors that reduce pig immunity and increase the risks of disease are prevented.

Summary

Disease is bad for welfare and production. Disease control is a complex issue beyond the scope of this book, but a few general points can be raised.

Intensive farms can reduce many diseases by:

- Applying strict biosecurity measures
- Vaccination
- Routine use of antibiotics

The incidence of many classical diseases has been reduced in this way. However environmentally-induced diseases and conditions can be more prevalent in modern intensive farms because:

- Crowded and humid conditions encourage the spread of diseases such as pneumonia
- Ammonia pollution and stress can reduce disease resistance
- Modern pigs are inherently less disease-resistant
- Urinary infections can be more common in confinement systems
- Lameness is more frequent in systems without bedding

An alternative approach, applied by organic farmers in particular, is to control disease by pasture rotation, closed stock systems and by encouraging natural immunity through:

- Weaning later to reduce stress
- Breeding for disease resistance
- Good stockmanship
- Other measures to improve welfare

Organic farmers use vaccination selectively, when it is necessary, and antibiotics are used to treat animals which become ill.

Chapter 15. Stockmanship

Many of the welfare problems experienced by pigs can be overcome by good stockmanship. Many have argued that good stockmanship is the key to providing good welfare.

When asked, an experienced stockperson will say things like 'good stockmanship is about understanding their pigs', 'I know that welfare is good by looking at my pigs', 'a good stockperson is constantly checking that everything is all right' and 'it takes a life time to learn'.

In other words, good stockmanship includes:

- Empathy
- Knowledge and experience
- Good observation skills
- Conscientiousness

Good stockpersons will have a strong empathy with their pigs. They will have the willingness and patience to treat the animals as individuals, attending to their needs, as they require it. Good stockpersons will have a sound basic knowledge of the pigs and their requirements. They will be able to recognise signs of ill health and poor welfare and also signs of good welfare including health. Good observation skills are therefore essential. Pigs, as with all livestock, must be inspected regularly. Good stockpersons will develop a regular and consistent routine for checking their pigs. With keen senses, they will note any change in the look, sound, smell or 'feel' of the system.

During inspection, sick, injured or dead pigs should be removed promptly. Ailing pigs should be segregated and treated or, if necessary, humanely killed without delay. Veterinary advice must always be sought and acted upon whenever disease is suspected.

A good stockperson is conscientious and is able to identify and prioritise the essential tasks required for good husbandry. In many situations, the importance of the stockperson as a 'welfare worker' is undervalued.

Stockpersons must be aware of the *Five Freedoms* (see page 6). Although most persons caring for animals are aware of the needs for a good diet, shelter and good health, the freedom to perform natural behaviour and the freedom from fear and distress can too easily be overlooked.

There has been a great deal of research into the personality types that make a good stockperson. Should they be introverted or extroverted? Some farmers believe that women often make better, more sensitive stockpeople (though there are clearly also many excellent men in the industry). Whatever the influence of sex or personality type, the attitudes of stockpeople are crucial. According to the website of the **Animal Welfare Science Centre (AWSC)** in Australia:

'The behaviour of a stockperson towards their animals is largely influenced by the attitudes of the stockperson. These attitudes and consequent behaviours predominantly affect the animals' fear of humans which, in turn, affects the animals' performance and welfare'

The AWSC has conducted considerable research into the effects of training programmes designed to improve the attitudes of stockpeople and their

understanding of pig behaviour, especially fear responses to people (Coleman *et al*, 1999). These training programmes changed attitudes, reduced the fearfulness of pigs and improved productivity. They also increased the likelihood of stockpeople staying in post – presumably improving attitudes to animals increases job satisfaction.

Scientists at the centre have now produced a multimedia training package called *Prohand* for general publication. They found that changes to attitude and behaviour following attendance at the training sessions improved reproductive performance amongst the pigs in their care by 7% (AWSC, undated).

Handling pigs

Human interaction can have a profound effect on the welfare of pigs. Pigs are naturally fearful of humans and may liken them to potential predators. Fear can have a large motivational and emotional effect on pigs that can lead to stress. It is therefore important to reduce this fear response as much as possible. This can be done by maximising the number of positive interactions and minimising the number of negative interactions. Positive interactions include gentle handling and calm talking. Negative interactions include rough handling and shouting.

Piglets will be at ease with a good stockman. To be at ease with strangers is clear evidence of much good treatment by people

The most common interaction between humans and pigs occurs when they are moved. Pigs are highly intelligent and inquisitive animals and can be quite reluctant to enter unfamiliar areas, particularly if they are not used to being moved. In such a case they will take time to investigate new surroundings, mainly by using their acute sense of smell.

Hearing is also acute in pigs, whereas eyesight is relatively poor. It is therefore a good idea to talk to pigs to let them know of your presence and allow them to get used to your voice. Encouraging tones can be used when moving pigs to let them know exactly where you are and prevent them from having to turn around to look. Pigs will also communicate with each other while being moved with a low grunt. This is contrast to the 'woof' emitted by a startled pig or the high-pitched 'squeal' of a distressed pig.

The movement of pigs should be done with the aid of a pig board to prevent them trying to escape back from where they came. Pigs should be allowed to progress at their own speed. The aim should be to achieve a steady flow. Any attempt to push pigs too quickly may result in them becoming disturbed, stressed and resistant to further forward progress.

