Welfare sheet – Pigs

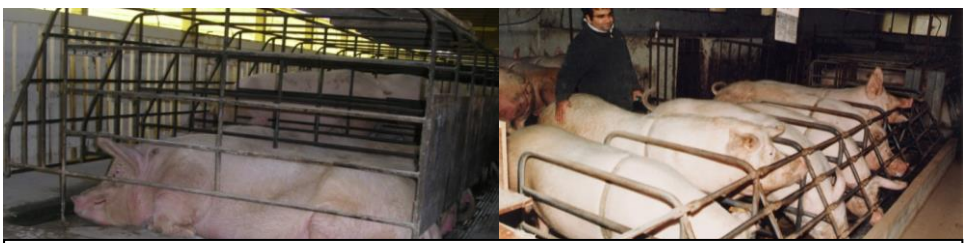
Pigs are reared for meat products such as pork, bacon and gammon. A sow on a commercial farm will have more than 2 litters of piglets a year. Sows are culled after having had 3 to 5 litters. Housing systems for pigs vary considerably and range from indoor intensive farming systems with barren environments and extreme confinement ('factory farms') to extensive farming systems that allow pigs to perform most of their natural behaviours. The housing of sows and boars often differs from that used for their offspring. China now produces over half of all pig meat in the world[1].

This document gives an overview of the different welfare problems associated with intensive pig farming. It will also outline how these welfare problems may be overcome in alternative housing systems that offer an alternative to intensive farming systems. There's serious welfare issues associated with the breeding and intensive rearing of pigs. Welfare can be affected by the interactions between the natural behaviours of pigs and the effects of housing and management. This can lead to issues such as the occurrence of abnormal behaviours (e.g. tail biting or oral stereotypies), injuries due to poor environments and pain due to mutilations.

Confinement

Sows

Most commercial pigs reared for meat are kept indoors in intensive units or 'factory farms'. The pigs are closely confined throughout their lives or are kept in barren pens at high stocking densities (expressed as the amount of floor space available for each pig). They are unable to carry out basic pig-specific behaviours such as exercising, socialising, exploration and foraging.



Sows in sow stalls (left). Tether stalls (right) – sows tethered by their girth. Stalls may cause physical injury, psychological stress and social deprivation

Stalls

Once a sow on an intensive farm, has been mated or artificially inseminated (AI) she may be placed either in a sow stall or a tether stall.

Sow stalls: a narrow steel cage that completely surrounds the sow.
Tether stalls: similar to stalls, but they the sow is fixed in position by using a tether or belt tied around her neck or girth. They are less common than free stalls.

The sow remains in a stalls throughout her pregnancy, which lasts for around 114 days (3 months, 3 weeks, 3 days). Sow stalls are now banned in the EU from 4 weeks into pregnancy until the last week of pregnancy[2] (when sows are normally moved to a farrowing crate). **There is a total ban on stalls in the UK, Sweden, Finland, Norway and Switzerland and some states in the USA. New Zealand has plans for a partial ban.**

The **severe restriction imposed by stalls affects the welfare of a sow, because she is unable to**:

- **Turn around:** the design of the stall is such that she can only stand up and lie down[3].
- **Exercise:** there is only enough space for a couple of steps forwards and backwards. The lack of exercise means that confined sows have a low level of cardiovascular fitness[4] and may suffer from weak bones[5] and muscles that can lead to lameness[6]. An Irish study showed that about 11% of breeding sows were culled due to lameness[7].
- **Interact freely with other pigs:** pigs are highly social animals and their confinement means they cannot socialise freely with other pigs, which can lead to stress and social deprivation[8].
- **Forage or root:** pigs are omnivores and will choose to have a varied diet, mostly high in fibre, and normally spend much of their time foraging and rooting for food, but sows in stalls are housed in barren conditions.
- **Dung in a separate area:** it has been shown that pigs have a specific 'toilet' area in their territory that they use for dunging[9]. In indoor housing, pigs show a clear tendency to leave the lying area (nest site) for excretory behaviour[10]. Stalls do not allow sows to move away from their lying area to dung.
- **Use the environment to control body temperature:** a pig will chose to wallow in mud for cooling and skin care. Their inability to control their body temperature may reduce their welfare[11].

