

ANIMAL WELFARE ASPECTS OF GOOD AGRICULTURAL PRACTICE: PIG PRODUCTION



Animal Welfare Aspects of Good Agricultural Practice: pig production

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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.

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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'.



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

Photo: © MAEP/CIWF Trust



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

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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.



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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.



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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

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.

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Wild boar and domestic sows with young



Birth

© Annelie Andersson



Wild boar sow collecting nesting material

© Diane Halverson/Animal Welfare Institute



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

© Marek Spinka



After a few days, piglets initiate suckling by massaging udder

© Marek Spinka



then the sow briefly ejects milk

© Marek Spinka



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).

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 6.8-8.0ft² (0.63-0.74m²) per pig with an average of 7.2ft² (0.67m²) (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 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



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.

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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



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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.

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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

© Fiona Chambers / Fernleigh Farms Produce



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

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



System at Schleithal, France

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

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

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

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).

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).

© Marek Spinka



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

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).

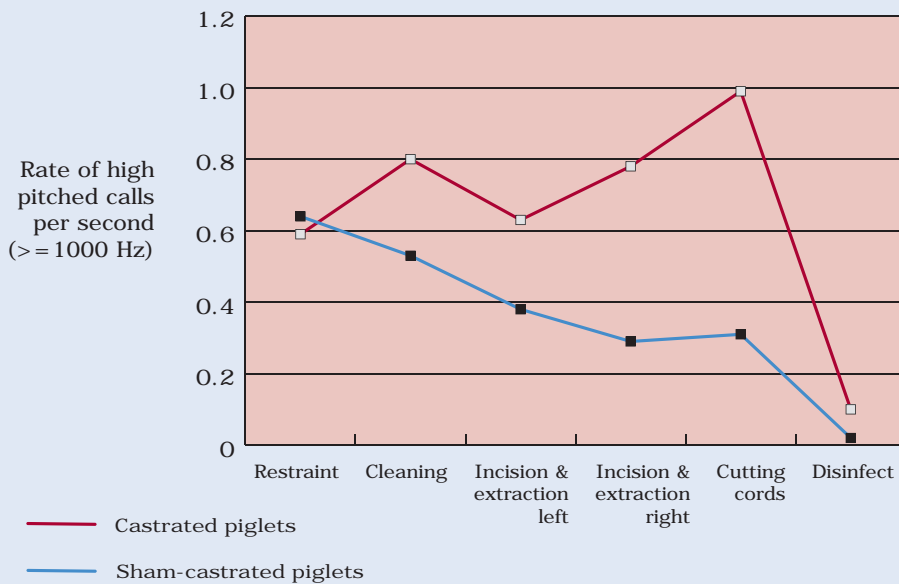


Castration

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).

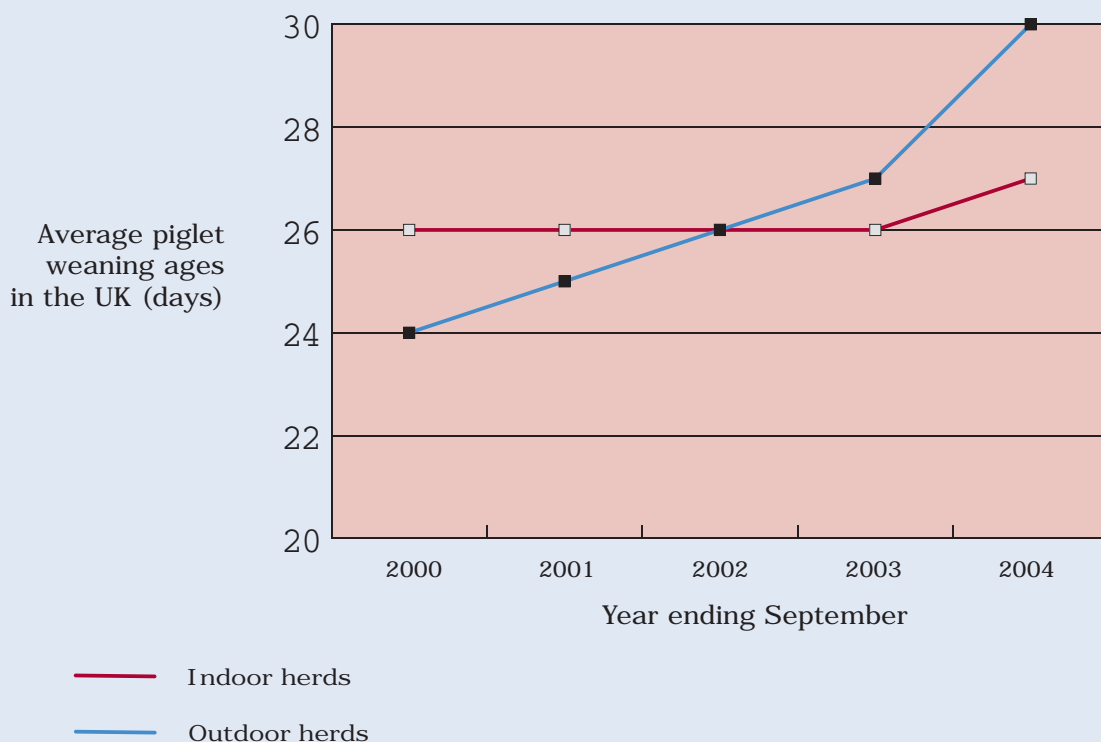
PMWS (Post-weaning Multi-systemic Wasting Syndrome) is a lethal disease exacerbated by stress (see Chapter 14 on disease). UK farmers with high levels of the disease often delay weaning to 32 days. Reducing stress by delaying weaning can significantly reduce death-rates. The Danish Pig Board report that 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 as 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



© Collin Seddon



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.



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

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).

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).

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 Oliveira *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.



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

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

Outdoor systems

© Dale Arey/CIWF Trust



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 Östergårde 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 carcasses 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



Tamworth, traditional British pig



Traditional African pig, Ivory Coast



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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 Seaton

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

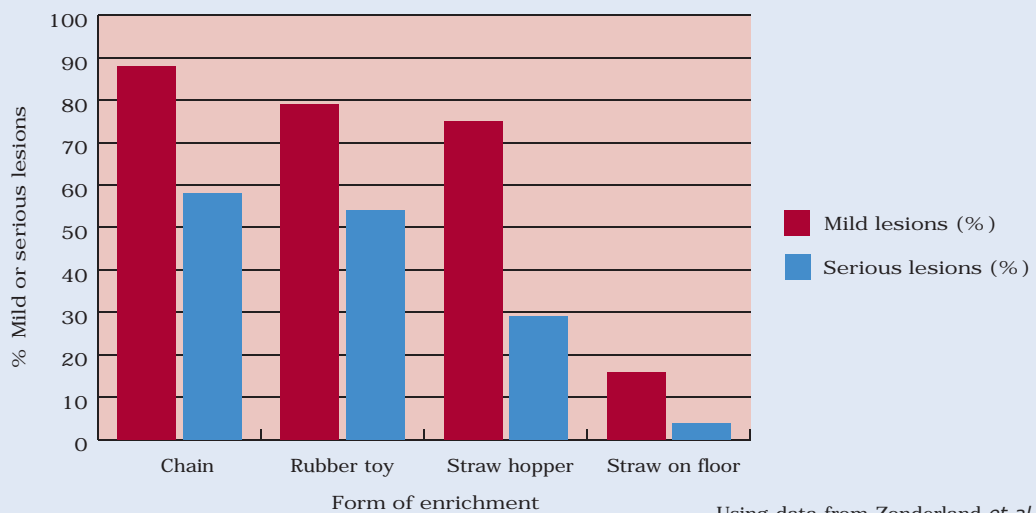
peat. Each substrate can have different benefits but it is important that the substrate fulfils all the components of foraging including investigation, manipulation and consumption. Artificial enrichment such as rubber tyres, chains and footballs are less effective because they fulfil too few of these 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



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

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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 led 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

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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 hypothalamo-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 hypothalamo-pituitary-adrenal axis. Catecholamines can increase heart-rate and prepare the animal for 'fight or flight' as first demonstrated by Canon in 1914. The hypothalamo-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 led 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. Dependence 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-borne 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 led 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

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.

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.

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.



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).

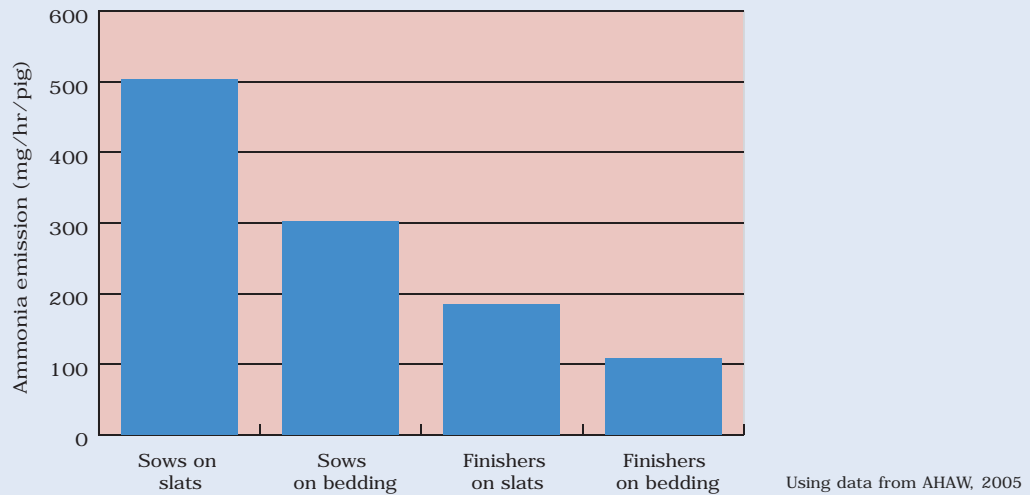
Indeed, the trend towards intensive farming is putting small farmers in LEDCs out of business. They are leaving the land in droves. For example in Santa Catarina, a small state in the south of Brazil, more than 20,000 families left the land in 1998 alone (page 32 Cox & Varpama, 2000).

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 (NH₃) is released into the air

Figure 4. Effect of bedding on ammonia emissions



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 Oliveira, 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).

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

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

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 Oliveira *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

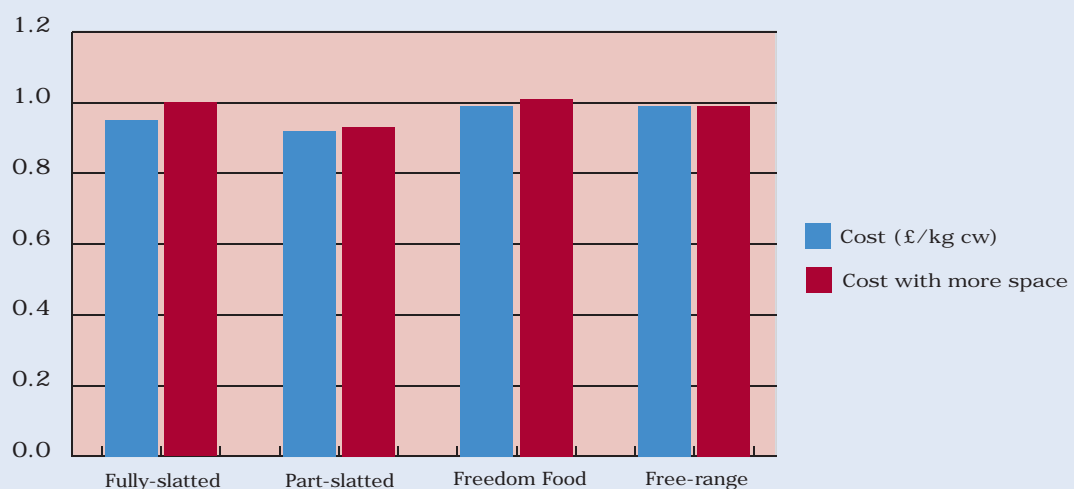


Straw-based system



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 Andalusian 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.

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

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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.



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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APPENDIX - PIG PRODUCTION CASE STUDIES

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Free-range system, Brazil



Straw-based system, United Kingdom

Introduction to the case studies:

This book is based on science and the practical experience of farmers running systems which exhibit good animal welfare practice.

These case studies demonstrate that systems designed for good welfare can be run economically in countries throughout the world. These include:

- Free-range systems from the UK, Sweden, Spain, Hungary, USA, Australia and Brazil
- Group systems for dry sows with bedding from the UK, France, Czech Republic and Australia
- Indoor systems with free-farrowing from the UK, France, Czech Republic and Hungary
- Indoor systems where sows and piglets are introduced into family groups from the Czech Republic and Brazil
- Deep-bed systems using a range of bedding materials for growing pigs from Brazil
- Straw-based systems for growing pigs from the UK, France, Czech Republic and Australia
- Systems with late weaning of piglets (8 weeks or more) from Sweden, UK, Spain, Czech Republic and Hungary
- Organic systems from the UK, Spain, Czech Republic and Australia
- Traditional and rare breed systems from the UK, Spain, Hungary and Australia
- Traditional subsistence systems from the Ivory Coast

These case studies exhibit good animal welfare practice, but it is important to note that this does not always apply to the entire system. There are practices in some of these farms which cannot be condoned on welfare grounds. For example, a few of these farms use confinement systems such as sow stalls or farrowing crates. Straw or other bedding material is not always provided throughout the life-cycle. Mutilations such as castration, tail-docking and tooth-clipping are practised on many of these farms. Not all animals have access to veterinary care when it is needed. More frequent inspection could be recommended on some farms. It is important to note that participation in a case study does not imply Compassion in World Farming endorsement of a farm or system. These case studies are included because at least part of the system demonstrates good animal welfare practice from which others can learn.

Good animal welfare, especially in the form of good stockmanship, can be good for production. On the other hand, the design of systems for very high welfare can increase costs. These case studies include farms, both indoor and free-range, which compete successfully in the mass market without a welfare premium. Others, most notably the Spanish case studies, get a premium price for a traditional quality product. In yet others the product is sold at a premium as a high welfare as well as a quality product.

If you know of other systems deserving to be written up as a case study, please let us know. Compassion in World Farming expects to visit more pig farms over the coming years, extending the portfolio further across the world and demonstrating additional good welfare systems. Compassion in World Farming expects to produce materials including case studies on other farm animal species, starting with broiler chicken production systems. Further case studies will be placed on the web as they are developed.



Free-range breeding system, Fittleworth, United Kingdom



Deep-bed system, Brazil

Pig Case Study Sweden 1

Organic pig production system, Davidsta Farm, Gnesta

Organic system with all pigs reared outdoors in grass paddocks throughout the life-cycle

Davidsta farm supplies organic pigmeat at a premium price to local butchers and restaurants, with a surplus sold to supermarkets. The pigs are kept free-range throughout their life-cycle, yet grass cover in the paddocks is maintained without nose-ringing or housing the fattening pigs indoors.

The main welfare advantage of an outdoor system is that the accommodation most closely resembles their natural environment. This allows the pigs to carry out most of their natural behaviour. The farm has 50 sows which, along with their offspring, share a site of 20 hectares. The ample space means that problems with aggression are reduced.

The Large White Landrace sows are crossed with Hampshire boars to produce a hardier cross that is better suited to outdoors conditions. The farmer has a policy of breeding sows that make good mothers and are neither too aggressive nor too fearful.

Sows

The key welfare aspects for the sows are:

- Small, stable family groups
- Good opportunity for foraging
- Good opportunity for supplementing their diet
- Grass cover maintained without nose-ringing
- Two litters per year rather than the conventional 2.3

The sows are kept in small, stable family groups of 6-8 animals. This means that aggression is reduced, as the sows are never mixed with unfamiliar individuals. At feeding time, the food is distributed along the whole length of the paddock so that competition for food does not become a problem.

A key to good welfare in free-range systems is the maintenance of grass or ground cover without nose-ringing. Dry sows are fed a restricted ration which leaves them hungry. In good free-range systems, they can supplement their diet by rooting, browsing or grazing just as they would in the wild. On some free-range farms, cover is sometimes maintained by



Both the farrowing sows and their piglets are free to roam in the large paddocks

nose-ringing the sow. This is a painful operation and nose-rings frustrate the natural urge to root. On this farm grass cover is maintained by good management practice without nose-ringing. There is a generous space allowance and the paddocks are regularly rotated.



The paddocks have good grass cover for grazing

As a result, the sows spend most of their time in foraging activities. Opportunity to carry out these behaviours can prevent the development of abnormal behaviours seen in more restricted environments. They have plenty of space in which to roam and the exercise can help reduce the incidence of lameness. The sows are provided with spacious bedded huts where they can shelter in poor weather. They also have wallows that they can use in hot weather.

Unlike conventional systems, in which sows have around 2.3 litters a year, the sows on this farm have just two litters per year. This regime more closely resembles the natural birth pattern seen in wild and feral sows. This means that the sows are less likely to lose bodily condition. For this reason, the sows can live longer and all the sows on the farm had produced seven or eight litters. In intensive production, sows are often culled after their third or fourth litters because of breeding difficulties.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- Each sow has freedom of movement at all times
- There is ample opportunity for the sows to build a nest
- The sow is able to leave her piglets if she requires
- The well-spaced individual arcs provide a quiet area away from the rest of the group

At farrowing, the sows are transferred to farrowing paddocks where they remain in their family groups of 6-8 sows. Keeping sows together at farrowing can result in higher piglet mortality if the sows disturb each other. However, this is less of a problem when sows are kept in familiar groups.

Each sow is provided with its own individual farrowing arc that is deep bedded with straw. This enables the sow to build a nest at farrowing. It alleviates the pre-farrowing stress experienced by sows that are normally confined in farrowing crates at this time. The arcs are well spaced out and provide a quiet area away from the rest of the sows.

After farrowing, the sows are free to leave the arc whenever they want. Each arc has a restraining barrier so that the piglets remain

inside. This means that the sow can escape from the constant attentions of the piglets if she wants. After 7 days, the barriers are removed and the sows and piglets can congregate together in family groups as they would under more natural conditions.

Piglets

The key welfare aspects for the piglets are:

- Straw bedding, earth floors and safety area reduce the risk of accidental crushing
- The piglets are not subjected to teeth-clipping or tail-docking
- The piglets are not weaned until they are 8 weeks old

The piglets are born in the farrowing arcs. The straw bedding provides good thermal insulation to help keep the young piglets warm. The bedding, along with the earth floors, means that they are less prone to being accidentally crushed by their mothers. The design of the farrowing arc provides 'safety' areas that also help to reduce accidental crushing.

The piglets are not subjected to all the mutilation practices that are seen in conventional production systems. They are not teeth-clipped. This is because the sow has freedom of movement and is able to leave the piglets if they begin to damage her udder with their teeth. They are not tail-docked. This is because the pigs remain in enriched environments throughout their lives and therefore are unlikely to bite each other's tails. Unfortunately, the males have to be castrated because of insistence by the slaughter company.



The pigs are neither teeth-clipped nor tail-docked

Piglets are normally weaned at 3-4 weeks. On this farm, they are not weaned until they are 8 weeks old. The piglets therefore do not suffer from the stress caused by early weaning, as seen in intensive production systems.

Growing pigs

The key welfare aspects for the growing pigs are:

- They remain outdoors throughout their lives
- Generous space allowance with good pasture
- They are kept in stable groups and never mixed

In organic production the general rule is that all stock should have access to an outdoor run. However, there is derogation for pigs in that growing pigs may be kept inside for not more than one fifth of their lives. This is because the natural rooting behaviour of the pig can be very damaging to the pasture, particularly as they get bigger. For this reason, most systems house the finishing pigs for the last fifth of their lives. With good management practice, Davidsta farm has overcome these problems and finish their pigs totally outdoors. As with the dry sows, this is achieved by providing a generous space allowance and rotation of the paddocks. Electric fencing is used to keep the pigs in the paddocks and this can easily be moved to new sites.

The main benefit of the outdoor accommodation is that the pigs have more freedom to carry out their natural behaviours. Pigs may spend as much as 75% of the daytime in foraging activity. This includes sniffing, rooting, biting and chewing. In less enriched environments, these behaviours become re-directed towards pen fittings and other pigs. This can lead to serious outbreaks of tail-biting. The wounds attract other pigs so that the behaviour can quickly spread throughout the whole group.

The risk of tail-biting means that in intensive production, piglets' tails are routinely docked in an attempt to reduce the problem. This occurs even though routine tail-docking is banned in the EU. The removal of the last third of the tail using pliers causes acute pain at the time. It can also cause nervous damage and chronic pain later.

At Davidsta, the enriched environment means that the tails never have to be docked. The outdoor pasture presents plenty of opportunity for the pigs to carry out their natural foraging behaviour. It was cold and wet on the day of the visit to the farm. Even so, all the pigs were outside and most were either grazing or rooting. They were widely spaced in the large paddocks with none of the problems caused by overcrowding that are seen in intensive production. With plenty of opportunity for exercise, there were no problems with lameness.

At Davidsta, the piglets are reared in outdoor farrowing huts. They are free to roam and socialise with other litters. After weaning at 8 weeks, the litters are all reared together and remain so until they are ready to go for slaughter. This means that levels of aggression remain very low. The dominance hierarchy is stable and they are never mixed with unfamiliar pigs.



The growing and finishing pigs remain outside all their lives

The pigs were provided with large communal huts that were deep bedded with straw. These provided protection from the worst weather. But, according to the farmer, the only time the pigs remained in the huts was when there was a combination of very wet and very windy weather.

When they are ready to go for slaughter, the pigs only

have to travel 50km to the abattoir. Even so, the farmer would prefer to slaughter the pigs on farm and market them all independently. At present, only half the pigs are sold as hams to local butchers and restaurants for a premium rate of 32 Kr per kg. The rest are sold by the big companies to the supermarket for the conventional production price of 16 Kr per kg.

Organic production system	
Date of visit	19 September 2003
Certification scheme	Ecologic
Number of sows	50
Breed	Large White/Landrace sows x Hampshire boars
Food	Home grown rape, potatoes, peas plus concentrate
Average and maximum farrowings per sow	Average 7. No upper limit; kill when not viable
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	15-20%
Average number of piglets weaned per farrowing	10
Mutilations	Castration. No teeth-clipping, tail-docking or nose-ringing
Weaning age	8 weeks. Growth rate 215 days to 110kg
Food conversion rate	500kg food per pig
Weight when sold on or slaughtered	110kg
Transport to slaughter	50km
Price to farmer	Premium rate of 32 Kronor (3.5 Euros)/kg deadweight. 16 Kronor (1.8 Euros)/kg for surplus not sold at a premium
Market	Premium hams to local butchers and restaurants, surplus to supermarkets
Number of stockpersons	1 (4h per day)
Number of inspections	1 per day
Health problems	Some liver and lung spots
Other welfare issues identified	One of the boars was attacked and killed by a wild boar. Mutilations (castration)

Pig Case Study Sweden 2

Organic rotation pig production system, Hånsta Östergärde Farm, Vattholma

Free-range system targeted at Christmas market with full utilisation of the pig's rooting behaviour for cultivation

On Hånsta Östergärde farm the pigs are rotated between a number of different areas including forest, cropland and pasture. The pigs play an integral role in the management of the farm and the recycling of nutrients. The sows farrow on pasture in the spring, then move with their piglets to clear forest brash in the summer. In the autumn they clear crop-land after harvest, helping to prepare it for planting in the spring.

This variety of different environments closely resembles those naturally inhabited by wild and feral pigs. The farm therefore has a very high potential for good welfare. This is because the pigs have the opportunity to carry out almost all their natural behaviours. The normal feed ration is supplemented by a variety of other different food sources that the pigs can forage for themselves.

The key welfare aspects for the pigs are:

- All pigs remain outdoors in highly enriched environments throughout their lives
- All pigs remain in stable family groups with natural weaning
- The sows only produce one litter of young per year, helping to keep them in good condition
- The environment provides excellent opportunity for foraging and a varied diet



The forest environment provides good opportunity for rooting

This is an organic farm that keeps a small number of pigs as well as other livestock. The pigs are especially reared for the premium Christmas market. In Sweden, it is traditional to have hams at Christmas. The farmer explained that at Christmas, people were more willing to pay extra for good quality hams to celebrate.

Spring

The small group of 10 sows remain together at all times. The familiarity that builds up within the group ensures that aggression is reduced to a very low level. In spring, the sows are moved to special farrowing paddocks that contain huts for the sows. When they are close to farrowing, each sow is allocated an individual hut with an outdoors run. The huts are quite spacious and provide plenty of room for the sows to move around. The separation of the group ensures that there is no risk of disturbance at farrowing. Sows normally seek isolation at farrowing in a natural environment.