Pigs will move most easily along an uncluttered passageway, where there is the minimum distraction. Provide sufficient encouragement from behind or from the side to keep the pigs moving forward. Unusual items such as drain covers or gaps in the floor surface will slow down the normal flow of pigs. A thin layer of straw can be used to cover any gaps and changes in the floor surface.

The skills of the stockperson that are called upon will vary greatly depending on the system used. The welfare of pigs can be safeguarded and their behavioural needs met under a variety of management systems. The system, herd size and stocking rate of pigs kept at any one time, should depend on the suitability of the conditions and the skills of the stockperson. The level of skill will depend on the amount of experience that the stockperson has had but the benefits of training and education should not be overlooked. This is particularly true for the carrying out of health care procedures such as the correct use and storage of medicines. Advice in these matters should always be sought from a veterinary surgeon.

Stockpeople need sound training in the natural behaviour of pigs. They should also be taught to recognise abnormal behaviours which are likely to indicate poor welfare. According to Professor Ingvar Ekesbo, a leading Swedish pig welfare expert, (private communication) it is common for stockpeople to become used to stereotypic behaviours common in intensive farms. They can come to see these as normal, without realising that they are a response to a situation that isn't meeting the needs of the animal.

The farrowing crate cannot provide for the needs of the sow, but a good stockperson can make her life better

Wallows and well-bedded shelters enable the sows to make themselves comfortable. Good stockmanship in extensive systems is partly about giving the sows control over their own environment

Summary

It is widely recognised that stockmanship is a key factor in good welfare. Good stockpeople:

- are conscientious
- are observant
- have a natural empathy with their animals
- learn to identify problems quickly and intuitively with knowledge and experience

While no-one can entirely overcome welfare problems inherent in systems, such as close confinement housing for sows, good stockpeople can still make things better by attention to detail and spending time building up relationships with their animals.

The key role for stockmanship is in ensuring that systems with high welfare potential achieve that potential. Welfare will be poor in any system if stockmanship is lacking.

Investment in the training of stockpeople, including a grounding in the principles of animal behaviour and welfare, are essential to achieve good animal health, welfare and production.

Section 4. LEGAL, ECONOMIC, ENVIRONMENTAL AND SOCIAL ASPECTS

Chapter 16. Pig welfare legislation

Sow stalls – banned in the UK, Sweden, Switzerland, the Phillipines and Florida; due to be banned throughout the EU, except for the first four weeks of pregnancy

Introduction

Legislation relating to animal welfare can be found in many different countries and can also operate at an international level. Different countries have different legal and political systems and differing attitudes to animals. Such variations tend to produce corresponding differences in national law. However, with an increase in the globalisation of market forces, there is a harmonisation process taking place to affect welfare standards on a much wider basis.

Although issues relating to cruelty to animals have been documented as far back as the third century BC by Indian Buddhists, it was not until 1822, in England, that the first law was passed to protect animals. Since then, the UK has been a forerunner in the development of animal welfare legislation. In 1911 (1912 in Scotland) The Protection of Animals Acts prohibited the cruel treatment of animals, including farm animals. The later Agriculture (Miscellaneous Provisions) Act of 1968 focussed specifically on farm animals and made it an offence to cause unnecessary pain or distress.

The development of farm animal welfare legislation across the world has progressed along similar lines to that of the UK. Many countries in the developed and developing world now accept that animals should be protected from cruelty. Most of these now accept that humans have a duty of care to the animals in their charge. Sometimes this duty of care is enshrined in voluntary codes. Many countries now have general legislation to protect animals which may or may not include farm animals. Some have specific legislation to protect farm animals such as pigs.

European Union

In 1997 the Treaty of Amsterdam, which amended the Treaty of the European Union, included a protocol on the protection and welfare of animals. It required the Community and Member States to pay full regard to the welfare requirements of animals when formulating and implementing policies including agriculture and transport. Details can be found at:

http://europa.eu.int/eur-lex/lex/en/treaties/dat/11997D/htm/11997D.html#0110010013

A range of directives have been passed which require member states of the European Union to pass legislation to protect farm animals. In the case of pigs, this is laid down in European Union council directive 91/630/EEC *Minimum Standards for the Protection of Pigs*. This legislation has been amended twice by directives 2001/88/EC and 2001/93/EC. All this legislation, including a consolidated version, can be found at:

www.europa.eu.int/eur-lex/lex

Individual member states have produced legislation enforcing these rules and published documents to help farmers to apply them. For example, the Irish government have published an illustrated and clearly explained booklet at:

http://www.agriculture.gov.ie/publicat/Pig_Welfare_Booklet.pdf

The EU directives lay down minimum standards for the housing and management of pigs. They contain a chapter on general standards for pigs and chapters for the specific categories of pigs: boars, sows, piglets and growing pigs.

Minimum general housing standards refer to all of the following:

- Stocking densities
- Pen sizes
- Pigs' ability to see other pigs
- Keeping sows in groups
- Comfort and rest
- Construction
- Maintenance
- Cleansing
- Heating
- Ventilation
- Flooring
- Lighting
- Noise

Minimum general management standards refer to all of the following:

- Inspection
- Treatment of sick or injured pigs
- Mutilations such as castration and tail-docking
- Management of aggression
- Feeding and drinking
- Access to foraging material such as straw or mushroom compost
- Training of stockpersons

The main points contained in the chapters for the specific categories of pigs can be summarised as follows:

For dry sows, the standards effectively ban the use of tethers for sows and gilts from 2006 and the use of sow stalls (except for the first four weeks of pregnancy) from 2013. Sows must be kept in groups from 4 weeks after serving until a week before the expected time of farrowing. They must have access to high-fibre food as well as high energy food to satisfy their hunger and the need to chew. Farrowing sows must also have access to suitable material for nesting behaviour unless it is not technically feasible for the slurry system used.