Housing sows in stalls can lead to the development of abnormal behaviours, known as stereotypies. These include bar-biting (as pictured) and sham chewing (chewing as if eating, but no food is present)

- **Reproductive disorders**: including taking longer to reach puberty, failure to show oestrous and inability to conceive[12] [13].
- **Urinary disorders:** inflammation of the bladder usually caused by infection is common in stalled sows[14].
- **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 rapid growth rates and large appetites and would normally eat 2-3 times this amount. The high-energy grain-based mixed feeds used are quickly eaten and digested and result in chronic hunger[15,16]. Without straw bedding they have no additional way of gaining fibre to satisfy their hunger.

- **Stereotypies:** the behavioural and dietary restrictions imposed on intensively reared sows can lead to the development of abnormal behaviour. Stereotypies are sequences of movements that hardly vary over time and that appear to serve no purpose. They are regarded as a sign of poor welfare[17]. Sows in stalls may perform stereotypies such as bar-biting and sham chewing (not chewing anything, chewing 'air') for up to 22% of their active time[18].
- **Apathy:** stalled sows become less active and 'apathetic' or less responsive to their environment. It has been suggested that they show signs of clinical depression[19].

Group housing for sows

Since 2013, EU legislation requires that sows are in group housing after 4 weeks of pregnancy (sow stalls are banned throughout pregnancy in UK, Sweden, Norway and certain US states). This is one of the only pieces of legislation in the world for group housing of sows.

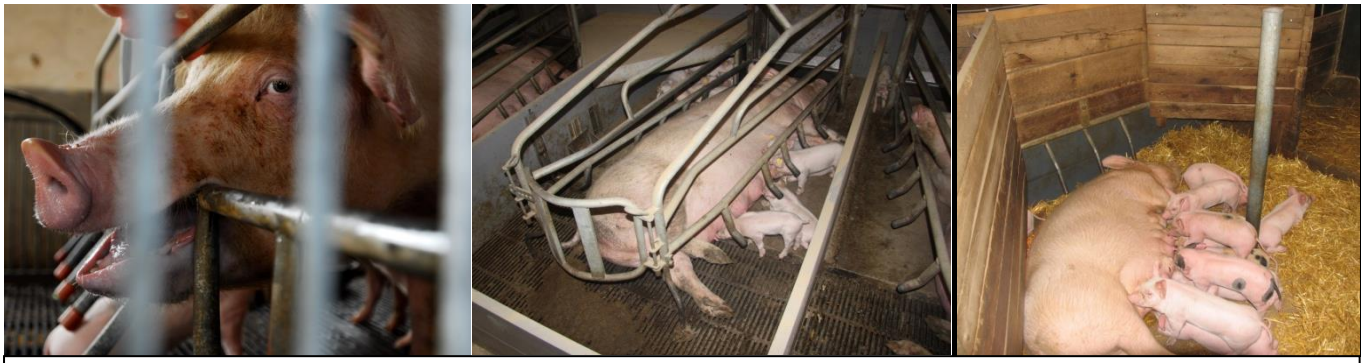
Group housing allows sows to socialise normally and prevents many of the welfare issues of sow stalls (see above). Furthermore, there is no evidence that group housing sows results in reduced reproduction[20]. The current knowledge about causes of reduced reproduction can ensure high farrowing percentages as well as large litters in sows kept in groups[21]. EU legislation requires a stocking density of 1.64 m^2 and 2.25 m^2 for gilts and sows respectively[22]. Many other countries will stock pigs at an even higher stocking density. When there is insufficient space in group housing due to high stocking densities this can lead to:

- An **increase in the level of aggressive behaviour, particularly during feeding and mixing**[23]. This can result in high rates of skin lesions, physical injuries and a greater variation in body condition within the group.
- **Stops sows being able to move away from aggressors** and therefore increasing the risk of being bullied[24].

It is important that group housing for sows provides enrichment and a reasonable stocking level. If sows are cramped in barren conditions (left) they will fight and sows are unable to move away from aggressors. By providing straw for bedding (right) and foraging (middle) and limiting stocking densities fighting can be minimised.

Farrowing crates

At 3-7 days prior to giving birth, sows in intensive farming systems are transferred to farrowing crates and kept there until their piglets are 3-4 weeks old (which is when they are weaned). Like sow stalls, farrowing crates consist of a steel cage that completely surrounds the animal. Some farms only use farrowing crates for the first few days when the piglets are at most risk of being crushed (when the sow lies down). In other systems, farrowing crates are only used for gilts (first time mothers) that have no experience with giving birth and are therefore more likely to savage their piglets. The first time farrowing is usually the most stressful for a sow.