The wooden huts provide good protection from the weather. They also contain a generous supply of straw bedding for nest building and safety areas for the piglets. These reduce the risk of the piglets being accidentally crushed by their mothers. After two days the sows are allowed out of the huts daily for exercise.



The pigs are provided with simple shelters and straw bedding

The piglets are not teeth-clipped. This is because the sow has freedom of movement and is able to leave the piglets if they begin to damage her udder with their teeth. There is also no need to dock the piglets' tails because they remain in enriched environments throughout their lives and are therefore unlikely to bite each others' tails. Unfortunately the slaughter company insist that the males have to be castrated.

After 1 week of age, the piglets are also allowed to leave the huts so that they can begin to experience their new environment. After 3 weeks, the outdoor runs are opened up and the sows and litters are free to congregate and socialise. The piglets are therefore able to establish their social hierarchy at a very early age when fighting is less intense and the number of injuries is lower.

Summer

During the summer months, the sows and their litters are all moved together to the forest. The sows and piglets are therefore allowed to wean themselves naturally. This normally occurs once the piglets are 10-17 weeks of age. Natural weaning ensures that the piglets do not suffer from the stress caused by early weaning as seen in conventional production.



The pigs assist in clearing the forest for the regeneration of native woodland trees

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. Nevertheless, the pigs still became very excited at feeding time. The farmer was keen to develop some kind of mobile feeding system to reduce the amount of aggression when the food was presented.



The growing pigs stay with their mother and are weaned naturally

The areas used in the forest by the pigs have been recently felled. The areas measure approximately 1 hectare and are surrounded by an electronic fence. The activities of the pigs helps to clear the brash, fertilise the soil, and thereby assist with the regeneration of native woodland trees. After one area has been cleared, they are moved onto a new one. This continues until mid September.

In the forest, the pigs are provided with crude shelters that basically consist of a roof under which a pile of straw was placed. By the watering point, the pigs had constructed their own wallow. The pigs were also seen to make good use of the tree stumps as scratching posts. Wallowing and scratching are important behaviours for keeping the skin in good condition and in the case of wallows, for cooling down.

Autumn

In September, the sows and growing pigs are moved together onto fields that have been used to grow crops. They clear the land by feeding on any remaining plant material and fertilise the soil with their dung. Any remaining food is an important supplement to their daily feed ration. The rooting activity of the pigs removes weeds and effectively ploughs the fields preparing them for re-sowing. The pigs are moved around the different fields as required thereby receiving a very natural and varied diet.

In the paddocks, the farmer has a mobile feeding stall that can enclose up to five sows at any one time. This method of feeding is very effective at preventing aggression. The growing pigs have their own feeding area that only they can access.



The farmer is hoping to improve the feeding system in the forest to reduce aggression

Once the growing pigs have reached 120 kg they are ready to go for slaughter. The pigs are sold for the special Christmas market for which the farmer receives a premium price.

The Large White/Landrace sows are then mated with a Duroc boar so that they are ready to give birth again in the spring. The cross with the Duroc boar ensures that the offspring are hardier and more suited to outdoor conditions. Unlike conventional systems in which sows have around 2.3 litters a year, the sows on this farm have just one litter per year. This regime is typical of the natural birth pattern seen in wild and feral sows. The reduced metabolic demand means that the sows remain in good condition all year round. It also means that the sows can live for much longer than conventional sows that are often culled after their third or fourth litters because of breeding difficulties. On this farm, all the sows had produced their fourth litter and all looked to be in good health.

Organic rotation pig production system

Date of visit	18 September 2003
Certification scheme	Ecologic
Number of sows	10
Breed	Large White/Landrace sows x Duroc
Food	Bought in concentrate plus a variety of natural food material
Average and maximum farrowings per sow	All have had 4 litters so far
Farrowings per year	1
% piglets stillborn	
% live born piglet mortality	10%
Average number of piglets weaned per farrowing	9
Mutilations	Castration. No teeth-clipping or tail-docking
Weaning age	Weaned naturally
Growth rate	Not known
Food conversion rate	Not known
Weight when sold on or slaughtered	Not known
Transport to slaughter	3-4hr
Price to farmer	20 Kronor (2.2 Euros)/kg deadweight
Market Premium	Christmas market for hams
Number of stockpersons	1 (2h per day)
Number of inspections	2 per day
Health problems	None reported or observed
Other welfare issues identified	Mutilations (castration)

Pig Case Study United Kingdom 1

Enriched indoor educational system, Sparsholt College, Hampshire

Straw bedded system, replacing an older more intensive system, run as an educational resource with semi-commercial restraints

See also Case Study United Kingdom 2

Sparsholt College is one of the UK's leading land-based colleges. Like other land-based colleges, agricultural courses used to be the mainstay but numbers have dramatically declined and other courses have grown to fill the gap.

The pig-unit at Sparsholt has been rebuilt mainly as a resource for the Animal Care Course which has 250 students each year and for 40 agriculture students. The unit is also visited by 7000 school children every year.

The key welfare benefits of the system are:

- Enriched environments well-bedded with straw
- Generous space allowances well above industry norms
- Separate space for resting, exercise, feeding and excretion
- Pigs kept in social groups with limited mixing
- Closed breeding system beneficial to bio-security
- System designed with insulation, ventilation and opportunities for wallowing

All parts of the system, with modification for the farrowing quarters, are based on a covered straw-bedded area for resting and foraging and a concrete area for exercising, feeding, drinking and excreting.



The straw bed allows the sows to exhibit natural foraging behaviour

The latter area can be cleaned out using a tractor.

The whole system is designed with temperature control in mind. The concrete used to make the floors was mixed with plastic insulation. The covered area is made using a modular material made of plastic with a hollow honeycomb interior. This also provides good insulation. It is also light enough to be removed to allow ventilation in hot weather.

In cool weather the pigs can choose to rest in a huddle on a straw bed. When it is hot (above 20°C) they can wallow in the water they have spilled from their drinkers and can rest on the cooler concrete.



Pens for dry sows, weaners and growing pigs have a dry well-strawed lying area at the back. Sows eat, drink and defaecate in the concrete area at the front which can be mechanically cleaned using a tractor



Farrowing sow has separate exercise area at the front of the pen where she feeds, drinks and defaecates. In hot weather she can wallow in water spilled by the drinker. The lying area remains dry, reducing the risk that she will slip and crush her piglets

A closed breeding system helps to ensure biosecurity. The college has an elite stock of pedigree Large White sows and boars. Semen is imported to produce Large White/Landrace crosses.

The new unit replaces an older one which needed updating. The old unit housed pregnant sows individually (though not in sow stalls). The farrowing sows were kept in farrowing crates and the weaned piglets on slats. The College believed a new system was required to teach modern high-welfare methods of pig keeping. As a showcase for the visiting public, a high welfare system was also essential.

The change to the enriched system from April 2004 has resulted in a massive reduction in lameness and vices such as tail-biting. The farrowing crate has been abandoned without an increase in piglet mortality being noted.

Dry sows

The key welfare aspects for the sows are:

- Feeding-stalls and shoulder separated feeders prevent or reduce aggression at feeding time
- They have access to straw at all times for comfort, for foraging and for supplementing the diet
- They are kept in small stable groups with freedom of movement



Recently weaned sows can be locked into feeding stalls, when necessary, to prevent aggression during feeding



After 8 weeks they are transferred to pens with shoulder feeders (at front of picture) which offer partial protection from aggression during feeding



Sow in feeding stall



Dry sows, on a restricted diet, can deal with their hunger by eating straw

Gilts and weaned sows are transferred to a spacious service area where the boars are housed. This area has lockable feeding stalls to prevent aggression while each is served by the boar. An additional benefit is that aggression at feeding time can be controlled when necessary. For example, aggressive sows can be locked in until the others have finished. Thin sows can be locked in with additional rations without risk of the other sows trying to steal it. The sows are released after 10-15 minutes, once all the food has been consumed. In practice, the stockman does not normally find it necessary to lock the sows in.

Eight weeks after weaning, the sows are moved to pens with shoulder-separated feeders. These offer less protection against aggression, but are a cheaper compromise. By this stage the dominance order in the group is well-established and aggression levels are lower.

Hunger is a major problem for dry sows on a restricted diet who are only fed once a day. The provision of straw gives them both an opportunity to forage and helps to fill their stomachs with roughage. A high proportion of the straw provided for bedding ends up being consumed.

Keeping sows in small groups is in line with their natural behaviour. It provides an opportunity for social behaviour without exposing them to the aggression which might be found in a larger group. Exercise is good for their health and can reduce lameness.

In nature, sows would remain in stable groups of sisters and perhaps their offspring without mixing. In commercial systems, mixing results in aggression as new pecking orders are established. At Sparsholt, mixing is kept to a minimum, though new gilts may be introduced to the group to replace cull sows shortly after weaning. Mixing does not occur at any other time.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- The sows have freedom of movement at all times
- They are provided with straw for nest-building
- The sows have individual pens to reduce disturbance

Every four weeks, 2 groups of 8 sows are transferred to specially designed farrowing pens shortly before farrowing. The pens are designed to allow the sows freedom of movement whilst, at the same time, a range of tactics and devices are applied to ensure the safety of piglets (see next section).

The farrowing pen is divided into a separate resting and exercising area for the sow as well as a cosy safety area for the piglets. The sow feeds, eats, drinks, and excretes in the exercise area at the front of the pen. In hot weather she can wallow here in water which she spills from the drinker.

This separation enables the resting area to be kept dry. Here the sow is provided with straw before farrowing to fulfil her essential nest-building instinct. This prevents stress before farrowing and can speed up the farrowing process. In turn, this can reduce the proportion of stillborn piglets. An unstressed sow is also likely to be a better mother.



Suckling

The farrowing area is surrounded by high walls to give the sow the seclusion she needs during farrowing and early suckling of her piglets. However, the group of sows can hear each other. Bouts of suckling are synchronised and this may help to maintain social bonds between the sows.

Piglets

The key welfare aspects for the piglets are:

- Good piglet protection devices and procedures to reduce the risk of accidental crushing
- The piglets are not subjected to castration or tail-docking
- The piglets are at all times provided with an enriched environment which reduces the likelihood of tail-biting



Piglets have a well-strawed safety area with infra-red lamp to encourage them away from the risk of crushing

The piglets are provided with a well-strawed safety area, with an infra-red lamp to encourage them away from the risk of being crushed by their mother. Removing some of the straw their mother used to make a nest after farrowing also helps to encourage the piglets into the safer area. There are also two safety rails by the side of the resting area to provide additional protection.

Providing a separate exercising area which encourages the sow to eat, drink and excrete away from the resting area, helps to keep the resting area dry. This reduces the risk that the sow will accidentally slip and crush a piglet. The farrowing area is also cleaned out by hand twice a day, helping to keep the area safe, dry and clean. (The rest of the system is cleaned mechanically two or three times per week). As a result of these

precautions, death rates amongst piglets have not gone up since Sparsholt College has abandoned the farrowing crate. The stockman hopes with experience to reduce mortality even further.

British pigs are almost invariably spared the pain and stress of castration. In Sparsholt, tail-docking is not

practised either, yet tail-biting is not a major problem thanks to the enriched environment. Unfortunately, teeth-clipping has been recommended by the unit's veterinary surgeon. All the piglets are given iron injections since iron deficiency is common in piglets which are born indoors. Under careful supervision, this is used as a training opportunity for animal care and agriculture students.



Weaners are kept in groups of 40 on straw

After weaning, the piglets are mixed into groups of 40 and transferred into straw covered pens. They are given a fairly generous space allowance which helps to keep the aggression for dominance, which is inevitable after mixing, to a minimum. After this they will not be mixed again which helps to reduce aggression.

The stockman is convinced that welfare is substantially improved since changing from a slatted system to a straw-based one. Aggression and tail-biting are down and growth rates are up.



Most of the bedded area remains clean. Most groups of piglets urinate and defaecate at the front

We observed one piglet with PMWS. Sparsholt used to separate these for reasons of biosecurity, but they found that the stress of separation often led to an early death. They are now treated within the group.

After weaning, one sow is often kept back to suckle a group of the weaker piglets.

Growing pigs

The key welfare aspects for the growing pigs are:

- Pens with plenty of straw to encourage rooting and foraging behaviour
- Space for exercise
- Low levels of aggression and tail-biting due to the comfortable and enriched environment

Once the piglets have reached 40kg at about 12 weeks old, each group is split into two groups of 20 and transferred to the fattening area. Here they will grow to 90kg before being slaughtered for bacon at about 20 weeks old.



Straw provides comfort and encourages foraging behaviour



Before moving from slats to straw, aggression and tail-biting were a significant problem. The farm manager explained they had tried providing footballs for environmental enrichment. The pigs showed initial interest, then returned to fighting each other after about 5 minutes. 'Today they spend all day nosing through the straw'.

As a result, aggression and tail-biting levels are low despite growing piglets with intact tails. We observed one growing pig with a missing tail out of a total of 180. The farm has isolation pens so that any pigs which do suffer tail-biting can be isolated and treated with antibiotics.

Boars

Boars are kept individually in straw covered pens. Where possible they can make nose-contact with the sows who are ready for mating. A few growing boars are kept without such contact, though they have visual contact with other pigs. The boars are kept separate to prevent fighting.



Recently weaned sows in pen next to boar

General

There are at least four veterinary visits per year, required by the ABM Certification Scheme. The breeding sows are vaccinated twice per year for Erisipelas and once for E Coli. The piglets are vaccinated at weaning for pneumonia (EP). There is a

disinfectant footbath and hand-washing facility on entrance and exit to the unit. Visitors to the farm are asked to keep away from pigs for at least 2 days beforehand and to wear uncontaminated clothes to reduce the risk of spreading pig infections. This biosecurity requirement is fairly standard in the UK.

The whole unit cost £600,000 to set up in place of the old one. The philosophy is to provide the pigs with as much comfort and freedom as possible within the confines of a commercial enterprise. The pigs are housed where possible in social groups and straw is provided for comfort and rooting.

A major aim of the college is to teach good stockmanship. According to farm manager Graham Boyt, poor stockmanship means bad welfare, whatever the system. A good stockperson is 'somebody who loves their animals. You have to live your animals. You have to need to know they are doing well.' A good stockperson will with experience know instinctively whether the animals are happy and well. A good stockperson 'will know an animal is sick before there are any obvious signs.'

Stockman John Garrett believes that the key to good welfare is conscientiousness and attention to detail. He believes good stockpeople are reliable, use their initiative, need experience but are fundamentally born not made. Good stockmanship depends on understanding the animal.



Tail biting. Only one case observed in 180 fattening pigs despite the no-tail-docking policy. Provision of straw reduces incidence of tail-biting



Note piglet-safety bar. Light behind comes from piglet safety area



Feeding

Indoor enriched pig production system

Date of visit	13 August 2004
Certification scheme	ABM/ABP (Assured British Meat/Pigs)
Number of sows	Currently 70; capacity for 130
Breed	Pedigree Large White breeding stock kept to produce Large White/Landrace crosses
Food	Standard cereal-based compound pig feeds. 7 separate feeds used: dry sow feed; farrowing sow feed; 2 creep feeds for weaners; grower feed; 2 finisher diets
Average and maximum farrowings per sow	Average 6-7. No maximum
Farrowings per year	2.2+ expected*
% piglets stillborn	10% expected*; hope to do better
% live born piglet mortality	10% expected*; hope to do better
Average number of piglets weaned per farrowing	10
Mutilations	No castration or tail-docking; teeth-clipping used on veterinary advice
Weaning age	4 weeks
Growth rate	642g per day - 90kg bacon pig in 20 weeks
Food conversion rate	2.3:1 estimated
Weight when sold on or slaughtered	90kg
Transport to slaughter	115 miles; 2 hour journey. This is longer than desired
Price to farmer	Conventional market price with slight premium for quality
Market	Conventional bacon market
Number of stockpersons	1 full-time stockman also looking after flock of 300 sheep. Stockman estimates 80% of 11-hour day spent with pigs. Cover provided by farm manager 3 days per fortnight
Number of inspections	At least twice per day. Farrowing sows 3 times per day at farrowing
Health problems	One weaner with PMWS observed
Other welfare issues identified	One grower pig with missing tail observed. One gilt separated from her group to protect her from aggression. Mutilations (teeth-clipping). Weaning age

* Since the unit is new, figures for piglet mortality and productivity are estimates based on the old more intensive system. Early indications are that results in the new system are at least as good and may be better.



The piglets can easily be shut in to the straw bedded section while the pens are cleaned using a tractor

Pig Case Study United Kingdom 2

Enriched indoor educational system, Rodway Farm, Bridgwater College, Cannington Centre, Somerset

Straw-based system including farrowing pens run as an educational resource with semi-commercial constraints

The Cannington Centre at Bridgwater College is one of the UK's leading land-based colleges. Rodway Farm is run on semi-commercial lines, but the prime function is to provide an educational resource demonstrating good animal welfare and agricultural practice for students of agriculture, animal care and land-based studies. More than 120 first-year students gain practical experience at the unit each year.

The pigs are owned by Meat Line Europe and the College is paid a management fee for looking after them.

History of the current unit

In the 1990s, following the ban on the sow stall in the UK, the college needed to update their old pig system.

The farm director, Steve Bryant, was determined to develop a high welfare system which gave the sows plenty of space with freedom to display their natural behaviours. To maximise their space allowance, the dry sows were all housed 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. 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



Farrowing pen allows freedom of movement for sow with protection for piglets

the straw. It is claimed that there was not much aggression at feeding time, which can be a problem where sows are fed in groups. Low stocking density, the choice of a docile breed and the dispersal of feed within the straw are likely factors in reducing food-related aggression.

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 and coped with the social disturbance of mixing better. 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.



Original enriched large group system with dump-feed system



New system with smaller groups

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 and is easier to manage. Since mixing was minimised, problems with aggression and embryo reabsorption were reduced.

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

Other key aspects of the system, designed to demonstrate good welfare practice, include:

- Farrowing pens, with piglet safety areas, which allow the sows freedom of movement
- Pens for dry sows, weaners and fattening pigs with plenty of straw and separate spaces for resting, exercise, feeding and excretion
- Separate areas with straw and concrete give the pigs some opportunity for thermoregulation

Extra straw is provided during winter to help the pigs keep warm.

Dry sows

The key welfare aspects for the sows are:

- Feeding stalls for recently mixed sows to reduce aggression at feeding time
- Access to straw at all times for comfort, for activity and to reduce hunger caused by a restricted diet
- Small stable groups with freedom of movement

Gilts and recently weaned sows spend the first two weeks in pens which contain feeding stalls. This allows the stockperson to give extra feed to sows which have lost condition and reduces aggression which is likely to be at its worst after mixing.



Feeding stall allows recently mixed sows to be fed individually without aggression



Dry sows on restricted diets can satisfy their hunger by foraging through straw

Farrowing sows

Shortly before farrowing, the sows are transferred to specially designed farrowing pens. These were designed with the objective of providing a high welfare system which minimised piglet mortality without compromising the freedom of movement of the sow.



Innovative farrowing system designed for high welfare

The key welfare aspects for the farrowing sows are:

- The sows have freedom of movement at all times
- They are provided with shavings for nest-building
- The sows have individual pens to reduce disturbance

A similar design was later set up at Sparsholt College (see Case Study United Kingdom 1 for more details of the operation of this system).

Piglets

The key welfare aspects for the piglets are:

- Good piglet protection devices and procedures to reduce the risk of accidental crushing
- The piglets are at all times provided with an enriched environment which reduces the risk of tail-biting and aggression
- The piglets are not subjected to castration; tail-docking and teeth-clipping are not performed routinely

The piglets are provided with a well-bedded safety area, with a infra-red lamp to encourage them away from the risk of being crushed by their mother. There are also two safety rails by the side of the resting area to provide additional protection.



Comfortable bedding and infrared heater encourage piglets away from the risk of crushing

British pigs are almost invariably spared the pain and stress of castration since this is not permitted by Assured British Meats (ABM), the main pig certification scheme. EU rules also prevent the routine use of tail-docking and teeth-clipping, though these are carried out at times on the advice of a veterinary surgeon after problems, such as tail-biting, occur.

To reduce health and welfare problems, EU rules no longer permit weaning before 4 weeks for most pig

systems and this is currently the usual weaning age at the Cannington Centre. To help the piglets get used to solid food before weaning, creep food is provided from 10 days old and the piglets start to eat it at 15 days. In the week before weaning, creep feed is provided twice a day.

Before the recent destocking which was carried out to eradicate disease problems such as PMWS, weaning was often delayed until 32 days. PMWS is aggravated by stress which can be reduced by later weaning.

Weaners, growing and fattening pigs



©Colin Seddon



Straw provides for activity and comfort

The key welfare aspects for the growing pigs are:

- Pens with plenty of straw to encourage rooting and foraging behaviour
- Space for exercise
- Low levels of aggression and tail-biting due to the comfortable and enriched environment

At weaning, 6 litters are mixed together producing a group of about 60 piglets. Ten weeks later, weighing about 40-45 kg, the pigs are divided into two groups of 30. Three to four weeks later, weighing about 65 kg, they are moved into groups of 20. A drawback of this system is that some mixing is required at this stage and some aggression is inevitable.

Boars

Boars are kept individually in straw covered pens. Boars, like sows, are kept on restricted diets and the provision of fibre provides essential gut-fill as well as encouraging foraging activity. UK rules have long required the provision of bedding material such as straw for the health and welfare of boars, recognising their key role in the productivity of farms.



Fibrous bedding is essential for the welfare of boars too

General

There are at least four veterinary visits per year, as required by the ABM Certification Scheme, with additional visits as required. Hospital pens are provided for sick animals. The breeding sows are vaccinated for Erisipelas and Parvo virus. In line with standard UK biosecurity practice, wellingtons are provided and there is a disinfectant footbath on entrance and exit to the unit. Visitors to the farm are asked to keep away from pigs for at least 3 days beforehand and to wear uncontaminated clothes to reduce the risk of spreading pig infections.

According to the Pig Unit Manager, Kellie Angell, this is a nice system to work with. She had previously worked on stall and tether systems which she felt were disgusting, allowing 'no natural behaviour whatsoever.' She said that in this system it is 'so nice when you're bedding them up and they root around and do what they ought to do – show natural behaviour.' She felt that another strength of the Cannington set-up is that there were spare pens for flexibility, including several which could be used as hospital pens when animals needed special treatment.



Hospital pen



Pig manager Kellie Angell bedding up the growing pigs

Indoor enriched pig production system

Date of visit	21 January 2005
Certification scheme	ABM
Number of sows	147
Breed	Large White/Landrace
Food	ABM (Assured British Meats)
Average and maximum farrowings per sow	Aiming for 7 litters
Farrowings per year	2.24
% piglets stillborn	1%
% live born piglet mortality	9% to weaning; 1-2% thereafter
Average number of piglets weaned per farrowing	9 for gilts; 9 for sows (hoping for 22* piglets per sow per year)
Mutilations	Tail-docking and teeth-clipping used on veterinary advice
Weaning age	4 weeks
Growth rate	Rearing 550g/day. Finishing 695g/day
Food conversion rate	Rearing 1.36:1. Finishing 3.60:1
Weight when sold on or slaughtered	110/120kg
Transport to slaughter	6 hours
Price to farmer	Paid a management fee
Market	Bacon produced for Meat Line Europe
Number of stockpersons	2 full-time stockmen
Number of inspections	3 times per day. Farrowing sows more often
Health problems	None at present. Unit recently destocked to reduce health problems including PMWS
Other welfare issues identified	Mild aggression sometimes, mainly in finishing pens following mixing. Mutilations. Early weaning

* Since part of the unit is new, these figures are estimates.

Pig Case Study United Kingdom 3

Free-range system, Fittleworth, West Sussex

Breeding system with sows and weaners kept free-range; a proportion fattened free-range as well

Tom Leddra is a tenant farmer who has run free-range pig systems for 20 years. He opted for the system because he has little access to capital. The huts, electric fences, feeding systems and water supplies required for a free-range system are much cheaper to set up than the buildings required for an indoor system. Tom also believes that free-range systems can be good for welfare.

Outdoor systems more closely resemble the natural environment of pigs. This allows pigs to carry out natural behaviours such as foraging. The larger space allowances allow weaker pigs to escape naturally from aggressive encounters. The farm has 500 sows on 30 hectares.



Sow and piglets, Fittleworth farm, West Sussex, United Kingdom



Outdoor sows spend much of the time foraging

Other key welfare aspects of this system include:

- A well-draining sandy soil
- An electric fence around the site to keep out predators
- The provision of wallows to enable the pigs to keep cool in summer
- The provision of shelters with a generous layer of straw to enable them to keep warm

Well-draining soils such as sand or chalk are considered essential for outdoor pig keeping, especially for those which keep the sows at a high density. Heavier clay soils can become excessively muddy, especially in winter. This can lead to foot problems and increases the time taken for pasture to recover.