The standards state that tail-docking and tooth-clipping must not be carried out routinely. If castration or tail-docking are practised after the seventh day of life, it must be performed by a veterinarian using anaesthesia and additional prolonged analgesia. Piglets, as well as pregnant sows and gilts, must have access to a solid floor. They must not be weaned in most normal rearing systems before a minimum of 28 days (though they may be weaned from 21 days in certain 'all-in, all-out' systems applying rigorous biosecurity rules). Weaners and growing pigs are given minimum space allowances according to their weight (see Table 2 in Chapter 4 on development of intensive pig production). All pigs must have access to a sufficient quantity of straw or other suitable material to enable proper investigation and manipulation activities.

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Tether stalls banned in EU from 2006

Routine tail-docking is banned in the EU. Where tail-biting becomes a problem, the environment must be enriched before tail-docking is resorted to

EU standards suggest that pigs should have access to a sufficient quantity of material to enable proper investigation and manipulation

Other European Countries

Farrowing crate – use restricted in Sweden to one week

Other countries in Europe such as Sweden, Switzerland and the United Kingdom have gone further and imposed national legislation which at least meets European legislation and, in some cases, has more strict regulation.

Piglets are weaned later in Sweden

Swedish law:

- Bans sow stalls and tether stalls
- Severely restricts use of farrowing crates
- Requires provision of bedding and nesting material such as straw
- Requires access to natural daylight
- Requires much lower noise levels than EU directives

Keeping sows tethered or permanently in stalls is banned in Sweden. This followed research in Sweden during the 1960s that showed that farrowing crates were bad for the health of both the sows and their piglets. For example, use of farrowing crates increased levels of mastitis-metritis-agalactia in the sows and of diarrhoea in the piglets (Ekesbo, private communication).

If necessary, occasionally sows may be kept in farrowing crates for a maximum of one week at the time of parturition to protect piglets and at the time of breeding. A significant proportion of Swedish farmers don't use it at all (Ekesbo, private communication). Swedish law states that in herds with more than nine sows they must be housed in groups during gestation. Piglets must not be weaned before four weeks of age. Most are weaned later, usually at 35-38 days.

Pig pens must be designed so that pigs can perform feeding, excreting and resting behaviours in different areas. Pens must provide enough space for all the pigs to lie down at the same time and to move freely. The laying area must not be slatted or perforated.

The use of electric goads is prohibited but for veterinarians in exceptional cases when the veterinarian considers it necessary on veterinary grounds. Noise in animal houses shall not have such a level or frequency so it will have an injurious effect on the animal health. Housed animals must only temporarily be exposed to mechanically-emitted noise exceeding 65 dBA.

Swiss legislation bans tethering, farrowing crates and sow stalls, with exceptions for the mating period and to allow the use of feeding stalls during feeding. Farrowing crates may be used during birth in exceptional cases. Otherwise, farrowing sows must have space to turn around freely and be provided with material like straw for nesting. Fully slatted floors are not permitted. All pigs must have access to straw, roughage or other suitable material for rooting.

Both sow stalls and tether stalls have been banned in the UK since 1999.

Useful information about Swedish, Swiss and UK legislation can be found respectively at:

http://www.sweden.gov.se/content/1/c6/02/58/44/53180d5d.pdf

http://www.bvet.admin.ch/tierschutz/?lang=en

http://www.defra.gov.uk/animalh/welfare/farmed/pigs/

Australia and New Zealand

Australia and New Zealand have similar general laws aimed at protecting the welfare of all animals. In both countries, there are laws that state that 'a person must not be cruel to an animal'. Cruelty is defined as causing an animal unjustifiable, unnecessary, or unreasonable pain or distress. Furthermore, both countries have laws that state that 'each person in charge of an animal has a duty of care to it'. This duty of care involves providing animals with the conditions set out in the *Five Freedoms* (see Chapter 1, an introduction to animal welfare).

The Welfare Acts do not expand on these obligations on the grounds that they would become too lengthy and unwieldy. It would also reduce flexibility to make amendments as knowledge improves or society's expectations change. The detailed minimum standards of care are therefore found in codes of welfare. These can be found at:

http://www.publish.csiro.au/nid/22/pid/1546.htm

http://www.biosecurity.govt.nz/animal-welfare/index.htm

Breach of the provisions set out in the codes of welfare is not an offence under the Animal Welfare Act. Rather, any prosecutions are for failure to meet the obligations in the Act relating to the care of an animal or for ill-treatment of an animal. Failure to adhere to the minimum standards set out in a code can, however, be used as evidence to support a prosecution under Parts 1 and 2 of the Act.

Compliance with a relevant code of welfare, where one exists, will be a defence where a person is charged with an offence under Part 1 or 2. Where a person is charged with an offence under Parts 1 or 2, they have the opportunity to argue and present evidence that their standard of care or conduct equalled or exceeded that specified in a relevant minimum standard in a code of welfare.

Asian Countries

Several Asian countries now have animal welfare legislation. These include countries such as India, Korea, Philippines and Taiwan. Legislation in these countries covers both the provision of adequate care for animals based on the *Five Freedoms* and the offence of being cruel to animals.

In the Philippines, the 1998 Animal Welfare Act set up a Committee on Animal Welfare. Subject to the approval of the agriculture minister, the committee issues rules and regulations to implement the act. In 2000 the committee issued a *Code of Practice and Minimum Standards for the Welfare of Pigs* (Republic of the Philippines Department of Agriculture, 2000).

Following advice from the industry itself, this Administrative Order prohibits close tethering and limits the use of sow stalls and farrowing crates. The order argues that keeping 'sows, boars or gilts in individual stalls places severe restrictions on their movement and may result in abnormal behaviour patterns, leg weaknesses and injury.' It goes on to state:

'Breeding boars, sows and gilts shall not be confined in individual stalls and/or farrowing crates for more than 6 weeks at any one time and that, in any reproductive cycle, such confinement shall not exceed 60% of the period.'

This rule is mandatory. It also states that, when released from stall and/or farrowing crate, the animal should be moved to accommodation which allows the pig 'to perform its natural body functions in a manner which is relatively unrestricted' for a reasonable period of time (several weeks). The code also says that provision 'must be made for alternative accommodation for pigs that show severe lameness or behavioural problems.'

The Code also lays down requirements including:

- A requirement that trough space allows all pigs to feed at once (except for *ad lib* or computerised feeding)
- Minimum requirements for inspection by stockpeople
- Rules concerning use of registered veterinarians
- Rules concerning mutilations such as castration, tail-docking and teeth-clipping

- Requirements for emergency humane slaughter
- Rules for pig transport

The Code also strongly recommends that dry sows and gilts be provided with straw or similar material in their lying area. Minimum space allowances and weaning ages are recommended.

Examples of animal welfare legislation in Taiwan and the Philippines can be found at:

http://www.gio.gov.tw/info/98html/aplaw.ht

http://www.angelfire.com/ok2/animalwelfare/welfareact.html

United States

In the United States, this trend has not been followed. Although there is anti-cruelty legislation at a federal level, farm animals are exempt from this protection.

In the U.S., the on-farm welfare of farmed animals is not included in Federal animal welfare legislation. Farm animals generally come under the anti-cruelty legislation of each state. Anti-cruelty legislation prohibits inflicting pain and suffering on animals. However, it does not state that anyone is responsible for providing care for animals and it does not stipulate practices that achieve better lives for animals, as for example, the *Five Freedoms*. It is also important to note that almost all the states in which agriculture plays a large part in the local economy have passed legislation that excludes farm animals from protection under their anti-cruelty statutes. That is, practices that are considered inhumane to companion animals are not considered cruel when applied to farmed animals. Therefore, farm animals are not covered by most (30 or more) state anti-cruelty laws.

Attorney David Wolfson published a small treatise about this a few years ago called *Beyond the Law* and gives details of state anti-cruelty provisions pertaining (or not pertaining) to farmed animals (Wolfson, 1996).

There are voluntary schemes such as the National Pork Board's *Swine Welfare Assurance Programme* (SWAP). SWAP is an educational assessment, not an audit. The SWAP codes state that adequate ventilation; air quality and temperatures must be maintained at all times. Non-slip flooring must be provided throughout. Pigs must have adequate feeders and drinkers so that the pigs can consume their daily rations without competition or fighting. Water should be available at least twice daily. Pigs should be allowed to drink freely and their daily water requirements should be met. The codes state that swine housing must allow enough room for all pigs to lie down completely on their side without lying on another pig.

Persons with adequate knowledge should be available at all times to assess any situation that may come up. Avoiding use of electric prods is also strongly recommended. All pigs should be inspected visually at least once daily. SWAP's guidelines are strictly voluntary and no enforcement or inspection agency exists. Details of the scheme are available at:

http://www.porkboard.org/SWAPHome/default.asp

Though some experts believe sows can communicate adequately between the bars of sow stalls, social interaction is clearly very limited

In the U.S., although it is recognised that pigs require social contact, it is believed that this interaction can occur adequately through the divider between adjoining stalls. The stall should be long enough for the sow to lie down without touching the front and back of the stall. However, both sow stalls and tether stalls will be banned in the state of Florida in 2008.

In the US there are no recommendations on tail-docking or teeth-clipping. In the US, it is recommended that castration occurs before seven days of age or at least one week before weaning. Anaesthesia is only recommended if the operation takes place after weaning.

Further information on the state of laws affecting farm animal welfare in the U.S. can be found at:

www.nal.usda.gov/awic/legislat/awicregs.htm

Summary

Many countries throughout the world have enacted general animal welfare legislation and more are expected to. This normally includes farm animals. This is true for example in the European Union, Taiwan, the Philippines, Australia and New Zealand. There is also general animal welfare legislation in the US, but most states exclude farm animals from these legal provisions.

Many countries have further detailed codes advising on the housing and management of farm animals including pigs. These include recommendations about such matters as stocking density, mutilations and environmental conditions. In the European Union and the Philippines, for example, there are legally enforceable regulations as well as advisory codes.

Sow stalls have been banned in Sweden, Switzerland and the United Kingdom. They are due to be banned throughout the European Union (except for the first 4 weeks of pregnancy) and Florida. Use of the farrowing crate is severely restricted in Sweden and Switzerland. Use of both stall and crate are restricted in the Philippines.

European Union regulations require that all pigs have access to manipulable material such as straw and that sows have access to high fibre as well as high energy food to satisfy their hunger.