Pigs are woodland animals and naturally would have access to shade. They cannot sweat and are sensitive to sunburn. Tom Leddra provides his pigs with wallows, each supplied by a continuous water spray. The pigs cool down by lying in the water or through the evaporation of water from their damp skin. They get coated in mud while wallowing which protects them from sunburn.

Tom Leddra believes that pigs are better adapted to the British winter than to the summer, provided that they have access to shelter with a dry bed. He replaces the straw in the shelters once a week in summer, and twice a week in winter to ensure a dry bed.

Most of Tom Leddra's pigs are sold at 12 weeks old for further fattening. These are sold at normal market prices. Indeed, more than 30% of UK pigs are now bred outdoors and then fattened intensively, especially those reared for pork.

Tom Leddra now has an additional deal to rear about 20% of his pigs through to slaughter-weight for sale as free-range pork. This is for a niche market. Tom has a long-term contract for these pigs so receives a reliable price which is not subject to normal market fluctuations.

Dry sows



The barrier keeps the piglets in for the first 2 or 3 weeks, but allows the sow to get away when she needs to

The key welfare aspects for the sows are:

- Stable groups throughout each period of pregnancy and lactation
- Space to exercise and to escape aggressive interactions
- Freedom to root without nose-ringing
- Access to straw, and at times other plant material, as a source of roughage

Aggression between sows can be a problem in group systems, especially if unfamiliar individuals are mixed. Ideally, sows would be kept in stable groups of sisters throughout their lives. The sows on this farm are only mixed after weaning when they are partially re-sorted according to age and size. The groups then stay together through pregnancy and farrowing without further mixing.

There is some aggression between sows after mixing as the sows sort out their dominance order. Since there is plenty of space, sows who lose a dominance contest can escape quickly and avoid serious injury. This also means that disputes can be settled quickly. Tom Leddra reckons that new dominance hierarchies are settled very quickly in a free-range system with plenty of space.

Space also encourages sows to exercise which is good for their general health and can prevent lameness. The sows are not subjected to the painful mutilation of nose-

ringing which inhibits natural foraging behaviour. They have access to straw at all times which enables them partly to satisfy the hunger that accompanies a food-restricted diet. Some stone-chewing was observed. This is thought by some experts to be a stereotypic response to lack of forage. It suggests that the sows would benefit from access to a larger area of rotated range-land or from greater access to other forms of forage.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- The sows have freedom of movement
- They are provided with plenty of straw to make a nest
- Gilts farrow in individual pens to reduce piglet mortalities

The sows are transferred to group farrowing pens shortly before they farrow. Each sow is provided with a farrowing hut with a generous supply of straw. The key welfare benefits for the sows are that they can turn around easily, build a nest and exercise. When they need a break, they can get away from their piglets for a rest. Once the piglets grow, the sow has the choice of suckling them outside if she prefers.



A separate hut is provided for each sow in the group to farrow in

Gilts farrowing for the first time are kept in individual pens. This prevents inexperienced animals from attempting to farrow in the same hut as another gilt, which can result in high mortality amongst the piglets.

Sows on the farm produce, on average, 12 piglets per litter. Recently the figure has been slightly less than this. On average, 1 piglet dies before or shortly after birth and another is lost before weaning. These figures compare favourably with the averages for indoor systems which use the restrictive farrowing crate. The system rears just under 22 live pigs per sow per year which is as good or slightly better than the national average for both indoor and outdoor systems. The

system is organised so that a group of sows farrows every three weeks.



Suckling sow inside the hut

The electric fencing between the pens prevent the sows from escaping, but not the piglets. A drawback of this is that a few piglets get separated from their mothers in the week or so before weaning. If there is a group of weak piglets at weaning, Tom Leddra sometimes fosters them onto one of the sows he has just weaned. The piglets are placed in the hut, and the sow placed outside. At night, once she is full of milk, she is allowed into the hut and she will usually allow them to suckle. He prefers to do this with an inexperienced sow who is least likely to reject or kill the piglets. Some other farms avoid using gilts for this to avoid them losing condition.



Suckling sow outside – notice electric anti-predator fence

Piglets

The key welfare aspects for the weaned piglets are:

- They are kept free-range till 40kg with plenty of opportunities to root
- They are provided with a shelter with plenty of straw
- They are not subjected to tooth-clipping or castration

After weaning, the piglets are transferred to paddocks which give them plenty of space to forage, root and



Weaner paddocks with piglets of different ages

play. Having plenty to do helps reduce the risk that problems such as tail-biting and aggression will develop. There is some aggression shortly after weaning when groups of piglets are mixed. However, this is reduced by giving the weaker piglets plenty of space to escape after aggressive encounters.



Weaner shelters

Tooth-clipping isn't necessary in a free-range system where the sows have freedom of movement and can deal with, or escape from, nipping piglets. Castration is not permitted by the certifying body ABM (Assured British Meats). In practice, British pigs are slaughtered before the age at which boar taint might be considered a problem.

Unfortunately tail-docking is practised, in consultation with a vet. The farmer would prefer not to do this and does not believe it would be strictly necessary for the pigs he rears to slaughter. These are kept free-range, have plenty to do and tail-biting isn't a problem. However, most of the piglets are sold on at 40kg to more intensive growing systems where tail-biting can be a problem. To minimise the stress involved, only the very tip of the tail is docked. The operation is carried out as soon after birth as possible provided that the sow will allow access to her piglets.

The farm used to sell piglets immediately after weaning. There is no longer a market for weaned piglets since PMWS (Post-weaning Multi-systemic Wasting Syndrome) became a problem. This often fatal condition is much more serious where the pigs are stressed. Weaning is a very stressful time for piglets:

- They are separated early from their mother (naturally they would wean at 13 weeks or older)
- They are moved to an unfamiliar environment
- They are mixed with other groups of piglets, so fighting to establish a dominance order will break out
- They change suddenly from a diet of milk to one based on solid food, and will often stop eating for a few days

The stress is compounded because all of these stressors occur at once.

The additional stress of transport to a new farm was enough to increase death rates from PMWS. The farm now has to rear its weaners until they are 40kg at about 12 weeks old before they can be sold on. This is inconvenient for the farmer. However, the extra 8 weeks of free-range life without the early transport is clearly a considerable welfare benefit for the piglets.

The farm has experimented with giving the piglets creep feed for a few days before weaning. This allows the piglets to get used to the food so it is more familiar to them once they are weaned and they are more likely to try it sooner.



A dry bed of straw provides comfort, warmth and fibrous food

Growing pigs

A very positive recent development is that the farm now rears just over 20% of the piglets all the way through to slaughter. This is the result of an increasing market in the UK for free-range pigmeat. Most of the meat from these pigs is sold to butchers' shops. Tom Leddra has a contract to rear some of his pigs on for another local free-range pig farmer who has developed the market and needs additional supplies.



Gilts relaxing

The key welfare benefits for these growing pigs are:

- They have plenty of opportunity to root in the soil and amongst their straw bedding
- Generous space allowance
- They are not mixed again during their growing period
- They are spared the experience of transport for further fattening
- They do not have to readjust to an intensive rearing system in which straw may not be available
- They are provided with wallows and shelters with dry straw beds to enable temperature control



Fattening pigs will be marketed as free-range pork

These pigs stay in their large paddocks from weaning through until just before they reach their slaughter weight. Having plenty to keep them occupied helps to reduce the likelihood of tail-biting. Keeping them in stable groups with plenty of space reduces aggression.

Just before slaughter, the pigs are transferred to small concrete pens, partly covered with a generous helping of straw. This enables sorting prior to slaughter. The straw provides a foraging interest as they adjust to their temporary housing. The concrete at the front of the pen may help them to cope with walking on concrete walkways on the way to slaughter. The pigs will only spend a few days, or at most a week, in these pens.



Temporary housing for pigs awaiting slaughter

Boars

A group of three boars is kept free-range with the dry sows who have most recently been weaned. These are kept as a stable group as far as possible to avoid fighting. However, from time to time new boars are mixed. Injuries are largely avoided because the losing boar has plenty of space in which to escape. Tom Leddra observes that the escaping boar nearly always runs for longer than the boar which is chasing. This is the same as normally happens in the wild.



Group of boars in dry sow enclosure. Space ensures that conflicts can normally be resolved without injury

General

There are at least four veterinary visits per year, required by the ABM Certification Scheme. The breeding sows are vaccinated twice per year for Erisipelas and the piglets at weaning for pneumonia (EP). Visitors to the farm are asked to keep away from pigs for at least 3 days beforehand and to wear uncontaminated clothes to reduce the risk of spreading pig infections. This biosecurity requirement is fairly standard in the UK.

Tom Leddra believes that the key for good welfare throughout their life-cycle is to give the pigs what they need. This includes enough food and water, shade or a wallow to keep cool, somewhere dry to sleep. In winter, extra bedding will be required. If you get these right, he believes welfare for outdoor pigs in the south of the UK is even better in winter than summer. This is because the pigs are generally better at coping with cold rather than hot weather.



Wallows enable pigs to keep cool. Mud can also act as a sun-block



Tom Leddra

Possible effects of new environmental legislation

In future, it may be necessary to reduce the stocking rate for outdoor pigs because of proposed legislation. This is to reduce runoff of polluting minerals such as nitrates and phosphates. There could be a considerable welfare benefit in this. With careful rotation, it might be possible to maintain grass-cover on the paddocks. This would encourage foraging and enable the pregnant sows to satisfy their hunger for roughage. The danger, however, is that lower stocking densities might undermine the economics of outdoor pig-keeping.



Stone-chewing is thought to be a response to lack of forage

Extensive production system	
Date of visit	10 August 2003
Certification scheme	ABM (Assured British Meats)
Number of sows	500 sows over 30 hectares
Breed	Large White/Landrace sows x Duroc
Food	Bought in concentrate, straw with limited natural forage. Dry sows fed once per day
Average and maximum farrowings per sow	Up to 5-6 litters per sow. 2% sow mortality per year.
Farrowings per year	2.2
% piglets stillborn	8% (includes mortality immediately after birth)
% live born piglet mortality	8%
Average number of piglets weaned per farrowing	10 (just under 22 per sow per year)
Mutilations	Tail-docking. No nose-ringing, teeth-clipping or castration
Weaning age	Approx 4 weeks
Growth rate	To 7kg at 4 weeks; to 40kg at 12 weeks; to max of 90kg at 20 weeks. Sold for pork
Food conversion rate	
Weight when sold on or slaughtered	40kg for further fattening; up to 90kg for slaughter
Transport to slaughter	30 miles (50km) Growers 90-190 miles (150-300km)
Price to farmer	Normal market price for piglets for further fattening; guaranteed price for free-range pigs reared to slaughter-weight, not subject to normal market fluctuations
Market	Growers for further fattening and free-range pork for local butchers
Number of stockpersons	3 full-time (half time spent with farrowing sows)
Number of inspections	2 per day
Health problems	Occasional pig with PMWS
Other welfare issues identified	Mutilations, early weaning

Pig Case Study United Kingdom 4

Free-range organic breeding system, Eastbrook Organic Farm, Wiltshire

Breeding system with sows kept free-range and with late weaning of piglets (pigs finished at Courtyard Farm, Norfolk, United Kingdom)

Eastbrook farm is one of the UK's leading organic producers. The farm is owned by Helen Browning, a key figure in the Soil Association, the UK's leading organic certifying body. The Soil Association has tougher rules on some welfare issues (e.g. mutilations like castration and nose-ringing) than are required by EU organic regulations.

According to IFOAM, the International Federation of Organic Agricultural Movements, 'organic livestock husbandry is based on the harmonious relationship between land, plants and livestock, respect for the physiological needs of livestock and the feeding of good-quality organically grown feedstuffs.' Organic farming rules do not permit the routine use of antibiotic growth promoters and rely on natural means of disease control. Rotations and the maintenance of high standards of animal welfare are required to ensure health while minimising the need for antibiotics and other medicines. Organic producers also believe that natural immunity develops best in the absence of unnecessary medication.

The farm has 1300 acres (approx 600 hectares) of clay and chalk soils. Clay drains badly and is not normally considered suitable for pigs, but the pigs are kept on higher downland where the drainage is better.

In line with organic rules, the sows are moved just before farrowing to land which hasn't had pigs on it for at least four years. This would be extended to seven if a disease or parasite problem built up.

EU organic regulations do not allow piglets to be weaned before 40 days. Soil Association regulations further recommend that piglets should not be weaned until at least 8 weeks and that they must not be weaned until they are taking sufficient solid food. Early weaning can compromise the immune system and health of piglets and is therefore contrary to the organic philosophy.



Artificial weaning is delayed until 8-10 weeks for the health and welfare of sow and piglets

Eastbrook farm wean their piglets between 8 and 10 weeks. Tony Connolly, assistant to the Managing Director and an authority on organic pig production, believes that three weeks is the worst time to wean from the piglets' point of view. By this stage their level of passive immunity absorbed from their mother's colostrum has dropped to a low level whilst their own antibodies have not yet developed significantly. Three weeks' old is a critical time for the development of muscle fibre and the growth-check caused by the stress of weaning can have a long-term effect on later growth.

Tony further believes that weaning at 40 days in line with basic organic requirements is a bad time for the sow. At this stage her milk production is at a maximum and many sows will have lost condition. Artificial weaning at this stage induces oestrus at a time when the sows are not physiologically ready for it. Some organic farmers have found that weaning at 40 days can result in an increase in sows coming back into oestrus, a reduction in future litter size and/or poorer sow condition when her next litter is weaned.

By eight weeks, the piglets' digestive systems have expanded. Provided that dry food is available ad libitum the piglets will be eating more of this and drinking less milk.

Delaying weaning until at least eight weeks allows the sows to recover condition before their next oestrus is induced by weaning.

In short, by eight to ten weeks, the piglets will have become more independent of the sow, both socially and nutritionally. The sow will have started to recover her condition as a result of increased feed consumption. Later weaning is a less stressful event for both sow and piglets, resulting in better growth and fewer health problems. For example, when the farm was infected by PMWS, Tony Connolly believes that the reason that death rates from the disease didn't rise above 3-5% was because good organic husbandry keeps stress levels low.

The farm has 200 sows, most of them Saddleback, now a rare British breed. The Saddleback has a largely dark skin which helps protect from the sun. Unfortunately, the fat content of their meat is fairly high so the farm are experimenting by crossing the sows with boars of other breeds, e.g. Large White. Some of the offspring have a lighter skin, but they can wallow in mud to keep cool and provide sun-block.

Dry sows

The key welfare aspects for the sows are:

- Access to pasture for foraging activity and gut-fill
- No nose-ringing (not permitted by the Soil Association)
- Sows remain in small stable groups at this stage



Foraging is essential for the welfare of sows

When the piglets are removed at weaning, the sows remain in the same group. Dry sows are kept on a restricted diet to prevent obesity, but they have access to pasture for grazing and rooting and the fibrous food obtained helps them to deal with their hunger. In due course the pasture becomes degraded, though Tony Connolly believes this happens more slowly with

Saddlebacks than with other breeds – his view is that they graze more and root slightly less. Nevertheless, it was clear that the pasture does become degraded and they are either moved to another paddock or additional silage is provided if this vital source of fibrous food runs out.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- The sows have freedom of movement
- They are provided with plenty of straw to make a nest
- Late weaning helps ensure that sows can recover condition before becoming pregnant again



Sows farrow in individual pens and the families are grouped together after about four weeks

Just before farrowing, the sows are moved to a new group on fresh land. The sows are placed in individual pens, separated by an electric fence. Each is provided with a hut with plenty of straw bedding for comfort and nest-building.

Once the piglets are about five weeks old, the dividers between the pens are removed and the sows become part of a new group. There is usually some minor jostling for dominance at this stage but, with plenty of space for weaker sows to escape, this rarely escalates into serious aggression. Tony Connolly further believes that the sows have had a chance to eye each other up

over the fence and that aggression is reduced since they have partly worked out their hierarchy already. However, this is not everyone's experience.



Plenty of straw for comfort and nesting

A day or so later, a team of boars is introduced to the group. About a third of the sows come naturally into oestrus before weaning and are mated. Tony Connolly believes that these sows are physiologically ready for another pregnancy and farrowing. His evidence is that these sows produce large healthy litters. The boars remain with the sows until two weeks after weaning (the process of artificial weaning brings the rest of the sows into oestrus). After this, a single chaser boar is kept with the sows for a further 8-9 weeks in case any of them come back into oestrus.

Piglets

The key welfare aspects for the weaned piglets are:

- Enriched environment to encourage play and foraging behaviour
- Late weaning at 8-10 weeks
- Piglets are free to mix with the larger family group as soon as they are ready to
- Gilts farrow in individual pens to reduce piglet mortalities
- No mutilations of any kind

The piglets are born on straw in the huts, but they are immediately free to explore outside. Although this risks an occasional piglet catching the cold, it reduces the build-up of faeces inside the hut. Nevertheless, it is normal practice for free-range pig farmers to place a barrier outside the hut to prevent recently-born piglets from getting out of the hut (see Case Study United Kingdom 3).

Although each family group is separated by an electric fence, the piglets can get underneath this and are free to associate with piglets from other groups. This means that they can begin to develop their hierarchy at their own rate (piglets weaned early usually suffer the stress of mixing at the same time as the stress of early weaning). By the time the piglets are weaned, they are already living together as a social group of piglets partly independent of their mothers.

The Soil Association does not permit mutilations such as tail-docking, tooth-clipping or castration. Permission may be given for castration in exceptional circumstances which follow veterinary advice, but the meat may not be sold as organic.

Weaned, growing and finishing pigs

At weaning, the group of piglets is removed to an insulated ark with an outdoor straw-filled run. They remain here for ten days whilst they adjust to the stresses of artificial weaning. They are then transported on a five hour journey to Courtyard Farm, an organic enterprise in the East Anglian county of Norfolk (run by Lord Melchett, informally known as Peter Melchett, another leading figure in the Soil Association).

It is acknowledged that a long journey like this is not ideal for welfare. However, the heavy nature of the soil at Eastbrook farm is not ideal for growing pigs. It was also found that the drier atmosphere and light well-draining soils at Courtyard farm resulted in fewer disease and welfare problems than when they were reared at another farm closer by. Tony Connolly believes that his pigs do travel well - the varied experience of free-range organic pigs helps to prepare them for the novel stresses of travel.



Large enclosures for growing pigs at Courtyard Farm

The key welfare aspects for the pigs once they reach Courtyard Farm are:

- Family groups are kept together without mixing
- They have access to shelter in tents with plenty of straw
- They are kept in free-range enclosures with access to pasture
- They are kept on land which hasn't had pigs for several years to avoid the build up of disease

The sexes are separated, but not at once. Again, the system is designed to ensure that not all the stresses of life occur simultaneously. Access to pasture ensures that the pigs have plenty to do so that tail-biting does not become a problem.

Most of the pigs at Courtyard farm are slaughtered at an abattoir 20 minutes away because Peter Melchett believes that journeys should be kept as short as possible for the sake of the pigs' welfare. Unfortunately, the supermarket Eastbrook farm deals with requires its pigs to be transported to a slaughterhouse in Bristol which involves a 6 hour journey. With the active co-operation of their meat processor, Eastbrook farm are now developing opportunities to send pigs from Courtyard to a slaughterhouse which is 2 hours away. Deep bedding is provided during transport to improve welfare.

Boars

The key welfare aspects for the boars are:

- They are kept in free-range enclosures with access to pasture

- Pairs of boars reared together since weaning are kept together for companionship
- They spend all of their life in the company of groups of sows
- When one dies, the survivor is kept as a "chaser boar" in the company of a group of dry sows

Boars, like sows, have to be kept on a restricted diet at times to prevent obesity. Access to pasture helps to ensure that they can satisfy their hunger by grazing and rooting. Boars can be aggressive, but with plenty of space to escape a weaker boar can usually avoid serious injury.

Since aggression can be a serious problem between boars which have not been reared together, once one boar dies the other is not paired up with another. This is considered particularly important since Eastbrook farm do not de-tusk their boars. However, the survivors still have the company of sows.

General

Meat from Eastbrook farm, and approximately 12-15 other local organic farms, is marketed under the name of the founder as 'Helen Browning's Organic'. The meat is sold to a meat processor who organises slaughter and butchering. Some of the meat is then bought back to sell as branded products. Some of it is marketed directly by mail-order from www.helenbrowningorganics.com. Some of it is sold to a major UK supermarket and to one or two minor ones. Having their own label gives Eastbrook farm more control over prices.



A pair of boars remain with the sow until two weeks after weaning

Extensive production system

Date of visit	18 January 2005
Certification scheme	Soil Association Organic
Number of sows	200 sows
Breed	British Saddlebacks x Large White/Landrace boar
Food	Bought in organic concentrate. Grass silage if pasture bare. Dry sows fed once per day
Average and maximum farrowings per sow	Average 7; max 14
Farrowings per year	1.8
% piglets stillborn	10% (1 per litter)
% live born piglet mortality	8-9%
Average number of piglets weaned per farrowing	8-9 (16-17 per sow per year)
Mutilations	None. No nose-ringing, castration, tail-docking, tooth-clipping or de-tusking
Weaning age	8-10 weeks
Growth rate	600-650g/day
Food conversion rate	3.4
Weight when sold on or slaughtered	Moved to another farm at weaning; sold for bacon and fresh pork at 100kg liveweight
Transport to slaughter	5 hour journey to further fattening in Norfolk; 6 hour journey to slaughter in Bristol
Price to farmer	Price to farmer around £2 (3 Euros)/kg Branded product sells in supermarket as: back bacon - £18 (26 Euros)/kg streaky bacon - £10.50 (15 Euros)/kg sausages - £8.50 (12 Euros)/kg
Market	Part of group of 12-15 farmers who sell to Tulip UK. Part of meat bought back to sell as Helen Browning Organics, sold mail-order and to supermarkets as a premium branded product
Number of stockpersons	1 full-time with help
Number of inspections	Approx 3 times per day – stockman there all day
Health problems	Range of usual pig diseases eg minor worms, PMS, PMWS, PRRS, meningitis. Some ruptures in growing pigs at growing farm
Other welfare issues identified	Occasional piglet lost to cold or predation; occasional lameness in sows. Transport of weaners to another farm. Long journey to slaughter

Pig Case Study France 1

Enriched indoor pig production system, Schleithal

Straw-based system with low stocking densities and freedom of movement for sows at all times

This is an enriched indoor system designed for high welfare. The sows and piglets have straw bedding and freedom of movement at all times. Despite this, piglet mortality rates were comparable to systems which use the farrowing crate.

On this farm, the buildings are either open sided or have access to outdoor runs so that the pigs get plenty of daylight and fresh air. The pens within the buildings are spacious and the farmer deliberately keeps the stocking rates low. All the pens contain deep-bedded straw at all stages of production. The straw gives the pigs the opportunity to forage, root and chew. It can also supplement their diet. All the straw bedding was in good condition. The farm was clean and tidy and appeared to be efficiently run.

The farm's high welfare status means that the farmer receives a premium for his pigs that is 10-15% higher than the conventional price. Images of pigs free to roam on deep straw are used in the farm's promotional brochure. The farm is also involved in the production of high quality hams and sausages. Some of these are sold directly from the farm shop and some are sold to local butchers and delicatessens. The farmer explained that high welfare and high quality are a good combination for marketing his products.



Feeding stalls help to prevent aggression amongst recently weaned dry sows and provide a cool retreat

Sows

The key welfare aspects for the sows are:

- Deep straw bedding for foraging and supplementing the diet



The sows are housed in spacious deep-bedded pens in an open sided building

- Electronic feeders to reduce aggression at feeding
- Open sided buildings for daylight and fresh air

The farm has 250 Large White x Landrace sows. Gilts and weaned sows are transferred to a large spacious service area where the boars are kept. The service area has lockable feeding stalls so that aggression at feeding time can be eliminated. During the day, the sows can also use the stalls to avoid aggressive interactions with other sows.

Once they have been served, the sows are moved to pens with electronic feeders. These pens are also open sided with deep bedding. The electronic feeders allow the sows to feed when they want up to several times a day. The sows that are on a restricted ration can also supplement their diet with straw.

The sows are kept in groups of 30. This group size is small enough for them to form a stable hierarchy so that aggression is reduced. Although there is some fighting when the sows are first mixed they soon settle down. The pens are approximately 12 x 20m so the sows have plenty of room to move around and exercise. This means that lameness is not much of a problem.