Chapter 17. Economic, environmental and social aspects

Good Agricultural Practice involves producing food in a way which:

- Is nutritious, wholesome and healthy to eat
- Provides rural employment with a fair income
- Protects the environment
- Maintains biodiversity
- Is kind to animals

Intensive systems

Intensive pig farming can produce cheap food in large quantities, but:

- Produces fewer jobs on farms for pig workers
- Can pollute the air and waterways
- Uses a very limited range of breeds, potentially
- damaging biodiversity
- Is often associated with poor animal welfare

Intensive farming has been driven by the demand for cheap food. This means either that farmers get paid less or that farms get larger. In the world's More Economically Developed Countries (MEDCs), farmers have been leaving the land for centuries. In the United Kingdom, less than 2% of the labour force is now in agriculture. Even that small figure continues to drop rapidly.

Intensive pig farmers in the MEDCs now expect to face stiff competition from imports from Less Economically Developed Countries (LEDCs) such as Brazil. Unfortunately, this may well not help small farmers in these poorer countries since intensive farms are increasingly being run by large national and multi-national companies. The trend, as in the MEDCs, is for each stockperson to look after larger and larger numbers of pigs.

The vast majority of farmers in LEDCs farm in a traditional way. According to the International Livestock Research Institute (ILRI), livestock are crucial to the lives and livelihoods of 675 million people in the developing world. Farm animals contribute 20–60% of household income and up to 80% of agricultural gross domestic product in developing countries (ILRI, 2002).

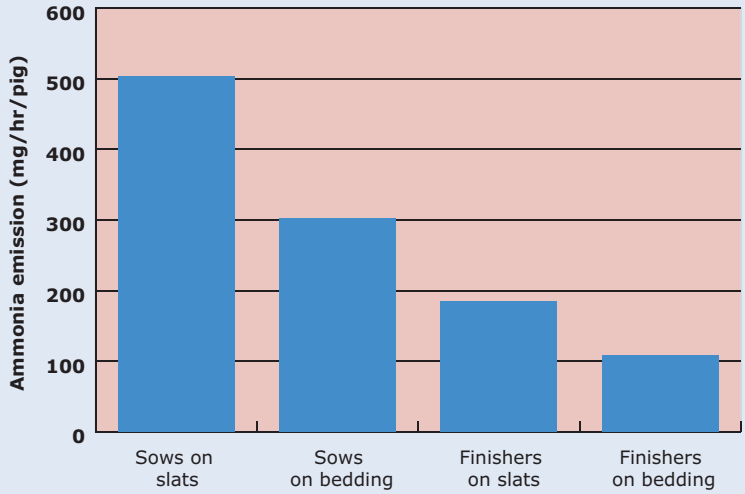
Demand for animal food in developing countries, now growing at over 3% a year globally, is expected to double over the next 20 years. Unfortunately, this is unlikely to be of much help to small farmers since livestock production is increasing more rapidly in industrial systems close to urban centres than in traditional systems (ILRI, 2000).

Indeed, the trend towards intensive farming is putting small farmers in LEDCs out of business. They are leaving the land in droves. For example in Santa Catarina, a small state in the south of Brazil, more than 20,000 families left the land in 1998 alone (page 32 Cox & Varpama, 2000). Unemployment rates in Brazilian cities can be as high as 20%. The trend to intensive farming is making the world's social problems worse. To address this problem, the Brazilian research institute, EMBRAPA, is developing livestock systems suitable for small scale producers to try to provide rural employment. This includes deep bed systems for pigs and free-range alternatives for a range of livestock (see Pig Case Study Brazil 3).

The trend towards producing livestock intensively near urban centres also has serious implications for the environment and public health. In a traditional mixed farm, animals can be good for the land. They produce manure in low concentrations which helps to fertilise crops. The huge concentrations of liquid manure produced by large pig sheds can be much more difficult to dispose of. Nutrient runoff can cause serious pollution to rivers resulting in eutrophication. Aquatic plants, especially algae, grow excessively; then they die and are decomposed, robbing the water of oxygen. Fish die and water supplies are contaminated. Nutrient runoff can also contaminate groundwater reserves, increasing nitrate concentrations above safe levels.

Industrial livestock units can pollute the air as well as the water. Ammonia (NH_3) is released into the air

Figure 4. Effect of bedding on ammonia emissions



Using data from AHAW, 2005

from livestock sheds and from manure. This increases the nitrogen load in the rain which can damage local ecosystems. Ammonia emissions can also precipitate acid rain. In the Netherlands in 1993, 55% of acid deposits were due to ammonia emissions. 87% of the ammonia emissions came from manure (de Haan, 1997). Conversely, semi-intensive deep-bed systems being developed in countries like Brazil emit 50% less ammonia (de Oliviera, undated). Research in the EU also suggests that the provision of bedding reduces ammonia emissions (see Figure 4).

Run-off from the sheds and manure heaps can also pollute water courses resulting in eutrophication and fish-kills. Metals added to pig feeds, such as zinc and copper, can build up in the soil. Crops can be contaminated, risking human health.

In the Netherlands, manure production has exceeded the capacity of the land to absorb it. Livestock farming has had to be limited in order to control the surplus of minerals such as nitrate and phosphate which pollute water and groundwater.

Singapore expanded its pig farming operations to achieve self-sufficiency in pig meat in the 1970s. This created environmental problems. Initially these were addressed using waste disposal technology methods imported from the west. In 1984, environmental standards were raised, particularly in relation to odour control. Pig farming was phased out in 1987 (de Haan *et al*, 1997).

Traditional local breed, Ivory Coast. This breed is disease resistant and adapted for extensive foraging in this environment

Breeds used in intensive farming are often the same the world over. The FAO have estimated that 30% of farmed animal species are endangered. As farmers turn to higher-yielding exotic breeds, traditional local breeds are lost. These indigenous breeds are often better adapted to local conditions; their loss reduces the options for kinder local extensive farming in the future. Genes needed for future breeding are lost for ever.

A particular problem is that most high-yielding exotic breeds are poorly adapted to withstand diseases associated with intensification and common endemic diseases of the tropics (ILRI, 2000). The spread of disease amongst farm animals in LEDCs is likely to be an increasing problem, both for animal and human health. Disease control is likely to result in an increased use of antibiotics which also has implications for human health.

In short, intensive systems produce food cheaply, but impose additional hidden costs on society, the environment and animal welfare. Policies which impose these costs onto producers may well tip the balance back towards less intensive systems. People, animals and environment could all benefit from policies that discourage intensive farming.

Can less intensive systems provide a viable alternative?

Intensive systems have been developed to reduce costs. Can less intensive systems be economic? One recent study compared the cost of systems for growing pigs designed for higher welfare with an

intensive system (Cain *et al*, 2003). Compared with a fully-slatted system, a partially-slatted system with a proportion of the floor as solid lying area reduced costs by 3%; a straw based system with increased space allowance based on the RSPCA's *Freedom Food* standards increased costs by 4.3%; a free-range system increased costs by 4.6% (see Figure 3). The alternative systems were cheaper on housing but had additional costs for bedding. The Freedom Food system had higher labour costs and the free-range system had higher feed costs.

There have been proposals in the EU to increase space allowance for welfare reasons by 50-70% according to liveweight. This would increase costs for all but the free-range system, but make the higher welfare systems relatively more competitive with the fully-slatted one.

The results clearly show that systems for growing pigs with a higher welfare potential only add marginally to costs. Unfortunately, if margins are low this makes a significant difference to the viability of an enterprise. It is clearly important for governments to pass legislation to set minimum standards for pig keeping. This would enable farmers using more humane systems to remain competitive.

In fact, some higher welfare systems may already be competitive:

- Deep bed systems for growing pigs in Brazil are claimed to reduce capital costs by 40-60% and labour requirements can also be lower (de Oliviera *et al*, undated)
- Some free-range farmers reduce feed and bedding costs by growing their own
- There are clear opportunities for developing niche markets for high welfare products sold at a premium

Deep-bed systems can be cheaper to set up

Alternative systems for growing pigs

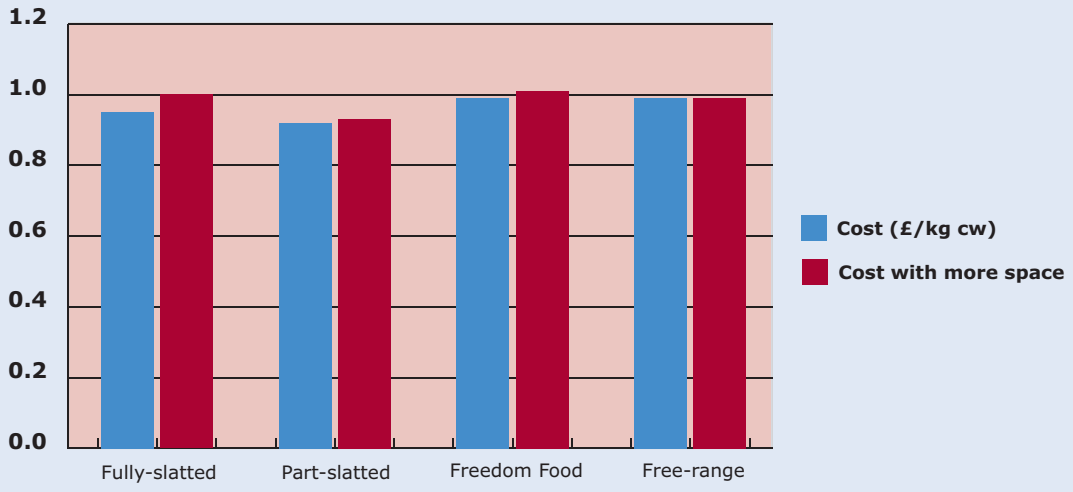
Fully-slatted system

Partially-slatted system

Straw-based system

Free-range system

Figure 5. Cost of pigmeat production as £/KG carcass weight for 4 different systems



Using data from Cain *et al* 2004

The economics for free-range breeding pigs are already favourable. The farming press in the UK have reported an increase in outdoor pig rearing in the UK to 35%. This follows increases in housing costs and the need to meet new emissions standards for pollutants such as ammonia from pig manure. Not only is free-range pig breeding competitive economically, but lower housing costs bring two advantages:

- Farmers with limited access to capital can set up a free-range enterprise who couldn't even think of setting up an indoor one
- Lower capital expenditure reduces the risk of bankruptcy if the price of pigmeat falls

Eastbrook farm sell under their own label

Case Study

Fittleworth farm, United Kingdom.

As a tenant farmer, Tom Leddra had little access to capital when he set up his pig farm in the 1980s. The low capital cost of an outdoor breeding unit made the enterprise possible. Like many outdoor pig farmers in the UK, Tom breeds piglets which are sold to other farms for finishing (usually in intensive systems).