Most of the sows could be seen relaxing, nosing through the straw and chewing. As well as access to plenty of drinkers, the pens were also equipped with misters that can be turned on to cool the sows down in hot weather.

Veterinarians regularly inspected the sows. For this, the farmer paid a cost which worked out as 25 Euros per sow per year.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- The sows have freedom of movement at all times
- The sows have straw for carrying out nest building
- The sows have individual pens to reduce disturbance

At farrowing time, the sows are transferred to individual farrowing pens. The nesting area measures approximately 1.5 x 2.5m and contains a good supply of fresh straw. Each pen has an external dunging area that can be accessed through a rubber flap. The sows have plenty of room to move around, exercise and perform nest building behaviour. The pens have high walls so that the sows are undisturbed by other pigs or stockpersons.



The pen provides good protection for the piglets from being accidentally squashed by the sow



The farrowing pen allows the sow to move around and build a nest

Piglets

The key welfare aspects for the piglets are:

- Good piglet protection devices to reduce the risk of accidental crushing
- The piglets are not subjected to teeth-clipping or tail-docking
- The male piglets receive an anaesthetic before castration

Once the piglets are born, some of the straw bedding is removed. This is to encourage them to use the heated creep box for resting and sleeping. The piglets are safer in the creep boxes and cannot be accidentally crushed by the sow. There are guard-rails within the nesting area to prevent the sow from squashing the piglets against the walls when she lies down. A central pole in the nest area further restricts the sow's movements. This is to slow down her movements making it less likely that she may accidentally step on one of her piglets.

The piglets are not subjected to all the mutilation practices that are seen in conventional production systems. They are not teeth-clipped. If there is evidence of damage to the sow's udder or to piglet faces, the farmer uses a teeth grinder. This is used

to blunt the tips of the eye-teeth. Teeth grinders cause much less pain and involve less risk of infection. In intensive production, the eye-teeth are usually clipped with pliers. This procedure causes pain and leaves the teeth open to infection.

The piglets are not tail-docked. This is because the pigs remain in enriched environments throughout their lives and are therefore unlikely to bite each other's tails. Unfortunately, the male piglets are castrated. This is insisted on by the buyers who don't want the risk of boar taint in the meat. To reduce stress and pain, each male piglet receives a course of 4 injections of local anaesthetic. Although this doubles the amount of time taken for the procedure, the farmer believes that it is worth it to reduce the amount of suffering.

The piglets have plenty of room in the farrowing pens to run around and play. The straw bedding within the pens provides a good form of environmental enrichment.

Growing pigs

The key welfare aspects for the growing pigs are:

- The pens have straw bedding
- Access to outdoor runs/open sided buildings
- Generous space allowance



The weaner pen has an outer exercise and excretion area

After weaning, the piglets are moved to weaner pens. These contain straw bedding and roofed kennels to keep the piglets warm. The kennel area is expanded as the piglets grow to give them more room. Space is restricted at the start to encourage the piglets to defaecate in an outer corridor that is open sided and has a roof. A small entrance with a rubber flap joins the kennel area and outer corridor. The piglets therefore have plenty of room to run around and play. The straw bedding provides behavioural enrichment.

As the pigs grow, they are moved to larger pens and group size is reduced from 80 in the weaner pens to

15-20 in the grower pens. In these smaller groups, the social structure is more stable and fighting is reduced. The grower pens also have an indoor area and an outer area measuring approximately 6 x 6m that is open sided. The pigs therefore have plenty of access to natural daylight and good ventilation. Both the inner and outer areas are deep bedded. This provides good opportunity for the pigs foraging activities. As a consequence, tail-biting is not a problem on this farm.



The grower/finisher pen is open sided for plenty of natural daylight and ventilation



The weaner pen contains straw bedding and a kennel to keep the piglets warm

Indoor pig production system	
Date of visit	19 November 2003
Certification scheme	Independent producer
Number of sows	250
Breed	Large White/Landrace
Food	Bought in for sows, home mix for growers
Average and maximum farrowings per sow	Average 6, maximum 7
Farrowings per year	2.4
% piglets stillborn	
% live born piglet mortality	12-15%
Average number of piglets weaned per farrowing	10.6 (25.4 per sow per year)
Mutilations	No teeth-clipping or tail-docking, anaesthetic used at castration
Weaning age	4 weeks
Growth rate	750g per day
Food conversion rate	
Weight when sold on or slaughtered	110kg
Transport to slaughter	60km
Price to farmer	10-15% above conventional price
Market	High quality hams and sausages
Number of stockpersons	3 full time
Number of inspections	2 per day
Health problems	Has had some diarrhoea in piglets
Other welfare issues identified	Mutilations (castration). Weaning age

Pig Case Study Spain 1

Traditional Iberian extensive woodland system, El Corchuelo, La Granada de Riotuito, Andalucia

Large sized, oak forest grower/finisher unit

Introduction to traditional Iberian ham production system

Iberian pig production, based in the region of Andalucia in Southern Spain, is a traditional system going back centuries. The pigs are fattened in ancient oak woodland called Dehesa.

The Iberian pigs are:

- A slow-growing breed that are adapted to local conditions
- Fed a conventional diet for over a year then finished in Dehesa woodland where they feed on acorns
- Used to produce high quality hams and loins



The growing pigs have many hectares of oak woodland in which to roam



The pigs feed on acorns

The Dehesa woodland consists mainly of Holm oak (*Quercus ilex*) and Cork oak (*Quercus suber*). The trees are hundreds of years old and have been managed for an equally long time. The trees are several metres apart from each other, which allows sunlight in for pasture to grow in between. The ecology of this woodland is maintained by grazing and foraging by cattle, sheep and Iberian pigs. The cork oaks are also used in the production of cork.

The Iberian pig is also centuries old. It is very similar in appearance to the wild boar. It has dark skin to help protect it from the strong sunlight. Most of the pigs remain outdoors throughout their lives. The Iberian pig is a slow growing breed and takes 18-24 months to reach slaughter weight. The growing pigs are fed a conventional diet for 13-14 months and reach a weight of 90-100kg. They are then fattened in the oak woodland from mid October until the beginning of March where they reach a weight of 150-160kg. This takes around 500kg of acorns for each pig which requires approximately 1 hectare of woodland. The pigs prefer the sweeter acorns from the Holm oaks and eat the ones from the Cork oaks later.

The Iberian pigs have long been selected to produce hams that have a distinctive marbling of fat. It is the acorns that give this fat the flavour. Acorns are high in oleic acid, a mono-unsaturated fatty-acid, which is also the main one in olive oil. The meat is graded according to the fat composition, which reflects the amount of acorns that the pigs have been fed. The highest price is paid for the pigs that have eaten the most acorns. The hams are hung for up to three years to mature.

The grades of ham include:

- Bellota – fed mainly on acorns
- Recebo – fed partially on acorns
- Pienso – no acorns

El Corchuelo Farm

This farm is part of a large organisation that specialises in producing the highest quality hams and loins from the traditional Iberian pig. The organisation has three areas of oak forest where they grow the pigs.

Growing pigs

In Spring, the piglets are taken to the forests to graze on the grass and other vegetation. The food is supplemented by cereal-based concentrate. The hillier areas of the forest are used while the piglets are young and more agile. As they grow, they are moved down to the lower slopes.

During the summer, the growing pigs receive approximately 1.5kg of cereal-based concentrate food per day and this is gradually reduced in the autumn as the acorns begin to fall. Young immature green acorns are particularly favoured by the pigs as they are sweeter than the mature brown acorns. The stockperson uses a stick to shake the trees, causing the acorns to fall at a more consistent rate.

© Dale Arey/CIWF Trust



The pigs will consume nearly 500kg of acorns

The pigs forage for acorns from October right through until March. During this time, the pigs also receive a small ration of concentrate each day. This is so that the pigs can all be attracted to a feeding area where they can be counted and inspected.

At the time of the visit the unit had 150 growers aged 11-17 months on 400 hectares of oak forest and pasture. The stocking rate is adjusted to the supply of acorns. This year has not been very good for acorns because of the dry summer.



The trees are also important for providing shade

Holes have been excavated in the paddocks to act as natural catchment areas for rainwater. These holes are used by the pigs for both drinking and wallowing.

This variety of different environments provided by the oak forest closely resembles those naturally inhabited by wild and feral pigs. The farm therefore has a very high potential for good welfare. This is because the pigs have the opportunity to carry out almost all their natural behaviours. An exception is rooting which was not observed. This is because it is the common practice, in extensive Iberian pig-farming, to nose-ring pigs to discourage rooting behaviour. Nose-ringing significantly reduces pasture damage, but it cannot be recommended on welfare grounds. It is a painful mutilation designed to discourage a highly motivated natural behaviour.

The pigs were observed to be fairly tame and highly active. Most of their time was spent foraging for acorns. The pigs were also seen to eat other plant material growing in their extensive range and appeared to be very content roaming around in the forest. The company veterinarian pointed out the fact that this could be observed from their highly curled tails, which is a good sign of well-being.



Wallows keep the pigs cool and improve skin condition

© Jennifer Berengueras/ADDA

The key positive welfare aspects for the growing pigs are:

- They remain outdoors throughout their lives
- Highly varied diet closely resembling one they find naturally
- Generous space allowance with good pasture and mature oak forest



© Dale Arey/CiWF Trust

The Iberian pig closely resembles the wild boar

- Plenty of shade from the trees and water holes for wallowing
- They are kept in stable groups and never mixed

Sows

The breeding unit owned by the company is on a separate site and is semi-extensive. The sows and litters are housed in individual huts with a small outdoor run.

Piglets

Unfortunately, piglet mortality is quite high though breeders select for sows that have lower mortality rates. Farrowing accommodation could be improved by providing anti-crush bars and by supplying more bedding material. Unfortunately, the market requires that male pigs are castrated to prevent boar taint. However, an anaesthetic is used to reduce the pain caused by the operation. Fortunately, extensive Iberian pigs are not usually tooth-clipped or tail-docked since litters are small and they are kept extensively. The piglets are given dry food after 20 days. They are weaned between 30 – 60 days, depending on the time of year.

Traditional extensive woodland system	
Date of visit	19 November 2004
Certification scheme	Iberico
Number of sows	
Breed	Iberian
Food	Organic concentrate. Growers finished on acorns
Average and maximum farrowings per sow	
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	15-20%
Average number of piglets weaned per farrowing	6
Number piglets per sow per year	12
Mutilations	Castration of males with local anaesthetic. Nose-ringing
Weaning age	40-45 days
Growth rate	Slaughter weight at 18-24 months
Food conversion rate	
Weight when sold on or slaughtered	150kg
Transport to slaughter	60km
Price to farmer	250 Euros for 7kg ham (premium)
Market	Traditional Iberian hams and fillets
Number of stockpersons	1
Number of inspections	1
Health problems	Some Mala rocha and pneumonia, now vaccinated against
Other welfare issues identified	High piglet mortality, mutilations

Pig Case Study Spain 2

Organic Iberian woodland systems, Dehesa San Francisco, Santa Olalia del Cala, Andalucia

Medium sized organic (ecologic) extensive oak forest production system

The farm breeds and grows Iberian pigs that are a local, traditional breed suited to outdoor conditions (see Pig Case Study Spain 1 for a general introduction to traditional Iberian pig production). The pigs are kept outside all year round. The growing pigs are kept in large oak forests where they feed on the acorns. The farm has developed a successful export market sending premium hams to Germany, Holland and Japan.

The farm is part of the Fundacion Monte Mediterraneo and is a multi-functional organic farm. The farm has been organic since 1996. It produces Iberian pigs that are a local breed that have lived in the area for centuries. The pigs are highly adapted to living outdoors in the oak forests. The pigs' skin has a dark pigment to help protect them from strong sunlight.



Traditional production system using modern organic principles

Most Iberian pig production occurs intensively. Of those that feed on acorns, most are reared indoors for the first

9-12 months before being finished on acorns. The difficulty with this management practice is that the pigs do not get time to adapt to the outdoor life. They are less likely to roam extensively around their ranges. Partly as a result of this, and partly due to lack of experience, they are less likely to sample the many beneficial plants that grow in their surroundings. Pigs that are allowed to grow up in the forests will learn to chew grasses that can cleanse their palates and eat other plants that can rid parasites and benefit the gut.

The fatty acid content of the acorn-fed Iberian pig is very similar to the acorn and olive oil. Of those fats, 60% are unsaturated. This makes for a healthier product. The organisation has two companies, one for the production and one for processing and marketing the meat. Meat is marketed under the 'dela Sierra'

organic brand. The farm exports products to Germany, Holland and Japan. They have just started exporting their products to Switzerland, which has one of the strictest import regulations.

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Pigs are kept active foraging for acorns

The farm includes cattle that graze the forest and sheep that then further fine graze the pasture. The cattle and sheep are also important for eating new oak trees that sprout. These can present a serious fire hazard if allowed to grow. The farm provides a clear example of how ecologic farming on marginal land can be made into a successful business.

Sows

The farm has 63 sows and 13 boars. The sows are fenced in paddocks to protect them from wild boar. Wild boar can transmit many infections including TB and Erysipalis. Wild boar will also impregnate the females if they get a chance.



Pigs have access to wallows and running water for drinking and cooling

The paddocks adjoin a river and the farmer believes that it is important for the animals to have access to a natural source of running water. The paddocks also contain many mature oak trees. Access to water for wallowing and the shade provided by the trees are important for cooling the animals down. The vegetation growing in the paddocks allows the sows to supplement their diet. Sows are normally fed a maintenance ration and in intensive production they become hungry because they do not have anything to augment their diet.

Farrowing sows

The sows farrow twice a year in March and October, giving birth to around 6 piglets each time. In comparison, sows in conventional intensive production have 2.3 litters and give birth on average to 10-12 piglets. This level of production makes huge metabolic demands on the sow. They can soon lose condition and are often culled after their third or fourth litters because of breeding difficulties. On this farm, the sows may have 6 or more litters.

At farrowing time, the sows are moved to a special farrowing paddock that is rotated each year to prevent the build up of disease. Prior to giving birth, the sows are given an organic pro-biotic.

All the sows are grouped together at farrowing. Each sow is provided with an A-frame hut that has an insulated roof that is also reflective to reduce the build up of heat. The huts are provided with straw bedding so that the sow can build a nest. The huts also have an outer run that can be closed off with a gate. These are closed during farrowing and opened after 1 or 2 days. This leaves the sow free to come and go as she needs. The lower part of the gate has a roller to prevent the sow from damaging her teats.

Piglets

The rear of the farrowing hut is fenced off so that the piglets have a safe area. The shape of the roof also means that they also have a safe area along the sides of the walls. However, there is still a problem with piglets being accidentally crushed by their mothers. The piglet's safe area is also drained to keep the bedding dry.

The piglets are not teeth-clipped. The litter size is close to the natural number for a pig and there is little competition at the sow's udder. The piglets are not tail-docked. This is because the pigs remain in enriched environments throughout their lives and therefore unlikely to bite each other's tails.

The males are castrated to prevent boar taint. The females are spayed to prevent mating with wild boar. To reduce the pain and stress caused by both operations, the pigs are given a local anaesthetic. The pigs are also nose-ringed to prevent them from destroying the pasture with their rooting behaviour.

The lower part of the gate prevents the piglets from leaving the farrowing area. The piglets are able to jump over the lower gate after 2-3 weeks. The organic probiotic that is given to the sows is also given to the piglets at 2 weeks of age. This helps to reduce problems with diarrhoea. Earth is also thrown into the paddock. Black earth, high in humus is good for the piglets' digestive system; red earth provides a good source of iron.



Farrowing paddock with large A-frame huts with nesting material



According to the farmer, the sow's milk production peaks at around 30 days and then begins to decline. The piglets are weaned at around 40-45 days, after which the mothers appear to get some relief away from the constant attention of the piglets.



© Dale Arey/CIWF Trust

Boar teams live in their own separate paddocks

By this age, the piglets are better able to cope with the stresses caused by weaning:

- Removal from their mother
- Change in diet
- Being taken away to an alien environment
- Mixing with other unfamiliar piglets



Rolling in mud is good for cooling, sun-screen and skin condition

The piglets become exposed to each other over time so that disputes over positions in the hierarchy are settled gradually.

Growing pigs

The farm keeps approximately 250 growers that can be supported by the acorn crop and any pigs in excess to this are sold on to other ecologic farms.

The pigs also receive a small ration of organic, cereal-based concentrate each day. This is so that the pigs can all be attracted to a feeding area where they can be counted and inspected. The growers take 18-24 months to reach slaughter weight. This is nearly four times the age at which conventional pigs go for slaughter. According to the farmer, the success of the enterprise is dependent on the combination of the acorn mast, the right genetics and good management.

Organic extensive woodland system

Date of visit	18 November 2004
Certification scheme	Ecologic (organic)
Number of sows	63
Breed	Iberian
Food	Ecologic concentrate. Growers finished on acorns from October to March
Average and maximum farrowings per sow	5 or 6 litters
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	3.3–8.3%
Average number of piglets weaned per farrowing	5.5–5.8
Number piglets per sow per year	11–11.6
Mutilations	Castration of males and spaying of females with local anaesthetic. Nose-ringing
Weaning age	40-45 days
Growth rate	Slaughter weight at 18–24 months
Food conversion rate	
Weight when sold on or slaughtered	150kg
Transport to slaughter	1 hour 20 minutes maximum
Price to farmer	400 Euros per 150kg pig
Market	Traditional Iberian hams and fillets
Number of stockpersons	2 on whole farm
Number of inspections	2 or more times a day
Health problems	Outbreak of Parvo in beginning. Developed own vaccine from dead pig
Other welfare issues identified	Mutilations

Pig Case Study Spain 3

Two more organic Iberian woodland systems

Small organic extensive oak forest production systems

1. La Granada, Aracena, Huelva, Andalucía

La Granada is a small organic farm that grows traditional Iberian pigs in traditional oak forests, the way it has done for centuries. Although the premium paid for organic meat is marginal, it is believed that this will increase in future. As well as having pigs, the farm also has 17 cows and 70 goats.

The farm occupies an area of 100 hectares with a river flowing through the bottom of the valley. It is situated within the regional national park. The farm has been in operation for 3 years.



Small organic farm in ecologically sensitive area



This landscape has been maintained for hundreds of years by pigs, cattle and sheep

The farmer receives a subsidy for producing pigs ecologically. Even though the system is good for the environment with low pollution in a particularly sensitive area, the price received is not much greater than that received for the conventional production for Iberian pigs.

The farm has 18 sows and 2 boars. They are kept in outdoor paddocks all year round and are fed an organic

cereal-based concentrate ration. The sows farrow twice a year in March and October. The sows farrow in an old building that contains small stone old-fashioned pigsties.

Accidental crushing is a problem, especially in winter when it is colder and the piglets huddle closer to the mothers. The old pigsties are straw bedded but have no guard-rails, protection devices or supplementary heating which could help to reduce mortality. There is not so much of a problem with savaging, perhaps because they have the freedom to interact with their piglets properly and develop normal relationships. Sows found to savage are culled. The farmer vaccinates for Aujeszky's disease and Erysipalis.

In common with local practice both of the farms in this case study castrate male piglets to prevent boar taint, but use a local anaesthetic to reduce pain. The pigs are nose-ringed to prevent pasture damage. However, the piglets benefit from not being teeth-clipped or tail-docked. Teeth-clipping is not considered necessary because, with smaller litters the sows suffer less from piglet bites and there is less competition for teats. Tail-docking isn't practised because the free-range pigs are generally too busy foraging to think of biting each others' tails.



Farm also keeps cattle and goats

The farm has approximately 70 growing pigs. All the pigs are outside all year round. Piglets are allowed outside after just 10 days. On average, the growing

pigs receive approximately 0.5 kg of ecologic concentrate per day depending on the availability of acorns.

Organic extensive woodland system

Date of visit	18 November 2004
Certification scheme	Ecologic (organic)
Number of sows	18
Breed	Iberian
Food	Organic concentrate. Growers finished on acorns
Average and maximum farrowings per sow	Unit has been running for 3 years
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	Lose approximately 1 piglet per litter (17%)
Average number of piglets weaned per farrowing	5.5
Number piglets per sow per year	11
Mutilations	Castration of males with local anaesthetic. Nose-ringing
Weaning age	2 months
Growth rate	Slaughter weight at 18 months
Food conversion rate	
Weight when sold on or slaughtered	150kg
Transport to slaughter	10kg
Price to farmer	2,000 pesetas (12 Euros) per 11.5kg
Market	Traditional Iberian hams and fillets
Number of stockpersons	1
Number of inspections	Present all day
Health problems	Outbreak of Aujeszky's disease (now vaccinate)
Other welfare issues identified	High piglet mortality, mutilations

2. Navanto Farm, Zalmea la Real, Andalucia

Navanto is a small organic farm that grows traditional Iberian pigs in traditional oak forests, the way it has done for centuries. The owner of the farm makes his living as a lawyer and employs a stockperson to look after the pigs.

The farm has 13 sows and 1 boar. They are kept in outdoor paddocks all year round and are fed an organic cereal-based concentrate ration. The sows farrow twice a year in March and October. The sows farrow in A-shaped huts with a corrugated iron roof. The huts are bedded and have an outdoor run. Even though the Iberian sows have small litters of around 6 piglets, their mothers still accidentally crush a number of piglets.

According to this farmer, Iberian pigs do not appear to make good mothers.



Organic Iberian system

The farm has approximately 80 growing pigs. All the pigs are outside all year round. From April to

September, the pigs receive a standard ration of organic, cereal-based concentrate feed. From October to March, this ration is reduced to 0.5 kg of concentrate per pig per day depending on the availability of acorns.

According to the farmer, he was doing good business with his pigs and that they were fetching a good price. Last year, the farmer sold 13 of his pigs to Japan.



The pigs are fed once a day so that they can be counted and inspected



The pigs are free to follow their natural activity patterns including rest and foraging



Nose-ringing prevents pasture damage but is a painful mutilation

Organic extensive woodland system

Date of visit	17 November 2004
Certification scheme	Ecologic (organic), National region of origin
Number of sows	13
Breed	Iberian
Food	Organic concentrate. Growers finished on acorns
Average and maximum farrowings per sow	
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	
Average number of piglets weaned per farrowing	6
Number piglets per sow per year	12
Mutilations	Castration of males with local anaesthetic. Nose-ringing
Weaning age	40 days
Growth rate	22 months to reach slaughter weight
Food conversion rate	
Weight when sold on or slaughtered	150kg
Transport to slaughter	
Price to farmer	2000 pesetas (12 Euros) per kg for premium cuts
4,500 pts per 11kg for remaining cuts	
Market	Traditional Iberian hams and fillets
Number of stockpersons	1
Number of inspections	1
Health problems	None reported or observed
Welfare issues	High piglet mortality, mutilations

Pig Case Study Czech Republic 1

Organic pig production system, Farma Sasov, Jihlava

Organic system with enriched pens, open yards and late weaning

Josef Sklenár runs the largest organic pig farm in the Czech Republic and he is trying to develop a fledgling local market for organic pigmeat products. The pigs live in an enriched indoor environment with access to an outdoor run. The farm keeps 80 Large White/Landrace sows which are mated with Duroc or Czech Saddleback boars.

A notable feature of the system is that, six weeks after farrowing, the sows and their piglets are placed together in family groups. A few days later, boars join the group in turn so that the sows become pregnant again. This enables late weaning at three months old whilst the sows can still produce two litters of piglets per year.



Vegetation and soil are placed in the outdoor runs to provide fibrous food and foraging opportunities



Family group indoors

All the pens for the family groups and the growing pigs have a deep layer of straw for comfort and foraging. The pens have access to an outside straw yard. Unfortunately, environmental regulations require a concrete base. However, the yards are enriched by providing vegetative forage and sods of soil on top of the concrete. Vegetative forage includes grass, nettles and a range of waste vegetables and crop weeds as

are available. The farmer also has a supply of stale unsold bread and rolls. These are fed to the pigs as a further source of dietary and environmental enrichment.

The farmer would like to be able to keep his pigs free-range and has visited and studied free-range systems in the UK.

Unfortunately, free-range pig-keeping is not permitted by the veterinary authorities in this part of the Czech Republic. There is a concern about the spread of disease from the wild boar population.

Family group system

This traditional family group system has many advantages for welfare:

- Later weaning for the piglets
- More gradual drying off period for the sow
- Less feed-restriction for the sow
- Longer periods between pregnancy reduce pressure on the sow
- Increased social contact for the boars



Straw provides comfort as well as environmental enrichment

Piglets naturally start to sample solid food when they are three weeks old. They would naturally wean from their mothers at 13-17 weeks. It is, however, common practice in intensive systems to wean piglets at 3-4 weeks old. Early weaning is highly stressful for the piglets because:

- They suddenly lose the comfort and protection of their mother
- Their diet suddenly changes from liquid to solid food
- They are usually removed to an alien environment
- They are usually mixed at the same time with unfamiliar piglets
- This leads to fighting to establish a dominance hierarchy

In a natural environment, piglets would get used to all these kinds of change gradually. With early weaning, all these stressors happen at once and can cause major problems for the piglets:

- They may feed much less for several days, causing a loss of weight
- The change in diet can cause digestive disorders
- Their strong urge to suckle may lead to vices such as belly-nosing and navel-chewing
- The stress can weaken the immune system, making the piglets more susceptible to disease

A higher incidence of disease may require increased use of antibiotics. For these reasons, organic systems in the EU are not allowed to wean piglets until they are at least 40 days old.

Extending this period to 12 weeks, after joining family groups together at 6 weeks, has many advantages for piglet health and welfare. Weaning is a gradual process and they will be used to eating solid food by the time their mother is removed. The mother's presence may have a calming effect and help reduce aggression. By the time their mother is removed, they will have established a stable hierarchy. Reduced stress means less susceptibility to disease.

Later weaning has advantages for the sow too. Her milk will dry off more gradually, reducing discomfort. Extra nutrition required to feed her piglets during the earlier stages of pregnancy means that she can be fed ad libitum without the risk of obesity. She is likely to suffer far less from hunger. Both sow and piglets are likely to benefit from each other's company, as they would in a natural environment.

Later weaning extends the gaps between pregnancies. This adds to the cost of production, though this is minimised by introducing the boar once the piglets are six weeks old. An advantage of extending the gap between pregnancies is to reduce the metabolic pressure on the sow. This is better for their body condition and their health. Partly as a result, the sows live to produce an average of ten litters, reducing the cost of replacements.

The family groups are kept in a spacious enriched environment. A large space is required to reduce aggression when the sows and their six-week-old litters are mixed. Josef Sklenár believes that the indoor pens



The farm's boars are rotated daily around the family groups

need to be at least seven metres long to allow a subordinate sow to escape from an aggressive encounter. In practice he says that aggressive behaviour does not last long once the sows have established or re-established their dominance hierarchy.

Two days after the sows and their piglets are mixed, the first boar is introduced. Every day or so, the boars are switched from one group to another. The farmer finds that sows have different preferences in a mate and that cycling the boars around increases the frequency of conception. The boars are very gentle towards the piglets. Extra social contact is likely to be very beneficial to the welfare of the boars.



Farrowing system allows freedom of movement of the sow whilst providing some protection for the piglets

Tail-docking is not practised on the farm since, in an enriched environment which gives the pigs plenty to do, tail-biting is not a significant problem. Tooth-clipping is practised on an individual basis, for example with a large litter where the sow might suffer more from biting piglets. Unfortunately, castration is practised because the local market requires it. It is also unfortunate that the vets who carry out the operation are not prepared to use an anaesthetic. EU organic regulations do permit castration of male pigs but state that any suffering to the animals must be reduced to a minimum. This would appear to require the use of anaesthetic. The farmer dislikes castration and hopes to abandon the practice in time.

Dry sows

At 12 weeks, the sows are moved as a group to a new pen for the middle and later stages of pregnancy.

The key welfare aspects for the sows are:

- Deep straw bedding for foraging and supplementing the diet
- Access to an outdoor run
- Provision of stale bread and forage to enrich the diet
- Being kept in a stable group without further mixing

Farrowing system

Prior to farrowing, the sows are transferred to individual straw-bedded pens.

The key welfare aspects of the farrowing system are:

- The sows have freedom of movement at all times
- The sows have straw for carrying out nest building
- The sows have individual pens to reduce disturbance
- The piglets have a safety area to reduce mortality from crushing



Infrared lamp encourages piglets away from the danger of crushing

Growing pigs

At 12 weeks, the growing pigs are transferred to large straw-bedded barns with an outdoor run.

The key welfare aspects for the growing pigs are:

- Pens with a thick layer of straw bedding
- A generous space allowance
- Access to an outdoor run
- Provision of forage and stale bread to vary the diet
- They remain in the same group, minimising stress and aggression



Indoor quarters for the growing pigs

At Farma Sasov, the pigs receive a great deal of human attention. They are inspected 5-6 times per day. When the finished pigs have to be loaded on a lorry bound for the slaughterhouse, their familiarity with people means that they can be loaded with a minimum of stress. The farmer attributes the fact that not a single pig has died on the way to slaughter in the last three years to regular handling. Social and environmental enrichment helps prepare pigs for novel stresses.

It must also help that the journey to slaughter is only 12km. Nevertheless, the farmer has plans to build his own slaughterhouse on the farm to remove the stress of the journey and to control all welfare aspects of the slaughter process.

A key welfare issue on this farm is the need to address the levels of piglet mortality (though mortality figures quoted below are rough estimates).

Only a proportion of the farm's pigs are sold at premium prices since the Czech organic market is still in its infancy. 80% of the pigs are sold on the conventional market. 20% are killed and processed to make organic salamis and other pigmeat products. The farm also sells organic beef, grains and vegetables and runs a horse riding business. The farmer grows most of his own organic feed. This keeps down the costs of production and makes the farm more independent. It is also consistent with the farm's sustainable production ethic.

Organic production system

Date of visit	22 September 2004
Certification scheme	KEZ (EU Organic scheme inspected by the Czech authorities)
Number of sows	80
Breed	Large White/Landrace sows x Duroc or Czech Saddleback boars
Food	Home grown organic feed based on peas, oats and other grains with yeast and vitamin supplements
Average and maximum farrowings per sow	Average 10
Farrowings per year	2
% piglets stillborn	14% (1-2 per litter)
% live born piglet mortality	27%
Average number of piglets weaned per farrowing	9 (18 per sow per year)
Mutilations	Castration. Teeth-clipping sometimes practised on an individual basis. No tail-docking
Weaning age	3 months
Growth rate	500-550g per day
Food conversion rate	Varies with feed
Weight when sold on or slaughtered	120-150kg
Transport to slaughter	12km
Price to farmer	80% at normal commercial prices. 20% sold as processed organic
Market	80% sold to local slaughterhouse. Developing an organic market for salami, hams, pork joints etc.
Number of stockpersons	3
Number of inspections	5-6 per day
Health problems	Occasional piglet digestion problems
Other welfare problems identified	Piglet mortality, mutilations

Pig Case Study Hungary 1

Organic traditional breed system, Nyírbogdány

Extensive system with rare breed Mangalica pigs, partly for export for premium hams

Nyírbogdány farm breeds and grows the Mangalica, or hairy pig. This is a traditional breed adapted to the cold Hungarian winter. The development of an export market in Spain has helped to save this rare breed from extinction.

The Mangalica breed

There are three separate coloured varieties of Mangalica – red, yellow and white. A fourth black strain became extinct in the 20th century. The Mangalica is a rare, traditional breed from Hungary that is adapted to free-range farming. Traditionally, the pigs were turned out into the woods to fend largely for themselves.

A thick coat of hair and a very thick fat layer help to protect the Mangalicas from the cold Hungarian winters. Since vegetable oil became widely available, the market for the 'lardy' Mangalicas declined in Hungary. Up until 1991, the breed was in danger of extinction.

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The Mangalicas have a thick coat of hair and a thick layer of fat to protect them from the cold Hungarian winters

There is now an export market to Spain, which has a tradition of keeping pigs in woodland, the natural habitat of the animals. Iberian pigs, fed on acorns and taking over a year to reach slaughter-weight, produce hams of a particular quality. Premium prices are paid for them (see Pig Case Studies Spain 1-3).



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Unique rare breed, adapted to the climate

In 1991, Peter Toth, in conjunction with the Spanish ham factory Jamones Segovia Sa, developed an export market for Mangalica products. Along with Spain, Holland and Italy are also becoming important markets for Mangalica products. Small markets are developing in a range of countries including Hungary, Germany and Sweden.

Peter Toth has developed the breed lines and contracts production out to about 40 producers with 2000 pigs between them. Nyírbogdány farm is one of these producers with around 50 sows and their progeny that are looked after by 3 stockpeople.

Nyírbogdány farm

The methods of production on Nyírbogdány farm are very simple. The sows and their progeny all share extensive paddocks, each with a large barn (approximately 400m²) that is deep bedded with straw. The pigs are locked into the barn at night to protect them from foxes, dogs and wild boar. They are released during the day and are free to roam the paddocks. The paddocks contain good pasture cover, edible plants, shrubs and trees, including mature fruit trees. This variety of different environments closely resembles those naturally inhabited by wild and feral pigs. It allows foraging behaviour that may occupy as much as 75% of time in a natural environment.

Foraging behaviour includes:

- Sniffing
- Rooting
- Chewing
- Eating

Food comprising mainly corn and fodder is thrown into the paddocks. In addition, the younger pigs have access to 10 hectares of orchard.

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The pigs can browse on the fruit trees

The main welfare benefits of the system are:

- The breed of pig is hardy enough to remain outdoors all year round
- This rare breed has small litters which puts the sow under less metabolic pressure
- All pigs are free to roam around in the paddock during the day
- The paddocks are enriched with various forms of vegetation including fruit trees
- Rails and barriers to protect the piglets from being accidentally crushed
- There is no teeth-clipping or tail-docking

On Nyírbogdány farm, the sows have just two litters per year and give birth on average to 6 piglets. In comparison, sows in conventional intensive production have 2.3 litters and give birth on average to 10-12 piglets. This level of production makes huge metabolic demands on the sow. They can soon lose condition and are often culled after their third or fourth litters because of breeding difficulties.



Even the young piglets are hardy enough to roam outdoors in the winter



Even in winter, the sows manage to find something to forage in their extensive paddocks

At farrowing, the sows are housed individually in pens. The piglets have a separated area which provides them with protection and supplementary feed. The pens also have rails for added protection.

There is no need to clip the piglets' teeth because the litter size is close to the natural number for a pig and there is no competition for the sow's udder. The piglet's tails do not have to be docked because they live in a very enriched environment where tail-biting would be highly unlikely.

The piglets are weaned at 30 days. This may have to be increased to 40 days to comply with EU organic legislation. The advantage of later weaning is that the piglets are more able to cope with the stress of losing their mothers and having a change in diet and environment imposed upon them. Early weaning can increase susceptibility to disease. After weaning the piglets have access to the paddocks and also have 10 hectares of orchard where they can forage for fruit.

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The large barn provides protection from both the weather and predators – but they still choose to venture out

Organic rare breed pig production system	
Date of visit	25 November 2003
Certification scheme	OMMI (National Institution on Agricultural Quality Assurance) and Biokontroll Hungaria (organic)
Number of sows	50
Breed	Mangalica
Food	Corn and fodder
Average and maximum farrowings per sow	Max 5
Farrowings per year	2
% piglets stillborn	<1%
% live born piglet mortality	<10%
Average number of piglets weaned per farrowing	6 (6 or 7 born per litter)
Mutilations	Castration. No teeth-clipping or tail-docking
Weaning age	30 days
Growth rate	450g per day
Food conversion rate	5:1
Weight when sold on or slaughtered	140-150kg
Transport to slaughter	185km
Price to farmer	Premium paid for Mangalica meat
Market	Premium quality hams locally and to Spain and Italy
Number of stockpersons	3
Number of inspections	At least daily
Health problems	None reported
Other welfare issues identified	Mutilations (castration). Weaning age

Pig Case Study Hungary 2

Four more traditional breed systems

Extensive rare breed Mangalica systems

(see also Pig Case Study Hungary 1 – organic traditional breed system Nyírbogdány)

Introduction

The Mangalica, or hairy pig, is a traditional Hungarian breed. Their coat of hair and very thick layer of fat adapt them to the cold. They have been bred to be hardy enough to withstand outdoor conditions all year around, despite winter temperatures which can average -4°C . More details on the Mangalica can be found in Pig Case Study Hungary 1.

In all four case studies below, dry sows and growing pigs are kept outdoors all year, though with access to shelter with straw bedding. In the first two case studies, the sows farrow indoors in individual pens. In the third case study, sows are transferred to group-farrowing paddocks. In the last, in a farm which demonstrates traditional breeds, all the pigs live together in the same paddock throughout the summer with natural farrowing and weaning.

1. Mangal Ilona Kft., Kapoly, Hungary

Large contracted, semi-extensive breeder and grower unit

Mangal Ilona Kft. is a large farm with 200 sows. The pigs are all blond or red Mangalicas. The farm was formerly an intensive unit that has now been restructured for breeding Mangalicas to take advantage of the premium prices paid for the meat. The farmer at Mangal Ilona receives 340 Ft per Kilo. All the pigs, except the farrowing sows and young piglets, have access to outdoor runs. This allows the pigs to carry out their natural foraging behaviours such as rooting.



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Piglet protection rails are fitted to the sides of the farrowing pen



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The farm used to house the farrowing sows in farrowing crates. These have now been dismantled and farrowing pens installed. Craftsmen on the farm constructed the pens. The farmer is testing 3 different designs, all of which are larger than EU standards. The pens give the sows plenty of room to move around. They are also bedded with straw. This enables the sow to build a nest at farrowing. It alleviates the pre-farrowing stress experienced by sows that are normally confined in farrowing crates at this time.

The thick hairy coat helps keep them warm in the cold Hungarian winter

The farrowing pens are well designed in terms of piglet safety. The pens all have grids that allow the piglets to escape from the sow. They also have piglet protection bars along the solid walls. As a result, the sows on average wean around 6 piglets with a mortality rate of less than 10%. The piglets also benefit from later weaning at 6 weeks. The piglets are not tail-docked. This is because the pigs remain in enriched environments throughout their lives and therefore are unlikely to bite each other's tails.

After weaning, the piglets are transferred into indoor pens with straw bedding. The pens measure 3x6m and contain up to 30 piglets. The piglets also have access to an outdoor run. The growers are kept in similar accommodation until they reach a weight of 140-170kg.

All the pigs enjoy a varied diet that includes hay, carrots and green fodder. Pigs are naturally used to a varied diet that contains a good deal of fibre.



The farrowing pens have straw bedding and plenty of space for nest building

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Rooting in the mud is a favourite occupation



The pigs dig out hollows to lie in



The pigs have ample shelter in extreme weather

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Rare breed pig production system

Date of visit	18 February 2004
Certification scheme	OMMI (Országos Mezőgazdasági Minősítő Intézet – National Institute for Agricultural Quality Control) – www.ommi.hu
Number of sows	200
Breed	Mangalica (blond and red)
Food	Hay, carrots and green fodder
Average and maximum farrowings per sow	6-7
Farrowings per year	2
% piglets stillborn	0.1%
% live born piglet mortality	10-15%
Average number of piglets weaned per farrowing	6
Number piglets per sow per year	12
Mutilations	Castration and teeth-clipping, no tail-docking
Weaning age	6 weeks
Growth rate	120kg/8 months
Food conversion rate	4:1
Weight when sold on or slaughtered	120kg
Transport to slaughter	350km
Price to farmer	340Ft (1.3 Euros)/kg
Market	local
Number of stockpersons	4
Number of inspections	Frequently
Health problems	None observed or reported
Other welfare issues identified	Mutilations

2. Ökorex Bio Kft., Fiad, Hungary

Extensive, medium sized, organic breeder and grower unit

Ökorex Bio Kft. is a large organic farm that keeps Mangalica pigs, both the blonde and swallow stomached varieties. The farm also breeds sheep and grows a variety of vegetables and fruits. There are 60 sows and their progeny which occupy an area of about 5 hectares.

The main welfare benefits of the farm are:

- The breed of pig is hardy enough to remain outdoors all year round
- The dry sows and growers are free to roam around in the paddocks during the day
- The paddocks are enriched with various forms of vegetation including mature trees
- There is no teeth-clipping or tail-docking
- The sows are not confined at farrowing

Sows

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The paddocks contain mature trees that also produce food for the pigs

The sows live outdoors in extensive paddocks. The paddocks are enriched with pasture cover, edible plants, shrubs and mature trees. The sows can therefore supplement their diet with grass and other plants

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The extensive paddocks contain many plants and shrubs for foraging



© Lars-Erik Sipos/CIWF Trust

The pigs have simple straw bedded huts for shelter

growing in the paddocks. The sows are fed twice daily a total of 2kg of milled feed. They also receive hay and green fodder. Access to fibrous food such as grass and hay helps to prevent hunger without the risk of obesity. In conventional intensive systems, sows are fed a restricted diet that leaves them feeling hungry. If food were not restricted, sows used on intensive farms would grow too fat and not be able to reproduce as effectively.

The sows are not pushed to high levels of production. They have 2 litters a year with 5 or 6 piglets in each litter. This means that they remain in good condition and can live for much longer than conventional intensive sows.

Farrowing sows

At farrowing, the sows are housed in pens with straw bedding. This allows them to perform nest-building behaviour. Because the sows are free to move around, they do not suffer from the stress experienced by sows in intensive systems that are closely confined in farrowing crates.

Piglets

Even though Mangalicas are adapted to outdoor life it would appear that the piglets still benefit from protection from both the weather and from accidentally being crushed by the sow. The Mangalica farms that have indoor farrowing do slightly better in terms of reducing piglet mortality. It may be that in outdoor farrowing, the sows are more inclined to farrow in nests rather than use the shelters. Or it may be that the huts are not designed well enough.

To start with, the farmer used to practise teeth-clipping where the tips of the eye-teeth are removed with pliers. This is practised in intensive production to reduce the risk of damage to the piglets and the sow's udder. Teeth-clipping causes acute pain and can cause teeth to



Even the young piglets get access to the outdoor runs

become infected. On this farm, the farmer soon realised that it was not necessary. This is because the Mangalicas have small litters and there is less competition for milk at the udder. The piglets are not tail-docked because tail-biting is unlikely to occur in the enriched environments used to keep the growing pigs.

Growing pigs

After weaning at 6-8 weeks, the piglets are transferred to outdoor paddocks where they remain until going for slaughter at 100-145kg. The paddocks have straw bedded huts for shelter in poor weather.



The growing pigs are fattened outdoors on milled feed

Organic rare breed pig production system

Date of visit	February 2004
Certification scheme	OMMI and Biokontroll Hungaria (organic)
Number of sows	250-300
Breed	Mangalica (blonde and red)
Food	Corn, hay and green fodder
Average and maximum farrowings per sow	10-12
Farrowings per year	2
% piglets stillborn	Rare – no data
% live born piglet mortality	Thought to be very low – no data
Average number of piglets weaned per farrowing	5-5.5
Number piglets per sow per year	10-11
Mutilations	Castration, no teeth-clipping or tail-docking
Weaning age	6-8 weeks
Growth rate	120kg in 12-14 months
Food conversion rate	5:1
Weight when sold on or slaughtered	120kg
Transport to slaughter	180km
Price to farmer	600Ft/kg (2.4 Euros/kg)
Market	local
Number of stockpersons	6
Number of inspections	At least daily
Health problems	None observed or reported
Other welfare issues identified	Mutilations (castration)

3. Primagro Bt, Kozárd, Hungary

Independent, medium sized, free-range breeder and grower unit

Primagro Bt farm breeds and grows blond Mangalicas. All the pigs are kept outside throughout the year.

The farm has around 30-40 sows and their progeny that are looked after by one stockperson, with some part-time help. The pigs are all fed a home-mixed diet

that consists of corn, wheat, peas, fodder with extra vitamins and minerals added. The food is all grown on this and a neighbouring farm. The pigs are exported to a lucrative market in Spain.

The main welfare benefits of this farm are:

- All pigs have access to outdoor runs
- The hardy breed of pig can be kept outdoors all year round
- Production rates for the sows are low
- The piglets are not weaned until they are 8-10 weeks old

The sows are kept in groups of 45. They share large paddocks measuring 4 hectares with open straw-bedded huts. At farrowing, they are moved to group farrowing



The pigs are kept in large paddocks

paddocks where they are provided with individual huts measuring 2x3m. The sows farrow twice a year and each time give birth to around 5 piglets. This level of production does not make huge metabolic demands on the sow. As a result, they remain in better condition and can live longer.

The piglets remain with their mothers for 8-10 weeks. This is much longer than the 3-4 weeks seen on conventional intensive systems. Early weaning can cause stress because of a number of reasons:

- Sudden change from milk to solid food
- Moved to a strange environment
- Mixed with unfamiliar piglets causing fighting

After weaning, the piglets are housed in large groups of 200 in deep-bedded sheds measuring 100x150m. The piglets also have an outdoor run measuring 0.5 hectares. The large amount of space and enriched environment means that the piglets have good opportunity for play and recreation.



The pigs are given a high fibre diet in long troughs

Rare breed pig production system	
Date of visit	27 November 2003
Certification scheme	OMMI
Number of sows	400
Breed	Mangalica (blond)
Food	Corn, wheat, peas and fodder
Average and maximum farrowings per sow	6-10
Farrowings per year	2
% piglets stillborn	< 1%
% live born piglet mortality	10%
Average number of piglets weaned per farrowing	4.5-5
Number piglets per sow per year	9-10
Mutilations	Castration, no teeth-clipping or tail-docking
Weaning age	8-12 weeks
Growth rate	450g per day
Food conversion rate	5:1
Weight when sold on or slaughtered	140-150kg
Transport to slaughter	220km
Price to farmer	Premium paid for Mangalica meat
Market	Local
Number of stockpersons	1 full-time + 1 part-time
Number of inspections	At least daily
Health problems	None observed or reported
Other welfare issues identified	Mutilations (castration)

4. Dél-Cserhádi Ökológiai Tájéközpont Kht, Jákotpuszta, Hungary

Demonstration farm for traditional native breeds

Jákotpuszta farm is known locally as 'happy pig valley'. This is because the pigs are kept in free-ranging conditions that have a high potential for good welfare. The farm is run by the Agrarian University of Godollo as a centre for indigenous Hungarian breeds like Mangalica pigs, Grey cows, turkeys, bald-necked chicken, geese, donkeys, horses and water buffalos.

The methods of husbandry used in production of the Mangalica pigs are very low tech. Production is not separated for the different categories of pigs like they are in conventional production. Instead, all the pigs including the boars, the dry sows, the farrowing sows and their progeny all share the same paddocks together. A key welfare benefit of this system is that piglets are weaned naturally, minimising stress both for them and for the sow.



The young are weaned naturally and remain in the family group throughout their lives

The paddocks contain simple wooden huts with straw bedding so that pigs have somewhere to shelter in extremely poor weather. They also have wallows that the pigs could use if it becomes hot.

In spring, the pigs are moved to larger paddocks measuring about 70 hectares. In these paddocks, the animals feed on whatever is being grown in the fields.

They receive no other food ration. These feeding conditions most closely resemble those seen in wild and feral pigs. The pigs can be seen to spend most of their time in foraging activities. Opportunity to carry out these behaviours can prevent the development of abnormal behaviours such as stereotypies that are seen in more restricted environments.

The abundance of space means that the pigs get plenty of exercise and this can help reduce the incidence of lameness. The Mangalica pig is a hardy, traditional breed that has very few problems with disease. The pigs do not have to receive any vaccinations. Veterinarians are seldom if ever required.

The level of production puts little demand on the sow. The target is to

produce 2 farrows per year with 4-5 piglets in each litter. The piglets remain with their mothers throughout their lives and are weaned naturally. Although the male pigs suffer castration without anaesthetic, the piglets are not teeth-clipped or tail-docked.

The meat from the pig is sold locally.



The sows remain in stable social groups where there is little fighting

On the farm there are 3 boars, 80 sows plus all their progeny. In winter, they are kept in a smaller paddock of about 30 hectares (illustrations show winter paddock). This is so the 3 stockpersons can feed them and look after them more easily. The feed rations are based on corn and fodder with a vitamin and mineral supplement mixed in.



All the pigs are kept outside throughout the year in spacious paddocks



The paddocks contain several mature trees and provide plenty of opportunity for foraging

University-based rare breed farm

Date of visit	27 November 2003
Certification scheme	OMMI
Number of sows	28
Breed	Mangalica (blond)
Food	Corn and fodder in winter, crops in paddocks for rest of year
Average and maximum farrowings per sow	No data
Farrowings per year	2
% piglets stillborn	Rare – no data
% live born piglet mortality	Thought to be low - 5% estimated
Average number of piglets weaned per farrowing	4.5-5
Number piglets per sow per year	9-10
Mutilations	Castration, no teeth-clipping or tail-docking
Weaning age	Natural weaning
Growth rate	450g per day
Food conversion rate	5:1
Weight when sold on or slaughtered	140-150kg
Transport to slaughter	Usually a few km
Price to farmer	Premium paid for Mangalica meat
Market	Local
Number of stockpersons	3
Number of inspections	At least daily
Health problems	None observed or reported
Other welfare issues identified	Mutilations (castration)

Pig Case Study Australia 1

Organic rare breed system, Fernleigh Farm, Bullarto

Small, organic system in which Wessex Saddleback pigs are rotated through the whole farm

Fernleigh Farm is managed by Fiona Chambers, an agricultural graduate who is one of the directors of Rare Breeds Trust of Australia. Fernleigh Farms has more than one quarter of the world's remaining genetics of the Wessex Saddleback breed, which includes all remaining 8 female lines and 5 male lines.