Tom now rears a proportion of his pigs through to slaughter weight. He sells these to another free-range pig farmer who has developed a market with local butchers for free-range pork. The key advantage for Tom is that he receives a guaranteed price for his free-range pigs whereas the piglets he sells are subject to the fluctuations of the market.

See Case Study United Kingdom 3 for a full account

Niche markets

Increasing numbers of consumers are prepared to pay extra for higher welfare animal products. For example, in the UK 35% or more of eggs sold by supermarkets are from alternatives to the battery system (CIWF Trust, 2004). Sales of pigmeat from higher welfare systems are lower, but are likely to grow. In Switzerland, higher welfare meat has been actively marketed for longer. Naturaplan, a co-operative organisation selling high welfare and organic pigmeat at premium prices, has 10% of the Swiss market (Phan-Huy & Fawaz, 2001).

Some farmers add value by marketing their own produce. Eastbrook farm sell their products both by mail-order and to supermarkets under the founder's name *Helen Browning's Organic*, helping to ensure a premium market for their produce. Having their own label gives them more control over prices when negotiating with supermarkets.

Impact on rural economies

With good promotion, demand for high welfare products is likely to rise. Not only is this good for animals, but rural economies are likely to benefit. High welfare systems lend themselves to small-scale farming. Many small farmers in developed countries see niche markets based on animal-friendly products, locally produced using methods which benefit the environment, as their best opportunity to compete with pigmeat from intensive farming or imported from abroad.

There is an even greater need to develop niche markets in less economically developed countries where small farmers are especially dependent on livestock to make a living. In Brazil, the research body EMBRAPA has been developing projects for small-scale pig production. The purpose is to maintain rural employment in needy communities.

Health

The fatty-acid content of meat is significantly affected by diet. Acorns are high in oleic acid, a key constituent of olive oil. Spanish Iberian pigs, fed in the woods on a diet high in acorns, end up with a fat composition similar to olive oil. The hams are sold as a quality product. Those with the highest oleic acid content, resulting from a diet particularly high in acorns, are sold at the highest price as "Bellota" hams. Many people believe that the meat is healthier.

Seville butcher's shop illustrating extensive nature of Iberian ham production

Iberian Bellota hams

Grass and clover are high in the fatty-acid linolenic acid, often referred to as omega-3. Increasing the amounts of omega-3 in the diet is thought to be protective against heart disease. Levels of omega-3 can be high in grazing animals like sheep and cattle provided that they are fattened on grass. Levels of omega-3 in pigmeat are generally low, but free-range pigs have a significantly higher proportion of omega-3 in their fat than animals of the same breed reared indoors (Muriel *et al*, 2001).

To get a healthier fatty-acid balance, it is likely to be important that the pigs have access to range until slaughter-weight. The practice of taking some free-range and even organic pigs indoors for final fattening is likely to reduce the omega-3 content of their meat. Managing the pasture so that they always have access to plenty of grass and clover is likely to increase it.

Environment

With good management, less intensive systems of pig production are likely to be less polluting:

- Deep bed systems based on materials such as wood chips or rice hulls produce a solid waste that can be less polluting and easy to use as a fertiliser and soil conditioner
- In free-range systems, wastes are returned directly to the soil where they can be recycled by natural systems

Free-range systems can still produce pollution problems. Where high densities of pigs are kept outside, their wastes can pollute local water courses. This is a particular problem in nitrogen sensitive zones where groundwater can be contaminated. Part of the problem is that pigs can destroy the vegetation. As a result, nutrients mineralised in the soil can leach away rather than being absorbed by plant roots.

Good pasture management and rotation are again key here, bringing benefits for health, the environment and animal welfare.

Swedish organic farm. Pasture is maintained by low stocking density and pasture rotation

Pigs as woodland managers

Grazing by Iberian pigs, sheep and cattle has played a vital role in maintaining this traditional Andalucian landscape

Pigs are woodland animals and were traditionally kept in woodland. In Spain the tradition survives. Iberian pigs are still kept in woods. Along with cattle and sheep, they help to maintain the local ecology.

Swedish pigs help to clear the undergrowth in recently felled forest

The pigs at Hånsta Östergärde farm in Sweden are moved onto recently felled pine forest. They help to clear the undergrowth, fertilise the soil and thereby assist with the regeneration of native woodland trees. Electric fences are used to prevent them from wandering.

Pigs are also used to manage deciduous forestry. They can be released into forest shortly before felling to help to clear the undergrowth. Pigs prefer eating the leaves and roots of bracken and brambles to those of small trees (Harris, 2003). After felling, their rooting helps to give an advantage to growing saplings.

Pigs can also be very destructive. It is important to keep them away from rare woodland plants, to keep them at a low stocking density, and to move them on once they have cleared the ground sufficiently. Otherwise they can destroy the ground flora and wildlife cover.

In the New Forest in the United Kingdom, pigs are released in late autumn. They are employed to eat the acorns which can otherwise poison the grazing cattle and horses.

Tamworth pigs being used to clear the undergrowth in National Trust woodland, United Kingdom

Organic systems

'Organic livestock husbandry is based on the harmonious relationship between land, plants and livestock, respect for the physiological and behavioural needs of livestock and the feeding of good-quality organically grown feedstuffs.' This is the view of IFOAM, the International Federation of Organic Agricultural Movements.