The farm combines its pig enterprise with another organic farm business and markets pork under the name of 'Old-Style Organic'.

Meat is marketed directly from the farm, at farmers markets and through selected retail outlets.

The pigs are rotated through the whole 45 hectare farm that includes areas of forest, cropland and pasture. The farm has a very high potential for good welfare. This is because the variety of different environments most closely resembles those naturally inhabited by wild and feral pigs. This gives the pigs the opportunity to carry out almost all their natural behaviours.



Photo: © Fiona Chambers of Fernleigh Farms Produce

Wessex Saddleback sow with her piglets, Fernleigh farm, Australia

The key welfare aspects for the pigs are:

- All pigs remain outdoors in highly enriched environments throughout their lives
- All pigs remain in stable family groups with later weaning at 7-8 weeks
- The environment provides excellent opportunity for foraging and a varied diet
- This rare breed has smaller litters, putting the sow under less metabolic pressure
- Sows, piglets and growing pigs are not subjected to any mutilations such as castration, tail-docking or nose-ringing

Wessex Saddleback sows are particularly suited to outdoor conditions. They make good mothers with a high milking capacity. The sows are all familiar with each other so aggression is reduced. The farm also keeps 7 boars that are used for breeding. When they are not with the sows, they are kept in long runs. Unfortunately it is considered necessary to de-tusk the boars for the safety and welfare of the stockpersons and other livestock.



Finishing pigs on the foraging trail



The growing pigs are not fearful and have well-covered paddocks in which to roam

Benefits of later weaning include

- The piglets benefit from the comfort and protection of their mother for longer
- They have started to consume solid food before weaning
- Later weaning is less stressful causing less damage to the immune system

After weaning, the piglets are moved to the paddocks with the best pasture cover. Here they are provided with well-bedded, small corrugated iron sheds for shelter. The weaners are kept together in small groups of 15-20. As the pigs grow, they are moved onto lower quality pasture.

The sows are farrowed just twice a year, due to the longer lactation phases that are practised. This ensures that they remain fit and healthy and can potentially live longer than intensive sows. If the weather is cold, the sows are brought into a large stable with straw bedding for farrowing. In fine weather, they farrow outdoors. According to the farmer the sow's preferred paddock, and where they do best, is far away from the main farm on undulating land with trees, foliage and loose bark. Forest is the natural habitat of pigs. Although there is a freestanding A-frame shed that sows can use, most sows choose to build nests and farrow outside.



The finished pigs have well bedded huts to protect them from extreme weather

The piglets are not routinely teeth-clipped. This is because there is rarely any incidence of piglets fighting or causing damage. Where piglets are seen to be physically affected by competitive fighting or where the sow's teats are damaged from the piglet's teeth, teeth-clipping may be employed in the future to minimise damage and discomfort. There is also no need to dock the piglets' tails because they remain in enriched environments throughout their lives and therefore are unlikely to bite each other's tails. The males do not have to be castrated as they go for slaughter before reaching sexual maturity.

The pigs enjoy a rich and varied organic diet. The organic raw ingredients are bought by Fernleigh Farms from a range of certified organic growers and mixed and milled into feed on the farm to formulations designed for them by an animal nutritionist. Fernleigh Farms sources locally grown organic grains, preferably barley, from within 1-2 hours drive of the farm.

The feed rations vary according to what organic ingredients are available. The rations take into consideration what farm produce the animals are eating, e.g. potatoes or pasture. There is also a certified organic processor of oilseeds about half an hour away, so they use the meal left after extraction of the oil from linseed and safflower.



A crop of 'green manure' is grown on the farm. It is fine for the dry sows but cannot be fed exclusively to the growing pigs. This is because it is too high in fibre for the young animals to get sufficient feed value from it to meet their requirements for growth. In the future, Fernleigh Farms would like to experiment with using silage from 'green manure' crops grown on the farm.

Finding high quality organic vegetable proteins is the biggest problem for the farm. Meat meal is not an alternative because the regulations state that it can only form 2% of total feed intake. Use of synthetic amino acids, e.g. lysine, methionine and leucine, has never been permitted in organic foods in Australia.

Grazing a green manure crop

Organic rare breed pig production system	
Date of visit	20 May 2004
Certification scheme	Organic - NASAA (National Association for Sustainable Agriculture Australia Ltd)
Number of sows	20
Breed	Wessex Saddleback
Food	Locally produced organic plant material
Average and maximum farrowings per sow	
Farrowings per year	2
% piglets stillborn	
% live born piglet mortality	Variable – piglet crushing a problem
Average number of piglets weaned per farrowing	5.8 (11.6 per sow per year)
Mutilations	Detusking. No teeth-clipping (currently), tail-docking, castration or nose-ringing
Weaning age	7-8 weeks
Growth rate	Best growth rate is to produce a 45kg carcass (hot weight-head on) in 20 weeks (about 425g/pig/day)
Food conversion rate	Not known – difficult to estimate because of the high proportion of fodder derived from pasture/green manure
Weight when sold on or slaughtered	
Transport to slaughter	1 hour
Price to farmer	\$8.50 (5 Euros)/kg carcass weight (head off) \$7.00 (4 Euros)/kg carcass weight (head on)
Market	As "Old-Style Organic Pork" at farm shop, farmers markets and selected retail outlets
Number of stockpersons	1
Number of inspections	At least once per day
Health problems	Rhinitis, occasional pneumonia in piglets, occasional lice infestations (all treated according to organic regulations)
Other welfare issues identified	Mutilations (detusking of boars). Piglet mortality

Pig Case Study Australia 2

Free-range pig breeding system, Otway Pork Pty. Ltd., Winchelsea, Victoria

Very large independent, extensive pig breeding unit

Otway Pork is a large outdoor pig-rearing system with 2500 sows. They rear 20% of the piglets they breed through to slaughter in a free-range system for sale at premium prices. The other 80% are sold to intensive systems as weaners at normal market rates.

The farm at Winchelsea is a breeding unit in which all the sows remain outdoors at all times. The housing is portable and moved to different paddocks in rotation after they have been harvested. The paddocks are surrounded by low electric fences.

Otway Pork Pty. Ltd. is a division of Pastoral Pork.

Sows

The sows appeared to be very placid, at ease with each other's company and keen to approach stockpersons and visitors.

The key welfare aspects for the sows are:

- Stable groups
- Good opportunity for foraging and supplementing their diet
- No need for nose-ringing



Pregnant sows keep cool by wallowing and taking a drink



Boar team have ample space for rest and play

The farm has 2500 Large White x Landrace x Duroc sows. The stocking rate is 11 sows per hectare. Fifteen well-trained stockpersons are charged with their care. The sows are kept in stable groups. This means that aggression is reduced, as the sows are rarely mixed with unfamiliar individuals. Aggression is also limited at feeding time by reducing competition. This is achieved by using a truck that blows the food into the paddocks over a large area.

In intensive systems, dry sows are fed a restricted ration that leaves them feeling hungry. On this farm they can supplement their diet by rooting, browsing or grazing just as they would in the wild. Although the sows are not on pasture, the crop stubble and roots provide plenty of fibre to prevent hunger.

Opportunity to carry out foraging behaviours can prevent the development of abnormal behaviours such as stereotypies that are seen in sows in more restricted environments. The sows have plenty of space to roam around in and the exercise can help reduce the incidence of lameness. The light soil can lead to overgrowth of hooves in boars and older sows but not to any great extent.

On some extensive units, the sows are fitted with rings in their noses to prevent them from causing too much damage to the pasture. This is a painful operation and nose-rings frustrate the natural urge to root. The sows at Winchelsea are not nose-ringed. The rooting activity of the sows on crop stubbles is not a problem. Indeed, rooting may be beneficial in removing weeds and preparing the soil for the next crop.



Sow shelters provide protection from both rain and sun

The sows were provided with spacious bedded huts where they can shelter in poor weather. They also have wallows that they could use if it becomes hot.

Farrowing sows

The key welfare aspects for the farrowing sows are:

- Each sow has freedom of movement at all times
- There is ample opportunity for the sows to build a nest
- The sow is able to leave her piglets if she requires
- The paddocks provide safe, tranquil areas for the sow



At farrowing, the sows are transferred to spacious farrowing paddocks, which contain an individual rectangular hut for each sow. Each hut is well bedded and allows the sow to carry out her nest building activities. In confinement systems, the inability to move around and build a nest is a cause of acute stress.

Each hut comes with a piglet-restraining barrier. Prior to farrowing, the barrier is removed so that the heavily pregnant animals do not have any difficulty in entering the huts. After the sow has farrowed, the barrier is put back in place. The barriers are designed to keep the piglets within the safe confines of the hut. However, they also allow the sows to get away from the constant attention of the piglets from time to time.



Farrowing sows have individual paddocks but the piglets soon learn they are free to roam

Piglets

The straw bedding in the farrowing huts provides good thermal insulation to help keep the young piglets warm. The bedding along with the earth floors means that they are less prone to being accidentally crushed by their mothers.

Teeth-clipping is not routinely practised on the farm and is only carried out where it is deemed necessary. The 20% of piglets, which Otway Pigs raise through to slaughter, are not tail-docked. These piglets remain in enriched environments throughout their lives where outbreaks of tail-biting are less likely. The aim is to increase the number of pigs that remain in the Otway system.



Weaners

After weaning, the piglets are moved to large portable sheds that contain groups of 550-600 weaners. The sheds are made from metal-framed domes with a canvas covering. The canvas sides can be lowered or raised depending on the requirements for temperature and ventilation. The ends of the sheds are left open so that the pigs have good access to daylight and fresh air. The sheds are bedded with straw to provide physical and thermal comfort. The straw also provides a good outlet for play and recreation.

Weaners get plenty of straw for comfort and recreation

Extensive breeding unit	
Date of visit	29 April 2004
Certification scheme	
Number of sows	2500
Breed	Large White/Landrace sows x Duroc
Food	Feed manufacturer
Average and maximum farrowings per sow	
Farrowings per year	
% piglets stillborn	
% live born piglet mortality	Up to 15%
Average number of piglets weaned per farrowing	
Mutilations	Some teeth-clipping, 80% tail-docking (piglets reared to slaughter on the farm are not tail-docked)
Weaning age	
Growth rate	
Food conversion rate	
Weight when sold on or slaughtered	
Transport to slaughter	2 hours
Price to farmer	Premium paid for Otway system pigs
Market	20% sold as free-range at a premium price. 80% sold as weaners at normal market rates
Number of stockpersons	15
Number of inspections	At least daily
Health problems	Some lameness caused by hoof overgrowth
Other welfare issues identified	Mutilations

Pig Case Study Australia 3

Bedded indoor group system for dry sows, Glenesk , Perthville, New South Wales

Mainly intensive, small-sized unit switching to loose-housed sow system

Glenesk piggery is an intensive farm, which has recently received a Federal Government grant to switch from sow stalls to a newly built loose-house system. The aim is to improve the welfare of the sows with the hope that this will lead to better performance through improved sow condition and piglet health.

Sow stalls consist of a steel frame that completely surrounds the animal in an individual enclosure. They reduce costs by housing many animals within as little space as possible. Sow stalls have a feed trough to the front and a slatted floor to the rear that makes management easier and labour costs cheaper. Each sow is fixed in one place so that any treatment such as veterinary care can easily be given to each individual sow.

Sow stalls were designed to prevent the stress and injuries caused by aggression between sows.

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 with other pigs
- Perform other important behaviours such as foraging



The sows have plenty of deep bedding for foraging and gut fill

The building of the loose-housing system for the sows was funded by a grant as part of the Federal Government's 'AAA - Farm Innovation Program'. Glenesk piggery was one of 33 successful applicants sharing in grants totalling Aus\$3.5m under the fourth round of funding.

According to the Agriculture, Fisheries and Forestry Australia website:

'Glenesk Piggeries of Perthville, NSW, will use a purpose-designed and built shed for housing dry sows after mating, together with a unique trickle-feeding system to improve animal welfare and increase productivity. Traditionally, dry sows are confined to stalls where they are unable to turn around, are fed by hand or automatically, with the whole ration being dispensed at once. Where loose housing is used, with groups of up to 80 pigs in the one shelter, the more aggressive animals take the bulk of the feed. This system will house sows in groups of five, with specially designed stalls dispensing measured amounts of food in a controlled manner. The use of straw bedding will improve hygiene and odour, and the straw itself can be recycled, e.g. for compost. It is expected this system will improve sow condition and therefore improve piglet health, while addressing animal welfare concerns.'



The sows have ad libitum access to water

The program states that the grant will be used to meet the costs of building a specially designed shed and installing an automated trickle feed system.

Information sheets on outcomes of the project will be widely disseminated. Other demonstration opportunities, such as field days and site inspections, will be used to inform the industry.

The new shed at Glenesk had to be purpose built for loose housing dry sows after mating. One of the main problems in loose housing systems is how to feed the sows. If food is simply thrown into the pen, competition for food leads to fighting and weaker individuals get less than their fair share.



The sows are fed using a trickle feed system



The feeders are separated by short barriers to reduce aggression at feeding

To overcome these problems, a unique trickle-feeding or 'biofix' system was installed into the building. Each sow has a separate feed area, partially separated by a shoulder barrier. The system delivers feed at a slow and consistent rate to all the sows in a group at the same time. Sows soon settle to the system and stay and feed in their own area. If a sow was to leave its area and bully another sow, she would actually lose out in terms of food. This is because more food accumulates in the abandoned area than she is likely to obtain by stealing from another. Sows soon learn that bullying isn't worthwhile.

The farm at Glenesk has 70 sows that are all gradually being moved into the new shed. The system houses sows in groups of five in pens measuring approximately 3x6m. This group size is small enough for them to form a stable hierarchy so that aggression is reduced.

The pens are deep-bedded with straw. The enrichment allows the sows to carry out foraging behaviour and can provide a good source of fibre to bulk out the diet. The use of straw bedding is also designed to improve hygiene and odour. The straw and manure can then be recycled for compost.



The sows have room to move around and exercise

The owners of the farm have noticed that the sows return to good body condition more quickly in the new facility and appear to be more content. There is now none of the lameness that was a significant problem when the sows were housed in stalls. The owners were expecting better production performance from the now stronger and healthier sows, but it was too early to tell.

All sows born and reared on the property have their tails intact because biting is not a problem.

The key welfare aspects for the sows are:

- Loose housing for freedom of movement and exercise to reduce lameness
- Deep straw bedding for foraging and supplementing the diet
- Trickle feeders to reduce aggression at feeding
- Sows kept in small groups which is natural for the species
- Improved condition and reduced lameness compared to previous sow-stall system

At present, the rest of the rearing systems on the farm are intensive.

Indoor pig production system	
Date of visit	14 July 2004
Certification scheme	Independent producer
Number of sows	70
Breed	Large White/Landrace
Food	Bought in and mixed on farm
Average and maximum farrowings per sow	
Farrowings per year	
% piglets stillborn	
% live born piglet mortality	Total mortality including stillbirths = 26%
Average Number of piglets weaned per farrowing	8.5
Mutilations	Teeth-clipping. No tail-docking or castration
Weaning age	4 weeks
Growth rate	
Food conversion rate	
Weight when sold on or slaughtered	60-66kg
Transport to slaughter	2.5 hours
Price to farmer	At the moment, 'breaking even' because of drought
Market	Conventional pork
Number of stockpersons	2 part-time
Number of inspections	2 per day
Health problems	None observed or reported
Other welfare issues identified	Mutilations (teeth-clipping). High piglet mortality. Intensive systems used for rest of pig lifecycle. Weaning age

Pig Case Study USA 1

Free-range pig production system, Willis Farm, Thornton, Iowa

Authors: Cat Carroll and Marlene Halverson
See also Pig Case Study USA 2

After college, Paul Willis spent time working with the Ministry of Agriculture in Nigeria. In 1970, he returned home to Thornton, Iowa, to help out on the family farm and, together with his wife Phyllis, decided to raise pigs. Shunning advice from university experts, they decided to raise pigs outdoors. For the purpose, Paul selected a mixed breed of pigs known as Farmers' Hybrid. This is a combination of older breeds having good mothering skills, higher backfat than conventional pigs and a sturdy conformation for outdoor living.

In 1994 Paul was introduced to Bill Niman, a co-owner of a company processing and distributing fine meats to up-market restaurants and natural food retailers. After sampling pork from the pigs on Paul's farm, Bill decided it was the best pork he had ever tasted. So began a lasting co-operative relationship with Niman Ranch Inc of California.

At a conference in 1997, Paul and Phyllis met Diane Halverson of the U.S. non-profit Animal Welfare Institute (AWI). In 1989, AWI had obtained the first U.S. Department of Agriculture-approved label for pork products from family farms raising pigs on pastures or in bedded pens, without the use of sub-therapeutic antibiotics. AWI had developed its husbandry protocol with the input of veterinarians, scientific experts in animal welfare and farmers. The key underpinnings of the AWI protocol are the *Five Freedoms* first stipulated



The Niman Ranch Pork Company headquarters is the red brick house on the boyhood farm of Paul Willis

by the Brambell Committee and later expanded by the Farm Animal Welfare Council and the Carpenter Committee. For all pigs special emphasis is placed on:

- Good health
- Attentive and skilled husbandry
- Freedom of movement
- Opportunity to form stable groups and socialize freely with others in their group
- Enriched environments for foraging, fibre, and nutrition
- Access to fresh water at all times

The Willis farm was endorsed by AWI and serves as a model for the other farms that have joined the Niman Ranch program. Paul now manages the Niman Ranch Pork Company (NRPC), which is half owned by the farmer members that number nearly 500. Besides buying pigs for the program, NRPC provides field staff that advise farmers and work closely with AWI to help farmers maintain the husbandry standards, with which the farmers are required to comply. NRPC is half-owned by nearly 500 farmer members and half-owned by Niman Ranch, Inc.



Paul and the other farmers in the Niman Ranch programme use sturdy breeds capable of thriving in a variety of outdoor environments

NRPC sells pork carcasses to Niman Ranch, Inc (NRI) of California. The company has 3 slaughter plants to reduce live transport and the carcasses are taken to California. The plants have been upgraded, are inspected by US Department of Agriculture and can guarantee traceability. NRI processes the carcasses and markets fresh and specially-processed pork exclusively from these farms to natural foods retailers and up-market restaurants across the United States. Farmers selling their pigs this way are able to command a higher price in the market, making it possible for them to improve the welfare of the pigs. The higher prices also encourage new farmers to join the program. There is also a guaranteed floor price above cost of production.

Signing on with Niman Ranch and getting AWI approval have permitted Paul to make a living from humane husbandry practices in a way that once seemed impossible alongside 'factory' systems. Paul now owns the remaining Farmers' Hybrid stock that includes mixtures of Duroc, Chester White and Berkshire, all valued for high meat quality and capable of thriving in outdoor environments. The backfat thickness of the pigs measures about 1 inch. The program strives for sows who milk well, are not easily excited, are gentle with piglets, careful with their movements and have a good sense of where their piglets are.

Today, Paul and Phyllis raise 2,500 pigs on their 320-hectare farm. Paul keeps 200 to 300 sows at a time on his farm, usually producing about two litters per sow annually. Pigs live outdoors with access to shelters, fresh water and feed, pastures, and wallows in the summer. In winter, when temperatures can dip to -20° F (-30°C) and lower, often with a stiff wind chill, pigs are housed on deep straw and maize stalk (corn stover) beds in hoop buildings and other converted barns on the farm. Hoop buildings are 10-20m wide and up to 30m long with wooden sides and a polyethylene roof covering a concrete floor. Pigs still have access to the outdoors for sunshine and fresh air.

In a nation where people who raise pigs almost universally call themselves 'pork producers,' Paul calls himself a pig farmer. The fondness he has for his pigs is reflected in their comfort with him and his two hired workers, as well as in their uninhibited curiosity towards visitors to the farm. Paul points out that pigs are social animals. Consequently, he keeps his pigs in stable social groups.



©Diane Halverson/Animal Welfare Institute

Kind treatment by stockpeople means that pigs react calmly to visitors

Recognizing the importance of nest building to farrowing sows, Paul is particularly concerned that his sows have the materials and ability to nest freely when it comes time to bear their young. In summer, sows farrow in individual huts on pastures that are lush with grass the sows can cut and use to bed their huts. To maintain the pasture, the sows have a nose ring placed through their septum. This is permitted by AWI to guarantee access to pasture in season. Rings placed in the rim of the nose disc were banned in 2004.

Paul has experimented with not using nose rings, but finds that the pastures become too degraded and barren, something he wishes to avoid because he feels pigs need a high level of environmental enrichment. Initial insertion of the ring is painful, even when done properly. Paul notices, however, even when he was using the disc ring, sows engaged actively with their environment, grazing, browsing, foraging, and enlarging the sides of the wallows in summer and ringing did not diminish their daily activities.

Editor's note: although septum rings cause less mutilation than those placed in the disc rim, Compassion in World Farming believes that alternative methods should be used to manage pasture. These include lower stocking rates and frequent rotation (see Pig Case Studies Sweden 1 and United Kingdom 4).

Paul has well-drained soils suitable for pasture pig raising and uses a regular annual crop rotation based

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Summer housing for farrowing sows

on a five year cycle. The rotation begins with pigs on the pasture. This is then rotated with a variety of organically-produced crops that provide both feed and bedding for the pigs. Although the rotation helps with the build up of health problems, Paul uses dewormers and vaccinates according to disease problems that arise on his farm or in herds surrounding his farm.

©Diane Halverson/Animal Welfare Institute



Paul Willis sets a high priority on providing lush pasture for foraging and nesting

Dry sows

Dry sows are loosely housed in bedded barns with access to the outdoors on lots adjacent to the buildings. They are kept in stable groups of 15 with the boars who remain with the sows after breeding is finished. In the winter, barns are deeply-bedded and straw is replenished weekly to permit composting and heat production from the beds.

Farrowing sows

The key welfare aspects for the sows are:

- Small, stable family groups
- Comfortable quarters for farrowing and materials for making nests
- Ability to interact freely with their piglets, including limiting nursings as piglets get older and less dependent on milk
- Continuous access to fresh water and fresh feed from "self-feeders" so they can maintain body condition during the comparatively long lactation

Pregnant sows are brought to the farrowing paddocks about a week before they are scheduled to farrow. The paddocks measure 0.6 hectares and are surrounded by electric wire fences. The electric wire is first placed at sow eye-level and is then lowered to piglet eye-level once they are born. However, some piglets still find ways to explore neighbouring paddocks for a short time. Tractors and other wheel-propelled equipment can generally be driven over the fence. Insulated handles are placed at various places in the fence to ease management.

Typically, 20 pregnant sows are placed in a paddock. When the first 15 sows give birth, the 5 sows who have not yet given birth are moved to the adjacent paddock where they are grouped with additional sows due to farrow. Because the paddocks are relatively large, social adjustment is smooth. For piglet survival, all piglets in the same paddock should be born within a 5 to 7 day period.

Nesting behaviour



The finished nest

A successful farrowing

©Diane Halverson/Animal Welfare Institute

Generous amounts of straw (oat or wheat or barley) are placed inside each hut prior to farrowing as nest-building material for the sow. Sows also gather vegetation with which they build nests. The straw and vegetation create a bedding pack underneath the sow and piglets that raises them above the ground. The straw helps seal the perimeter of the hut to prevent rain from washing in. New bedding is also added from time to time, especially in periods of heavy rain, to keep the bedding fresh. In the heat of summer, Paul places a block under the rear of the hut to raise it several inches above the ground, enhancing the flow of air through the hut.

In the winter months, Paul moves some of his sows to farrow in a barn with deep-bedded pens. The entrances to the pens are fitted with rollers that keep piglets in the pens for the first several days while allowing the mothers to leave and return to the nests. After piglets start climbing out of the pens, Paul removes the rollers and all the piglets and their mothers can mix freely. Through a doorway protected by a rubber flap, the pigs can go outdoors to eat from a self-feeder or bask in the winter sun. In winter, hoop buildings are also used that contain deep-bedded farrowing huts brought in from the pasture and placed along the sidewalls of the building.

Because of the healthy environment and ad lib feeding during the lactation period, Paul's sows are viable much longer than sows in confinement systems. Some sows are not culled until they have had 8 or 9 litters.

Piglets

The key welfare aspects for the piglets are:

- The piglets are not subjected to tail-docking
- Teeth-clipping is not practised, but teeth-filing reduces the sharpness of the needle teeth to prevent injury to neighbouring piglets' faces when competing at the udder
- Late weaning at six weeks which minimizes stress by removing the sows from the paddocks/rooms and letting the pigs stay behind

Within the first 24 hours after giving birth, Paul retrieves piglets from inside the huts to vaccinate, castrate, and file their needle teeth. Iron shots are unnecessary since sufficient iron is acquired as piglets root in the soil. Clipping of needle teeth is not permitted under AWI husbandry standards due to the potential for cracking the teeth and causing pain. Removing piglets for these processes appears to be less

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Fresh water is continuously available

In addition, various types of wood or steel shelters, some from salvaged materials, provide shelter to small groups of pigs or sows. Sows naturally farrow separately in individual nests, later bringing their piglets to rejoin the social group. Providing both kinds of accommodation allows for these natural behaviours.

Summer and winter quarters

Summer quarters



Straw is added before and after the sows farrow in individual huts

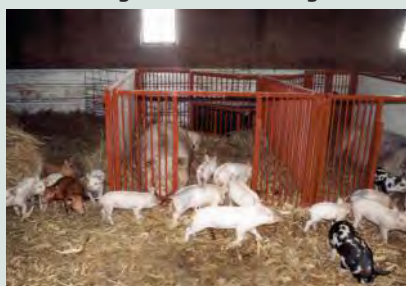


Sows with older piglets can shelter in groups

Winter quarters



The temperature is -6°C, but the pigs choose to go outside to forage



Adapted Swedish free-stall farrowing system



A second adapted Swedish design



Sow nesting in winter farrowing hut

© Diane Halverson/Animal Welfare Institute

disturbing to the sow if they are performed within the first day rather than later when the sow becomes more active and protective. Piglets also become much more active and harder to catch as they get older.

When working with especially protective sows, Paul uses a small, folding aluminum panel placed between him and the sow as he retrieves and processes the piglets. Gently and slowly picking the piglet up by the hind legs reduces distress noises or squealing, thereby minimizing the disturbance to the sow. He places the piglets in a large plastic tub and then steps into a protective trailer or truck bed to carry out the procedures.

Live-born piglet mortality is very low as Paul and the other workers on the farm take measures such as twice-daily inspections of the piglets. Farrowing huts allow plenty of space and they are padded with many layers of straw.

Sows are provided with self-feeders from which they can eat at any time. Piglets receive 'starter' feeds in creep-feeders that only piglets can enter. One of the benefits of a large group of farmers working together is that they can exert demand on suppliers. This has been so for the Niman Ranch farmers who now have their own specially formulated piglet feeds supplied by a large feed cooperative, without the addition of meat by-products or antibiotics.



Self feeder system for farrowing sows (separate smaller feeder for piglets in background)

Typically, industrial pig operations routinely feed low-levels of antibiotics to piglets, in part to reduce the incidence of E coli scours at weaning. The routine administration of antibiotics is not permitted in the Animal Welfare Institute's Humane On-Farm Pig Husbandry Standards, nor in the Niman Ranch company's protocol. The healthy environment provided by pasture and bedding dramatically reduces health problems at weaning and thereafter, rendering the feeding of antibiotics unnecessary.



Once the piglets are two weeks old, the sow begins to limit lactations by denying access to her teats

Although the nursing sows and piglets are given unlimited access to feed which meets all of their nutritional needs, they spend much of the day fulfilling their instinctive desire to graze and root for food.

Piglets play and forage just as older pigs do and they can often be found chasing each other around their paddocks, gaining independence and showing their intelligence and good social skills. They are well-prepared to move to the quarters for growing pigs (pastures or deep-bedded hoops) at the end of their time with their mothers.

As the pigs grow, the sows instinctively begin to limit the number of nursings to preserve their body reserves. Piglets are weaned at 6 weeks of age by removing the sows from the pasture. Removing the sows, rather than the piglets, avoids adding the stress of leaving the home onto the stress the growing piglets are already experiencing from weaning. The piglets stay behind in familiar surroundings, with the scents of their mothers still in the huts and nursing rooms. The growing pigs remain on the pasture until they are sold or, if they have been born in the fall (autumn), until they are moved into straw-bedded barns or hoop houses where they are raised to market weight during the cold winter months. After the weaning period is over, sows are mated again.

Weaned, growing, and finishing Pigs

Almost every day of the year, Paul's pigs (typically 1,000 at a time, divided into seven different areas) have freedom to roam over their pasture. Paul says that on 20-degree days in the middle of the winter, they can have the most fun outdoors in the sun (20°F, -7°C). Their natural layer of fat keeps them warm as they play in the snow and, when it gets too cold, they stay warm in straw-bedded hoop houses. In the hotter months, the pigs might spend their days wallowing in the mud or napping in the sun.

'We treat our pigs with a lot of respect,' Paul explains, noting that he makes sure everyone working on the farm understands the animals deserve the best of care while they're in his hands. This good treatment combined with the good environment keeps the pigs extremely healthy and illness is rarely a problem. Paul does not use antibiotic feed additives although he treats sick and injured animals with antibiotics when they need them to get well. Pigs reach market weight of 110kg by 5.5 to 6 months of age.

In the winter, in straw-bedded hoop houses, an initial layer of straw or cornstalk bedding is laid 20cm deep on the floor. Bales of bedding are added each week. Typically pigs spread the straw themselves, but it is essential that wet spots are covered with fresh bedding as soon as they develop. At least 160kg of bedding per pig is used in the winter. A space allowance of 4.5m² bedded living area per growing pig is aimed for.

Boars

On the Willis farm, boars are housed in a group with the pregnant sows. They have outdoor access and access to bedded shelter. Although, like the pregnant sows, they are limit-fed, they have access to bedding for forage which not only affords them occupation but also prevents hunger. Boars are not nose-rung.

Management of straw and manure

Pigs eat the bedding. Therefore, it must be stored indoors to maintain its quality and to prevent formation of mould or toxins that could cause abortions, stillbirths or lowered immunity levels. Straw requirements are 2.0 to 2.5kg of straw per sow per day.

Fresh bedding is added until the end of the farrowing, gestation or growing cycle. That is, soiled straw is not removed until the cycle is completed and pigs have been removed from the barn. Paul also uses chopped maize stalks and soy-bean hay for bedding as piglets get older and strong enough to navigate through the heavier material. Sufficient bedding creates a porous mixture wherein free air space provides conditions suitable for aerobic microbes to flourish. This decomposition produces heat, water vapour, carbon dioxide, and ammonia (a process called 'composting'). Only ammonia is odorous and its emissions are low or negligible if farmers use sufficient carbon-rich bedding to prevent the beds from becoming anaerobic.

Maintaining the surface of the bedding pack in such a way as to provide a dry and comfortable environment for the animals will be sufficient to keep ammonia emissions negligible. The heat generated in the composting process helps warm the pigs and to keep the bedding dry. The composting process kills pathogens and parasites. When spread and incorporated in the soil, the soiled bedding fertilizes and builds tilth and soil organic matter. About half of the organic matter added to soil in solid manure is incorporated into the native organic matter pool of soils.

Conservation

Paul and Phyllis are both humane and conservation minded. They raise crops organically and also maintain a 15 hectare native tall grass/wildflower prairie on their farm. They have converted additional hectares of farmland to a wetlands and tallgrass/wildflower prairie through a permanent conservation easement. There is little of the original tallgrass prairie left in the Midwestern United States. It is especially rare to find native prairie-land that has never been touched by agriculture or development. For Paul and Phyllis, maintaining the original native prairie and restoring additional land to its uncultivated state has been an act of love and respect for nature that also characterizes their attitudes toward their animals.



Restored wetlands provide habitat for wildlife

Free-range pig production system	
Date of visit	
Certification scheme	Approved by the Animal Welfare Institute
Number of sows	200-300 at any time
Breed	Farmer's Hybrid (50-year-old breed no longer commercially produced)
Food	Feed made of corn and soy; virtually unlimited amounts of fresh alfalfa, clover and grasses from pastures
Average and maximum farrowings per sow	No set upper limit
Farrowings per year	2
% piglets stillborn	Generally no more than one per litter, especially in recent seasons
% live born piglet mortality	Generally no more than one per litter
Average number of piglets weaned per farrowing	8
Number piglets per sow per year	16
Mutilations	Castration & tooth-filing for new-born piglets; septum rings for sows
Weaning age	6 weeks
Growth rate	110kg by 5.5 to 6 months of age
Food conversion rate	3-4:1
Weight when sold on or slaughtered	110kg
Transport to slaughter	Less than 4 hours (180 miles)
Price to farmer	Approximately \$5-6 (4.5 Euros)/hundredweight (9 Euro cents/kg) quality premium above going market prices
Market	Niche (sold to Niman Ranch as premium meat)
Number of stockpersons	3, plus part-time help (Paul is also manager of the Niman Ranch Pork Company which takes a great deal of his time)
Number of inspections	2 per day (minimum)
Health problems	No major problems
Other welfare issues identified	Mutilations

Pig Case Study USA 2

Free-range pig production system, Holmes Farm, Creswell, North Carolina

Authors: Cat Carroll and Marlene Halverson

See also Pig Case Study USA 1

In 1998, markets for independent family farmers were shrinking in North Carolina with the growth of industrialized pig farming. Brothers Tim and Mike Holmes chose to leave pig farming altogether rather than contract with large-scale processors to raise pigs in confinement. In 2001, they returned to pig farming when Niman Ranch, California, offered them a market for pigs raised on pasture. The Niman Ranch program was a good fit for the Holmes brothers because the Animal Welfare Institute Husbandry Standards codified the way they already wanted to raise pigs and the higher prices paid by Niman Ranch enabled them to do so. (See Pig Case Study USA 1 for details of requirements of the Niman Ranch program and the Animal Welfare Institute).



Pregnant sows on pasture

The key welfare aspects for the pigs are:

- Caring and attentive management by the Holmes brothers
- Continuous grazing opportunities, with fibre promoting healthy bowel function
- Spacious pastures allowing freedom of movement, with ample room for sows to choose or reject who their closest companions will be

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Tim Holmes

The Holmes brothers keep pigs free-range throughout their life cycle in the moderate to warm North Carolina climate. There are separate paddocks for dry sows, farrowing sows and their piglets and market pigs that are surrounded by electrified fences. All sows have continuous access to rich pasture.

The pasture is kept in good condition by 'ringing' the sows with a single ring inserted through the septum. (Editor's note: Compassion in World Farming does not support this practice). Feeders and waterers are provided in each paddock. Wallows are provided in each large paddock for pig comfort in the warmer summer months.

The Holmes brothers produce around 1,500 pigs every year. They are good stockpeople who enjoy spending a lot of time with their pigs, with the result that the pigs are accustomed to, and not fearful of, people who visit the farm.



Farrowed sow with piglets on pasture

©Diane Halverson/Animal Welfare Institute

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- Exposure to the seasons, natural sounds and routine human activity, while remaining safe yet free roaming in their outdoor paddocks, helps ensure that the sows are calm and are not easily startled or fearful
- Shade and shelter during adverse weather conditions
- Availability of wallows for mud baths and heat tolerance
- Sunlight helps to destroy pathogens and fresh air contributes to respiratory health, which is important when antibiotics are not permitted in the diet

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Good stockmanship means the sows are comfortable with people. Note protective barrier on right-hand hut

Dry sows

The Holmes brothers previously housed both pregnant sows and finishing pigs in bedded hoop buildings, but after a hurricane blew some of them down in 2003 (no animal casualties), they decided to put the animals permanently on pasture and use the hoop buildings for straw or hay and machine storage. The moderate North Carolina climate makes this possible and the Holmes brothers found that continuous outdoor rearing is a good system both for pig welfare and economy.

A separate paddock houses the Holmes' Duroc boars. The half-Hampshire, quarter-Yorkshire and quarter-Landrace sows are mated with the Duroc boars year-round, yielding approximately 2 farrowings per year for each sow. The sows are normally culled when they are about 5 years of age and no longer care so well for their piglets. The breeding selection produces pigs well suited for the North Carolina farm, and the Holmes brothers have been able to avoid any major health problems without the use of routine antibiotics.

Farrowing sows



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Group farrowing pen, with individual huts. Note solar-powered electric fence around perimeter.

The key welfare aspects for the farrowing sows are:

- Small, stable family groups
- Ad libitum feeding of a corn-soy ration with mineral supplements, to ensure that sows maintain body condition throughout the lactation
- Comfortable farrowing in straw-bedded English arcs
- Two litters per year, rather than the conventional 2.3, helps to keep them in good condition
- Pasture vegetation provides natural materials for sows to gather for nest-building at farrowing time. Straw is also provided for nesting

Piglets

The key welfare aspects for the piglets are:

- The arc design protects piglets from accidental crushing
- Shelters are well-bedded with straw to give pigs a dry and warm nest at birth and through their nursing period
- The piglets are not subjected to teeth-clipping or tail-docking
- Cross-suckling by young piglets is discouraged and sow-piglet bonding is encouraged by the use of barriers placed up against the arc entrances. These also give new piglets extra room outside of the arc itself
- After about 1 week of age piglets are allowed to leave the farrowing arc and to have unlimited opportunities to mix with piglets from other litters. At this early age, mixing of young piglets can be done with little disturbance

- Pastures provide an enriched playground for piglet activities
- Pigs are fully accustomed to sow feeds and grazing before weaning
- At weaning, sows are removed from the farrowing pasture to a different pasture for dry and pregnant sows so that piglets remain in the familiar area where they were born, nursed and lived with their mothers
- Sows are not removed from the farrowing paddock until the piglets are at least 6 weeks of age, allowing piglets to develop their own immunities to disease after losing the passive immunity acquired from their mother

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**Piglets running for wallow**

Sows give birth in dense straw protected by well-spaced English arc shelters sitting on the pasture, which Tim Holmes says are much more effective farrowing huts than the A-frame and Porta huts that are favoured by some farmers. The arcs allow for good ventilation, and the extra floor space they provide helps prevent the sows from crushing their piglets. Body heat is well trapped in the straw-bedded hut, making farrowing possible all year-round. After an arc has been used once, the farmers move the structure to a new location and fill it with fresh, dry straw to prevent the build-up of pathogens.

Male piglets are castrated without anaesthetic within the first two weeks of their lives to prevent boar taint in the carcass later on. Holmes prefer castrating in the first week but, if there is a possibility for heat stress in the hot summer months, they castrate just before the pigs are two weeks of age. They say that the wounds heal more quickly if castration is done earlier rather than later. US slaughterhouses have been built to handle pigs that are 110kg or larger, beyond the point when boar taint can be expected to appear, and will dock farmers for bringing in lower weight pigs. Hence, castration of male pigs destined for market is unfortunately a universal practice in the US. Castration causes pain to piglets at any age, especially if conducted without an anaesthetic.

Lower litter size means that there is less competition at the sow's udder and therefore no need to clip the piglets' teeth. The enriched environments for the growing pigs means that there is no need to dock the pigs' tails.

The Holmes brothers find that their sows begin to regulate the frequency of nursings when the piglets reach about two weeks of age by making themselves less and less available. Piglets are thus encouraged to eat the sows' feed and become less dependent on milk. The farmers try to adhere to the saying 'Mother knows best,' producing healthy, happy pigs on their pasture.

Weaned, growing and finishing pigs

The Holmes brothers allow their pigs constant access to feed typically made from their own farm-raised, mostly non-GMO corn and soy (with no animal by-products). Nevertheless, they have noticed the animals usually prefer to graze on the pasture's green grass. Because the market pigs are not nose-ringed, they quickly destroy the pasture as they grow and become more active. Hay is therefore provided in addition to their feed to supply fibre and variety in their diet. Wastage from the hay forms a bedding substrate. The feed stations are situated on elevated slatted platforms to keep the feeding areas clean. Water is supplied continuously to drinkers in each pasture with irrigation hoses that do not freeze in the winter.



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Feed is always available for the growing pigs

The outdoor system's main welfare advantage is that it closely resembles the pigs' natural environment, and provides many opportunities for enriched natural behaviour. The Holmes farm is a wonderful example of this; the pigs are regularly seen foraging for greens and grazing and rooting in the soil. Young pigs can play in their paddock all day long, and they always have freedom of movement. The extensive paddocks means pigs have a vast area to move around in and therefore do not become aggressive. The brothers say that their favourite part about raising the animals is 'watching them run around and interact with each other.'

Keeping pigs outdoors takes care of the problem of manure, which naturally distributes itself on the pasture. The Holmes brothers test the soil each year for phosphorus levels that could cause pollution. So far levels have consistently been low enough. The farm itself smells remarkably fresh and predators have never been a problem in the area.



Shades and enrichment for growing pigs

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Free-range pig production system

Date of visit	2 May 2005
Certification scheme	Animal Welfare Institute approves farms selling to Niman Ranch
Number of sows	120 (13-22 per hectare)
Breed	Hampshire/Yorkshire/Landrace sows x Duroc boars
Food	Rape or millet on pasture, feed made of corn and soy
Average and maximum farrowings per sow	Average 10; no upper limit
Farrowings per year	2
% piglets stillborn	Less than 1%
% live born piglet mortality	15-20%
Average number of piglets weaned per farrowing	8.5
Number piglets per sow per year	17
Mutilations	Males are castrated. One septum nose ring placed in sows
Weaning age	Approx. 6 weeks, longer if necessary
Growth rate	630-635g/day
Food conversion rate	3.0-3.5:1 (depending on the weather)
Weight when sold on or slaughtered	approx 110-120kg at 6 months
Transport to slaughter	3 hours
Price to farmer	Approximately \$135 (110 Euros) per pig. Niman Ranch maintain a minimum price of \$42-45 (36 Euros) per 100 pounds liveweight, approximately \$1 (0.8 Euros)/kg. The quality premium above going market prices is approximately \$5-6 (4.5 Euros)/ hundredweight (9 Euro cents/kg)
Market	Niche (pork carcasses sold to Niman Ranch, Inc. of California, as premium meat)
Number of stockpersons	2 plus part-time help
Number of inspections	2 per day (minimum)
Health problems	No major problems
Other welfare issues identified	Mutilations

Pig Case Study Brazil 1

Deep bed system for weaners, Sitio Sao Luiz, Jaboticabal

Includes intensive and semi-intensive pig production systems

Sitio Sao Luiz is an independent family run pig farm. The farm includes 230 breeding sows and their offspring that are reared to 100kg. The pigs are all fed a homegrown mix to which antibiotics are not added. This medium sized farm is able to support six full-time workers. The low ratio of pigs to stockpersons means that the pigs are well looked after with good attention to detail.

The farm is experimenting with a deep bed system based on peanut shells for some of the weaners. The weaners are housed indoors in open sided buildings. This gives them good access to daylight and fresh air. They are kept in groups of 50-60. Half the weaners are kept in pens that are part-slatted and half are kept in pens with deep litter. The farmer was in the process of evaluating the improvements to health and welfare made by the litter.



Peanut litter provides good enrichment

He 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. The litter is made of peanut hulls and provides good enrichment for foraging type activities, probably more so than straw. It is also likely that it provided a good supplement to their diet.

The litter is turned approximately once a week by fork. More litter is added as required. The litter is finally removed after 4 batches of weaners have been grown. Replacement after each batch would improve both hygiene and positive behaviour. The farmer then sells it as manure for which he receives a reasonable price. A number of farms in Brazil are experimenting with deep bed systems, partly to improve welfare and partly because it is expected to be more economic than flat decks.



Deep bed provides a comfortable lying surface



Piglets on litter are less fearful than those kept in partly-slatted pens

The rest of the pigs are kept intensively. Sows are kept in stalls and farrowing crates. Despite the high level of stockmanship, these animals suffer as a result of not being able to carry out their natural behaviour. As a result, stereotypies including bar-biting and sham-chewing were observed amongst the closely-confined sows.

However, a number of practices were employed to improve welfare:

- Farrowing sows received a great deal of individual attention
- Teeth-grinding was employed in place of teeth-clipping (this is still a mutilation which would be



better avoided, but causes less damage)

- Growing pigs had access to water during the heat of the day for wallowing
- Growing pigs also had rubbing posts for grooming



Intensive care during birth



Piglets' teeth are ground not cut

The farrowing sows receive 24-hour care. The farm deliberately employs female stockpeople to look after the farrowing sows and piglets. It is believed that women have more empathy, particularly when working with animals in early motherhood. The stockperson was very aware of the signs that sows were about to give birth. On such an occasion, she was seen to patiently spend time cooling the sow with water from a hose and scratching the sow's belly to try and sooth her.

Deep-bed system for weaners

Date of visit	9 July 2003
Certification scheme	None
Number of sows	230
Breed	Large White/Landrace sows x Dally boars
Food	Home grown mix
Average and maximum farrowings per sow	
Farrowings per year	2.4
% piglets stillborn	
% live born piglet mortality	
Average number of piglets weaned per farrowing	9.7
Number piglets per sow per year	23.3
Mutilations	Castration, tail-docking and teeth-grinding
Weaning age	4 weeks
Growth rate	
Food conversion rate	
Weight when sold on or slaughtered	
Transport to slaughter	Less than 100km
Price to farmer	Presently not making a profit
Market	
Number of stockpersons	6
Number of inspections	2 per day
Health problems	Some diarrhoea in weaners
Other welfare issues identified	Most systems are intensive. All sows closely confined at all times without access to fibrous food. No bedding for sows, growing pigs and those weaners on slatted system. Mutilations. Weaning age

Pig Case Study Brazil 2

Partly free-range pig production system, Fazenda das Palmeiras, Jaboticabal

Free-range dry sows; partly enriched weaner semi-intensive pig production system

Fazenda das Palmeiras is a semi-intensive breeder and grower pig unit. The farm has 400 sows and the growing pigs are finished to a weight of 100kg. The pigs are Large White x Landrace x Duroc crosses. The food for the pigs is produced locally and is home mixed. The farm has a mixture of conventional intensive systems and more extensive systems. The farm supports 9 full-time workers.

The farm has a number of features aimed at improving pig welfare. These included:

- An outdoor production system for the dry sows.
- Weaner pigs housed on litter made of rice hulls
- Wallows for the growing pigs



Mature trees provide good forage



Sows grazing on pasture

After service, the sows are kept in stable groups numbering approximately 20 individuals. Although there is some initial fighting, the sows soon settle into a well-established hierarchy that reduces the risk of further aggression. The sows are kept in large paddocks measuring approximately 80x80m. Each paddock contains a large permanent hut measuring 25x25m.

During the night, the sows are free to roam the paddocks where exercise can reduce the risk of lameness. The sows are also able to carry out foraging activities such as sniffing, rooting and chewing.

They are also able to supplement their diet by eating the grass and vegetation in the paddocks. This can reduce the problems of hunger caused by feeding dry sows a restricted diet.

During the day, the sows are encouraged back into the huts using feed where they remain for the rest of the day. The sows are thereby shielded from the strong heat of the day. However, the main reason for housing them during

the day is to protect the pasture in the paddocks. Pigs are generally less active during the night and therefore cause less damage with their rooting and foraging activities.

The practice means that the sows do not have to have rings fitted to their noses to prevent these destructive behaviours. As a result, the paddocks had a pasture covering of 90-100%. The paddock also contained mature trees and these, particularly the fruit trees, represented a very good source of environmental enrichment.



Rice hull litter for comfort and enrichment in weaner pens

Accommodation for the growing pigs could have been improved by greater provision of bedding material. The weaners are housed indoors in groups of 50-60. The pens have a light covering of rice husks. The litter is replaced as required and removed after 2 or 3 batches of pigs. The pigs become very interested when fresh litter is added. The piglets' foraging appeared to be more active than had it been straw but less so than the peanut hulls seen on some farms in Brazil.

Some pens contained chains which received occasional interest. Chains are often added to pens to provide environmental enrichment and to distract pigs from tail-biting. However, since chains are not edible, they are much less effective than the provision of fibrous materials such as rice hulls which provide for the repertoire of foraging behaviour which includes searching, manipulating and eating.



Wallows provide recreation and cooling

The pens also contain wallows or water baths that are apparently meant to be emptied daily. This was not occurring because of the high costs of water disposal and so posed a risk to good hygiene. Despite this, the pigs used them as a source of recreation and many pigs could be seen rooting and snuffling through the water.



Chains, provided for enrichment, have lost most of their novelty

The fattening pigs are housed in an open-sided building with pens that have concrete floors. The group size is 20-30 pigs. The housing is very similar to the weaner accommodation in that they also have wallows. However, the fattening pigs did not have access to litter.