The organic philosophy is clearly about Good Agricultural Practice:

- Natural methods of disease control contribute both to human health and animal welfare (see Chapter 14 on disease)
- The avoidance of chemical use and the natural return of nutrients to the soil benefit the environment
- The higher prices obtained for organic products can provide employment and fairer incomes for small farmers
- Consumers get potentially healthier food
- Where local breeds are used, biodiversity benefits

Sheepdrove Organic Farm

In the UK, organic production is one of the few parts of the industry making a decent living for farmers. Sheepdrove organic farm now employs more than 50 people. Before going organic there were only two or three jobs on the farm. This is partly because organic methods are more labour intensive. It is also because they now process and market much of the food produced.

Good organic practice is essential. To obtain all these benefits, organic and free-range production need to start from first principles rather than adapt conventional methods. The best organic practice is likely to involve small-scale farmers keeping traditional local breeds in small groups in natural conditions. Wherever possible, organic produce will be marketed according to fair trade principles. High standards of stockmanship must be insisted upon by the organisations that certify organic production.

Summary

The intensification of pig farming has caused:

1. A loss of rural employment as:
- Small farmers leave the land
- Stockpeople look after larger groups of animals

2. Environmental problems resulting from:
- Release of ammonia from manure and slurry which precipitates acid rain
- Runoff into rivers causing eutrophication
- Loss of biodiversity as traditional breeds are lost

3. Health problems resulting from:
- Routine use of antibiotics leading to bacterial resistance
- Pigmeat with a less healthy fat composition

4. Animal welfare problems outlined throughout this book

Good Agricultural Practice, using less intensive, free range or organic systems can benefit:

1. Rural economies as:
- Free-range and deep-bed systems can be cheaper for small farmers to set up
- Organic and other high welfare products can achieve premium prices

2. The environment as:
- Deep-bed systems produce less ammonia and other odorous gases
- Deep-bed systems and low-density free-range systems can produce manure in a form less likely to leach into rivers and watercourses
- Systems using traditional breeds help to maintain biodiversity
- Free-range pigs can play a part in the management of woodland and other habitats

3. Human health as:
- Well managed and humane pig systems should require fewer antibiotics
- Pigmeat from some free-range and organic systems may have a healthier fat composition

4. Animal welfare

In short, Good Agricultural Practice can help to achieve development that is humane as well as sustainable.

Chapter 18. Good Agricultural Practice and humane and sustainable development

Good Agricultural Practice is an essential part of humane and sustainable development. The purpose of sustainable development is to ensure a good quality of life for **all** people. This includes an adequate supply of healthy and affordable food, fair and reliable incomes and a safe and decent environment.

Quality of life is not just an issue for people. To be fully humane, sustainable development must also ensure quality of life for all sentient creatures including farm animals. Whilst there may be some conflicts between human and animal welfare, fundamentally good attitudes towards animals are often good for healthy production. Furthermore, civilised policies towards animal protection help to create a compassionate and healthy society.

Sustainable development involves achieving a good life for all, now and in the future. There are several aspects to sustainability:

- Environmental and ecological sustainability
- Social, political and cultural sustainability
- Economic sustainability
- Ethical sustainability

Production systems must be designed to minimise environmental impact. There are environmental limits, for example, to the land and water resources available for production. Policies must take account of social and cultural needs and economic practicalities.

If any of these are missing, development will not be sustainable. For sustainable development to be worthwhile, it must also be ethical and just. What this means depends on values. Compassion in World Farming believes that Good Agricultural Practice and sustainable development must meet the needs of all sentient beings including both people and farm animals. Development must be humane as well as sustainable.

Summary

Humane and sustainable farming, through Good Agricultural Practice, aims to ensure that the welfare of people, animals and the environment are protected whilst providing ample, quality food for all. Humane and sustainable farming is about:

- Animals – protects their welfare
- People – protects rural livelihoods
- Environment – protects the countryside
- Food – provides safe, quality food
- Food security – ensures sufficient food for the nation
- Sustainability – food for all people, tomorrow as well as today

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Dr Dale Arey and Phil Brooke

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Compassion in World Farming
River Court, Mill Lane, Godalming,
Surrey, GU7 1EZ United Kingdom
Tel: +44 (0) 1483 521 950 Fax: +44 (0) 1483 861 639
Email: education@ciwf.org Website: **ciwf.org**

Compassion in World Farming - Ireland
P.O. Box 750, Togher, Cork, Republic of Ireland
Tel: + 353 (0)21 4639038
Email: info@ciwf.ie Website: www.ciwf.ie

Compassion in World Farming – South Africa
PO Box 825, 7129 Somerset West, South Africa
Tel: +27 21 852 8160 Fax: +27 21 852 8160
Email: avoice@yebo.co.za Website: www.animal-voice.org

Compassion in World Farming - Nederland
Postbus 1305, 6501 BH Nijmegen, Netherlands
Tel: +31 (0)24 3555552 Fax: +31 (0)24 3551777
Email: ciwf@ciwf.nl Website: www.ciwf.nl

Protection Mondiale des Animaux de Ferme
Compassion in World Farming - France
BP 80242, 57006 Metz Cedex 1, France
Tel: +33 (0)3 87 36 46 05 Fax: +33 (0)3 87 36 47 82
Email: courrier@pmaf.org Website: www.pmaf.org

Compassion in World Farming – Oceania
PO Box 197, Camberwell, Victoria 3124, Australia
Tel: +61 (0)3 9880 7342 Fax: +61 (0)3 9888 5480
Email: ciwf@alphalink.com.au

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ciwf.org