The farrowing sows are kept in standard farrowing crates with 75% slatted floors and no bedding. The sows have constant access to water and are fed twice a day.

The piglet production figures are high. The average number of piglets born per litter is 11.6 and the number weaned at 30 days is 10.6. Although farrowing crates do not provide good welfare for the sow, they are effective at reducing the risk of the piglets being accidentally crushed or trampled by the sow. Weaning at 30 days is late compared with more intensive systems and this is beneficial for welfare. However, pigs naturally wean much later and a later weaning age still would reduce stress for the piglets and be good for their immune systems.

The environment could have been improved for the piglets. The creep areas are slatted without bedding and have no supplementary heating. The piglets are tail-docked, their teeth are clipped and the males are castrated.

Pig production system with sows free-range at night	
Date of visit	9 July 2003
Certification scheme	None
Number of sows	400
Breed	Large White x Landrace sows x Duroc
Food	Locally grown mix
Average and maximum farrowings per sow	
Farrowings per year	2.3
% piglets stillborn	
% live born piglet mortality	
Average number of piglets weaned per farrowing	10.6
Number piglets per sow per year	24.4
Mutilations	Castration, tail-docking and teeth-clipping
Weaning age	30 days
Growth rate	100kg in 6 months
Food conversion rate	
Weight when sold on or slaughtered	100kg
Transport to slaughter	
Price to farmer	
Market	
Number of stockpersons	9
Number of inspections	2 per day
Health problems	None reported, though hygiene may be an issue
Other welfare issues identified	Sows closely confined at farrowing. Limited use of bedding for piglets and growing pigs. Mutilations. Weaning age

Pig Case Study Brazil 3

Experimental deep-bed system, EMBRAPA Farms, Concordia, Santa Catarina

Semi-intensive pig production system

This is an experimental pig farm run by the Brazilian Agricultural Research Corporation EMBRAPA. The farm keeps 130 sows on one site and finishes the 25kg growers on another site.

Pig production on the farm is a combination of both intensive and semi-intensive systems. The main aim of the farm is to experiment with techniques to improve production using less intensive methods. The production systems that are developed are geared more to the small producers in the rural community, rather than the big intensive agricultural businesses. The consequence of these less intensive systems is that they are potentially better for animal welfare. Improvements in animal welfare are also seen as important for possible export markets, particularly to the EU.



Deep litter encourages foraging behaviour

Deep bed systems



Deep litter for comfort and recreation

EMBRAPA have been developing deep bed systems for economic, social, environmental and animal welfare reasons. A range of waste biological materials can be used to make a layer of fibrous bedding. The bedding absorbs the pigs' urine and faeces. As it decomposes, waste heat helps to evaporate water and to keep the bedding reasonably dry. A layer of 50cm is recommended in cool climates.

Where the weather is hotter, 30cm may be adequate, though extra bedding may be required to absorb and evaporate dampness.

Claimed benefits of the system include:

- It can cost 40-60% less to set up than intensive systems
- It is suitable for small-scale producers
- Ammonia emissions can be reduced by 50%
- Other odorous emissions like hydrogen sulphide are also reduced
- Smaller quantities of waste are produced reducing labour requirements for cleaning out and transporting wastes
- The drier waste makes a better fertiliser
- Less disinfectant is required
- The bedding provides physical and thermal comfort for the pigs
- The bedding provides for recreation and foraging opportunities
- These welfare benefits reduce lameness and cannibalism in the pigs

Details of this system are described in 'Perguntas e Respostas – Sistema de cama sobreposta' (Portuguese: Questions and answers – deep bed systems) which is available from EMBRAPA's website at www.cnpsa.embrapa.br.

Weaners and growing pigs

Most of the growing pigs benefit from good welfare conditions. The weaners are housed indoors in pens. The pens contain around 70 piglets and measure 4x5m. They are deep-bedded with 30-50cm of ground wood. The litter is replaced after every batch to improve hygiene and reduce the risk of infection.

After they have reached 25kg, the growing pigs are transferred to the other farm. The pigs are housed in open sided buildings with pens. The pens measuring 4x6m contain 20-30 pigs. At the time of our visit, they were experimenting with providing the pigs with different floor types. These included bare concrete, ground wood and rice hulls. The litter was 20-30cm deep. The scientists were mainly measuring differences in growth rate, food conversion rate and sanitary conditions.



Ground wood is ideal for rooting through and lying on

From the pig's behaviour point of view, it appeared that the rice hulls were better than the ground wood, which in turn was better than the bare concrete. This is because the pigs were more occupied with their natural activities. Boredom and aggression are both reduced. Although the scientists did not detect any differences in production measures, bacterial counts were higher in the litter systems.

Sows and piglets:

The farrowing sows are housed in conventional farrowing crates for the first three days after farrowing. They are then transferred to pens measuring approximately 1.5x2.5m. Although the sows are closely confined after farrowing, they do not spend the whole



Farrowing pens allow the sow some movement

3-4 weeks confined as in conventional intensive systems. This means that there is none of the stress and frustration caused by being unable to get away from the constant attention of the piglets. In the pens, the sows are free to turn around and interact more naturally with their piglets. The pens have well maintained floors with a covering of sawdust.

For the first three days after birth, the piglets are particularly vulnerable to being accidentally crushed or trampled by the sow. For this reason, it is unfortunately considered necessary to keep the sows in farrowing crates that restrict their movements and reduce the risk. After the risk has been considerably reduced, both sows and piglets benefit from having more space in the pens. A heated piglet escape area also reduces the risk of crushing. Although the pens contained some sawdust, both sows and piglets would have benefited from more bedding.



Heated escape area encourages piglets away from risk of crushing. Additional bedding material would help further

After weaning, the sows are kept in sow stalls to try and improve conception rates. This is unfortunate since this system is severely restrictive and denies the sow the freedom to perform many natural behaviours. However, the sows are transferred to group pens some days after service. The pens measure 3x4m and house 4 sows. The group remains together until they are ready to farrow again. The lack of mixing means that aggression is reduced. The pens have concrete floors with no bedding.

The sows are floor fed a diet containing maize, soya and supplements. They receive 2kg per day in two feeds. During feeding there is some aggression between the sows. This is because, as with all sows, they are only given enough food to maintain their weight and prevent them from getting fat. Sows would normally consume 3 or 4 times this amount given the chance. Modern strains of pigs are bred to have large appetites and put on weight quickly. Competition for feed is therefore intense and dominant sows will attack those lower in the hierarchy.

Boars

The boars are kept in spacious pens with solid floors and a light covering of sawdust. The risk of foot injuries is therefore reduced, though they would also benefit from the provision of bedding for comfort and fibrous food to reduce hunger.



Boar pens have solid floors with some bedding

Experimental deep-bed system

Date of visit	14 July 2003
Certification scheme	None
Number of sows	130
Breed	Large White/Landrace sows x Duroc
Food	Commercial feed. Weaner and grower food contains antibiotics
Average and maximum farrowings per sow	
Farrowings per year	
% piglets stillborn	
% live born piglet mortality	
Average number of piglets weaned per farrowing	9.3
Number piglets per sow per year	
Mutilations	Castration, tail-docking and teeth-clipping
Weaning age	4 weeks
Growth rate	
Food conversion rate	
Weight when sold on or slaughtered	
Transport to slaughter	20km
Price to farmer	2 Reals (0.75 Euros)/kg
Market	
Number of stockpersons	2.5
Number of inspections	2 per day
Health problems	None observed, though routine use of antibiotics is a concern
Other welfare issues identified	Sows closely confined for 3 days after farrowing and for 4 weeks after weaning. Sows, young piglets and boars have little or no access to bedding/forage. Mutilations. Weaning age

Pig Case Study Brazil 4

Semi-intensive pig production system, Urla Tanardus, Concordia

Deep-bed system for weaners and growing pigs; loose-housed dry sows

Urla Tanardus is a small family run farm. The farm has 25 breeding sows and the weaned pigs are sold on at 25kg. The pigs are Large White x Landrace crosses. The food for the pigs is produced locally and is home mixed. The pig unit comprises a mixture of intensive and semi-intensive production systems. All the pigs are housed indoors in open-sided buildings with curtains. During the day, the curtains are raised to increase air flow and reduce the temperature. This gives them good access to daylight and fresh air.

The farm has a number of features aimed at improving pig welfare. These included:

- The weaners are housed on a deep-litter system
- The sows receive grass swards daily as a nutritional supplement/enrichment
- The dry sows are loose-housed



Deep litter for rooting and comfort

more frequently than once a year after which 6-7 batches of pigs have been grown.

After weaning, the sows are kept loose-housed in pens. The pens measure 3x4m and house 3 or 4 sows. The group remains together until they are ready to farrow again so aggression is minimised. Although the sows have freedom of movement, they would benefit from constant access to bedding.

The sows are floor fed, which can lead to aggression. The diet is supplemented with swards of grass that are cut fresh each day as a cheap source of nutrition. The behaviour of the sows showed that the grass had a large effect on improving welfare. The grass not only provides additional nutrients, it also provides a degree of gut fill. This is important because the standard diet is not sufficient to satisfy the big appetite of the sows. The grass also has recreational value and can help to reduce boredom. Permanent access to fibrous food would improve welfare further.

The farrowing sows are kept in old wooden farrowing crates with wooden slatted floors and no bedding. The farrowing accommodation could have been improved for the piglets. The creep areas have no bedding and no supplementary heating. The creep areas appeared to be draughty, the piglets were huddled together and some were shivering. The piglets are tail-docked, their teeth are clipped and the males are castrated.



Sows are loose housed and receive green forage each day to supplement diet

The weaners are kept in a deep litter system. Approximately 20 weaners are housed in pens measuring 4x5m, so stocking density is relatively low. The type of litter used is sawdust that is about 50cm deep. The litter provides both physical and thermal comfort. It also gives the pigs the opportunity to dig and root. The litter is occasionally turned by fork. More litter is added as required. For behavioural and hygienic reasons, the litter could have been changed

Deep-bed system for weaners

Date of visit	15 July 2003
Certification scheme	None
Number of sows	25
Breed	Large White x Landrace
Food	Home grown mix
Average and maximum farrowings per sow	
Farrowings per year	
% piglets stillborn	
% live born piglet mortality	
Average number of piglets weaned per farrowing	
Number piglets per sow per year	
Mutilations	Castration, tail-docking and teeth-clipping
Weaning age	4 weeks
Growth rate	
Food conversion rate	
Weight when sold on or slaughtered	
Transport to slaughter	
Price to farmer	
Market	
Number of stockpersons	1
Number of inspections	2 per day
Health problems	None observed
Other welfare issues identified	Farrowing sows closely confined at all times. Dry sows and boars have no access to bedding. Fibrous food not available for sows at all times. Young piglets appeared to be chilled. Mutilations. Weaning age

Pig Case Study Brazil 5

Outdoor system for sows, Prezzotto Farms, Xanxerê, Santa Catarina

Free-range system for dry sows, farrowing sows and weaners

Prezzotto is a large family firm running a number of agricultural enterprises in Southern Brazil. They keep pigs in a range of intensive, semi-intensive and free-range systems.

The 35 hectare free-range system includes many features to improve welfare:

- Sows have access to range with a good covering of grass
- Sows are kept in groups
- Farrowing sows have freedom of movement
- Weaners also have access to range for the early part of their lives
- A range of measures are used to keep the animals cool in hot weather



Dry sows enjoy spacious grassy paddocks



Shade and wallows are important in hot climates

Sows naturally live in groups, often of sisters. Keeping them in groups throughout their life-cycle helps to maintain their need for social relations without undue aggression.

The good grass cover allows natural foraging behaviour. Pregnant sows are usually fed on restricted rations to prevent obesity. This leaves them feeling hungry leading to stereotypic behaviours such as bar-biting, sham-chewing and stone-chewing. Access to grass for grazing and rooting helps the sows to cope with hunger without putting on too much weight.

The sows are kept in groups and transferred into farrowing pens. A farrowing hut is provided for each sow.

This outdoor unit is new and they are still experimenting. A major problem is piglet mortality at 16%, mainly due to crushing. They are looking for ways to reduce this. The huts have guard rails either side to give the piglets

large escape areas and wooden blocks are applied to prevent very small piglets from escaping from the huts.



Walk through farrowing huts help keep sows cool

Further changes which might reduce crushing mortality include:

- Providing individual pens for farrowing sows (sows naturally seek seclusion around farrowing, returning to the group when the piglets are a week or more old)
- Providing more bedding in the huts, especially in the escape areas shortly after farrowing
- Providing more freedom of movement for the sow to make it easier for her to lie down carefully

The piglets are weaned at 22 days and removed to a separate free-range enclosure where they grow to 25 kg. After this they are fattened in an intensive system. Welfare could be improved by later weaning and by fattening in more enriched environments.

In the sub-tropical environment of Southern Brazil, heat-control is a major welfare issue. Prezzotto deal with this by:

- Providing shades and wallows for the dry sows
- Providing openings at both ends of the huts for the farrowing sows

- The roofs of these sheds are covered with insulating material to provide shade
- One side of the hut is made of plastic tarpaulin which can be opened to increase ventilation
- Weaned piglets are also provided with a hut and partly sheltered paddock

Prezzotto are developing free-range systems because they believe it is kinder to pigs and they can grow better. As their commercial director, Fernando Prezzotto, explained to us, 'if you look in their eyes the outdoor pigs are happier than the indoor ones. If you walk around free-range sows they are calm and happy and come to you; indoor animals are far more nervous.' He also finds that outdoor pigs are more resistant to disease.

Prezzotto also run a free-range unit near Brazilia with 1200 sows, and are planning one in another state with 5000 sows. Fernando Prezzotto hopes free-range will prove to be the system of the future. Prezzotto hope to develop markets for free-range pigmeat both in Brazil and for export.



Farrowing rails designed to protect piglets

Free-range system for breeding pigs	
Date of visit	16 July 2003
Certification scheme	
Number of sows	400
Breed	Dalland x Penarlam
Food	As for intensive systems. Plan to change this
Average and maximum farrowings per sow	
Farrowings per year	
Average litter size	10-12
% piglets stillborn	
% live born piglet mortality	Up to 16%
Average number of piglets weaned per farrowing	
Mutilations	Includes nose-ringing of sows and castration and routine tail-docking of piglets
Weaning age	22 days
Food conversion rate	
Weight when sold on or slaughtered	
Transport to slaughter	
Price to farmer	
Market	
Number of stockpersons	4
Health problems	Some liver and lung spots
Other welfare issues identified	High piglet mortality, early weaning, mutilations. Growing pigs fattened intensively

Pig Case Study Brazil 6

Intensive deep-bedded educational pig production system, Technical School, Concordia

Farrowing sows and growing pigs

Concordia Technical School provides its pupils with an education that has a strong agricultural component. The school has a range of facilities for livestock including pigs, broilers, laying hens, dairy cows, sheep and rabbits. For educational purposes, a range of intensive and semi-intensive systems are used.

It has a small pig unit that is experimenting with less intensive methods of production.

The farrowing sows are first kept in farrowing crates. Although this practice cannot be condoned, they only remain there until the piglets are six days of age. Piglets are most at risk of being accidentally crushed by their mothers for the first 2-3 days after which there is much less reason for keeping the sow closely confined.

In intensive production, sows that go on to be closely confined for 3-4 weeks become chronically stressed because they are unable to get away from the constant attention of the piglets.



Deep litter encourages foraging behaviour

After six days they are moved to a multi-suckling system that houses six sows and all their piglets. The system offers the pigs plenty of space to move around and the sows are able to get away from their piglets from time to time. In a natural environment, sows and piglets will normally congregate back into groups, once the piglets are several days old. The sows are familiar with each other since they were kept together during gestation so there is no fighting when they are re-grouped. The piglets are able to socialise with other litters from an early age. This means that there is less stress at weaning because they are not mixed with unfamiliar pigs. The system is deep bedded with straw so that both sows and piglets are able to perform rooting and foraging behaviour. The building has open windows with shutters for good ventilation. The piglets are provided with a heated creep area to keep warm.



Growing pigs on deep litter

The piglets are weaned onto a deep litter system. The ground wood litter provides both comfort and a source of enrichment. The pigs remain on litter systems throughout their life. The risk of abnormal behaviour such as tail-biting is therefore much reduced.



Piglets begin rooting at an early age



Deep bedding provides comfort

The sows are returned to sow pens and kept in their original groups. Although there is no bedding, the sows at least have the freedom to move around. Aggression, which can be a particular problem when it comes to feeding sows in groups, is eliminated by feeding them separately in stalls. Once the sows have finished feeding they are released from the stalls.

Educational deep-bed system for farrowing sows (unfortunately, key information was not recorded)	
Date of visit	15 July 2003
Breed	Large White x Landrace
Mutilations	Clearly includes tail-docking; probably includes castration
Other welfare issues identified	Sows are confined in farrowing crates until the piglets are 6 days old. The dry sows have no access to bedding. Some pigs (not referred to in above account) kept in intensive systems without enrichment. Mutilations

Pig Case Study Ivory Coast 1

Extensive village systems, Abigui, Dimbokro

3 extensive easy-care traditional production systems

It is common for village farmers in the Ivory Coast in Africa to keep a few breeding pigs and their progeny. The joints of meat they produce, killed and butchered on the farm for sale at the local market, provide an important source of income.

N'dja Malan, Gnamien Kanga and Konan Kouadio Etienne are three small farmers from the village of Abigui in the prefecture of Dimbokro. They obtain their main livelihood by growing crops, but they keep pigs as a source of additional income.

They operate a traditional 'easy-care' system of production, feeding their pigs once a day when they return from tending their crops. They provide their pigs with a carbohydrate-based maintenance diet consisting largely of cassava and papaya. The pigs' growth rates will be largely dependent on the amount of protein they forage for themselves to supplement their diet.



Photo: © MAEP/CIWF Trust

Traditional African pig production



Photo: © MAEP/CIWF Trust

Pigs, chickens and goat scavenging food waste

The farmers originally obtained their stock as gifts from relatives.

Animal welfare aspects

Traditional systems such as these have many welfare advantages:

1. The pigs have considerable freedom to control their own environment and welfare and to perform natural behaviours. For example:
 - They can choose when to forage and when to rest
 - They can huddle at night in family nests to keep warm
 - They can seek natural shade and wallows in the surrounding woodland when they want to cool down

Photo: © MAEP/CIWF Trust



Pigs are fed on carbohydrate foods like cassava

The pigs are not contained at all and are free to go where they like at all times, mixing amicably with other village



animals such as chickens, ducks and goats. The animals all have access to waste human food. The pigs then top up this diet with what they can forage from the village and its surrounding area. The villagers' crops are grown some distance away and are protected from the pigs and other animals by a fence. The pigs remain associated with humans to obtain food and protection.

Photo: © MAEP/CIWF Trust



Pigs can forage in the area around the village

- They can find most of their requirements for food, water and shelter in the surrounding area. Although they may not get all they want to eat, a hungry pig can always go out to forage.
2. Their life-cycle is not subject to frequent human interference. For example:
- They are not usually subject to painful mutilations
 - The sows breed naturally
 - The sows wean their piglets at the time of their own choosing

Photo: © MAEP/CIWF Trust



Piglets can huddle for warmth or seek the shade

Although there are occasional reports of piglet castration, mutilations are very rare in this region. Tail-biting is in any case uncommon in systems where piglets are free to explore their natural environment, so there is no need for tail-docking. Since the sows have relatively few piglets, it is not necessary to clip their teeth to prevent damage to the mother.

The piglets are spared the stress of early weaning. They can gradually increase their intake of solid food as their

mother reduces the availability of milk. Natural weaning may also help to ensure that the sow comes into oestrus when she is physiologically ready for it. The pigs remain in their natural social groupings, with several generations of pigs living together, until they are slaughtered.

3. The pigs are a local breed with a range of adaptations to their local environment. These pigs:
- Are said to be resistant to disease
 - Are dark skinned
 - Are small in size
 - Grow slowly
 - Have small litters



Photo: © MAEP/CIWF Trust

Piglets continue to suckle until naturally weaned

Animals kept in any environment for many generations without too much human interference become adapted through *Natural Selection*. For example, pigs with natural immunity to local diseases are likely to prosper and pass this on to their offspring.

A dark skin helps protect the pigs from sunburn. Smaller animals are better able to keep cool in a warmer climate. Relatively low productivity helps the pigs to thrive in an environment in which concentrated food is not available in large quantities and breeding cycles are likely to be controlled naturally by the food supply. In addition, the pigs do not suffer from many of the metabolic pressures experienced by intensively-reared pigs that have been bred for high performance rates.

Traditional systems also have some obvious welfare drawbacks:

- The diet will not always provide for the animals' nutritional needs
- Sick animals are not likely to receive any veterinary care
- The pigs may fall victim to predation and thieving

Nevertheless, their natural adaptations help many of them to thrive. The reported fact that the sows farrow twice per year suggests they probably are getting an adequate diet. Predation is not a problem locally, though the occasional piglet may fall victim to dogs if they stray too far from the protection of their mothers. However, thieving is considered a problem.

Access to waste human food at the village garbage dump brings with it potential risks for the spread of disease and for injury to the pigs. However, 90% is of vegetable origin and anything which is edible is probably consumed very quickly. If the pigs obtain access to human faeces, tapeworms could be a problem.

Economic and social aspects

This is a classic traditional low-input low-output system. The pigs are small, grow slowly and produce small litters. However, they survive on relatively little feed and generally look after themselves. Their wastes decompose and are recycled where they fall, helping to fertilise the land.

In contrast, modern intensive farming is a high-input high-output system. Intensive pigs are larger, grow faster and produce larger litters. However, they need large quantities of high quality feed, require more veterinary care and are much more dependent on their stockpeople for their welfare.

Intensive farming can produce meat cheaply for urban populations, but there are costs:

- Price of meat drops, reducing the income of small traditional producers
- The concentration of pig wastes can cause pollution problems
- Animal welfare can suffer in systems which prevent natural behaviours and interfere with the animals' natural life-cycles

Small farmers throughout the world are often very dependent on their animals to provide a reasonable

income as well as subsistence. Although these Ivorian farmers do eat some of the meat of their own pigs, they are mainly reared for sale as joints at the local market. The development of intensive farming can undermine the livelihoods of farmers such as these.

It is likely in the future that local farmers may have access to more productive 'improved' breeds of pig. This could have the potential to increase farm incomes, but there are also risks. Exotic breeds of pig may be less well adapted to:

- The low quality diet
- Local diseases
- Traditional easy-care systems of management

Furthermore, the adoption of exotic breeds brings with it the risk that these traditional local breeds will become extinct. Genetics which may be important for the future development of pig farming may be lost.

Many traditional breeds of pig and other farm animals are valued for qualities including flavour. In Spain traditional extensive systems of pig farming, using the traditional Iberian pig, produce hams which fetch high prices.

At present, these farming systems provide an important income through local village sales. There could be demand in future from urban centres for 'traditional tastes of the countryside.' If traditional methods with traditional breeds are developed, not abandoned, there may be opportunities for niche markets in the future. In the long term there may also be export opportunities. These will depend on the survival of both traditional breeds and methods of rearing.

These three farms give an insight into how pigs were traditionally reared throughout the world. This has only changed in highly developed countries over the last 50-60 years. Intensive systems now predominate in these countries and many of the skills associated with traditional ways of rearing have been lost.



Photo: © MAEP/CIWF Trust

3 traditional free-range subsistence systems

Farmers: N'dja Malan, Gnamien Kanga and Konan Kouadio Etienne

Dates of visit	30 July & 1 August 2004
Certification scheme	None
Number of sows	Not available. Total number of pigs including piglets: 15; 23; 32
Breed	Small local breed
Food	Cassava, papaya fruit and what they can forage for themselves
Average and maximum farrowings per sow	No data, but each farmer owns several generations of pigs of all ages
Farrowings per year	2
% piglets stillborn	No data available
% live born piglet mortality	No precise data. Death rate varies according to numbers of piglets born; higher when litter size more than 6
Average number of piglets weaned per farrowing	litter size usually 6
Mutilations	None
Weaning age	Natural weaning
Growth rate	Variable, but approx 80g per day (slaughtered at one year or more old)
Food conversion rate	Not known, but they will forage most food for themselves.
Weight when sold on or slaughtered	30-40kg
Transport to slaughter	Usually killed on the farm
Price to farmer	Not reported, but an important part of income
Market	Mostly sold as joints at the local market
Number of stockpersons	Varies; farmer and his children
Number of inspections	Once a day when fed
Health problems	Scab can be a problem. Pigs said to be generally resistant to disease
Other welfare issues identified	Likely slaughter methods (not reported). Risk of injury and to health at garbage dump. Low quality diet. Occasional predation by dogs and thieves

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