Sows are confined to farrowing crates just before giving birth (left). They remain there until the piglets are weaned at around 3–4 weeks (middle). Free farrowing systems (right) have been designed to allow the sow more freedom to move, but there may be a higher risk of piglet crushing if the system is not well-designed or managed

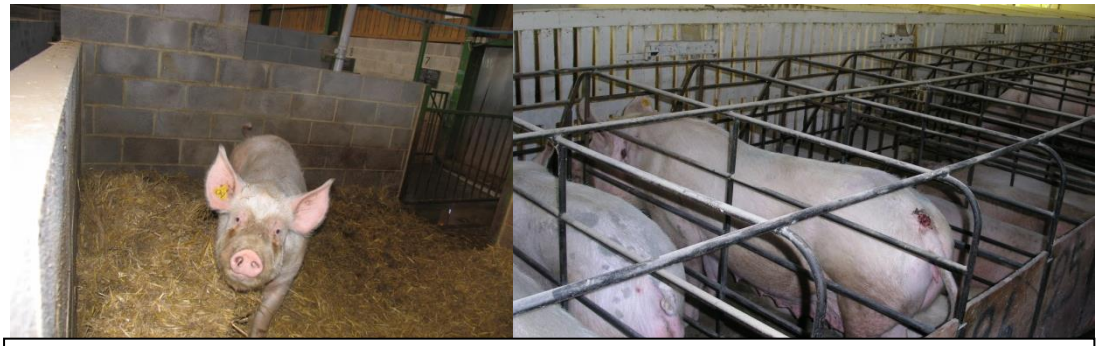
Farrowing crates **cause a number of severe welfare issues**, because sows are:

- **Constraint in the way they lie down**[25]**:** as the crates are purposefully designed to allow the piglets to get out of the way when the sow lies down, so that she does not crush her piglets.
- **Unable to explore for a suitable nest site**[26]**:** sows are highly motivated to construct elaborate nests prior to giving birth. One or two days prior to farrowing, sows would normally leave the family group and wander many kilometres in search of a suitable nest site. Restricting this natural behaviour to nest causes great stress to the sow at a time when she is about to give birth.
- **Unable to build a nest**[27]**:** once a nest site is found, they construct a nest using branches, twigs, leaves and grass. They then crawl into the nest to give birth[28]. Farrowing crates are typically barren and sows are given no material with which they can build a nest, which causes frustration.
- **Showing behavioural and physiological signs of stress**[29]: sows show restlessness and frustration and continually 'fight' the crate by rooting and biting the metal bars. Signs of stress include elevated levels of the stress hormone cortisol, cuts and bruises, exhaustion and a higher body temperature. There is also a link between restrictive housing around farrowing and development of piglet-directed aggression (savaging), which is an abnormal maternal response[30].
- **Unable to get away from the constant attention from their piglets**[31]**:** this may cause stress, as the sows teats can become damaged from the piglets that are vigorously suckling[32].
- **Physical injury:** sows can develop skin lesions on hips, back and shoulders from bumping against the bars when lying down and from prolonged contact with both the hard floor and the bars of the crate[33]. They may also get foot lesions due to slatted flooring[34].
- **Stereotypies: t**he behavioural restrictions imposed by the farrowing crate can lead to the development of abnormal behaviour. Sows in crates may perform stereotypies such as bar-biting and sham chewing (not chewing anything, chewing 'air') (see section on stalls).

In Sweden, farrowing crates may only be used for a maximum of one week. They are prohibited in Norway and Switzerland, where they use non-confinement systems to achieve similar production results (measured as the number of piglets weaned per sow).

Boars

Adult male pigs kept for breeding are called boars. They are usually housed singly in pens. This is to prevent them from fighting with each other. The pens are usually used for the mating process and so need to be big enough to also add one or more sows. Bedding is often provided to ensure good foothold during mating. However, some boars are still kept in small slatted floored pens where they can develop foot sores and other injuries. Boars are sometimes kept in sow stalls and only taken out at mating time. This is not allowed in the EU as boar pens must allow the boar to turn round and hear, smell and see other pigs. The minimum space allowance of 6 m^2 precludes housing boars in stalls in the EU[35]. If confined in small pens, boars can then experience similar welfare problems seen in confined sows: unable to turn around; lack of exercise; unable to exhibit natural behaviours such as foraging, rooting and socialising; unable to dung in a separate area; unable to control their body temperature; and they may show stereotypic behaviours and suffer apathy.



Boars are often housed singly in a pen (left). Some are used as teaser boars and may be housed in sow stalls, next to sows (right)(this is banned in the EU).

Some boars are kept as **teaser boars** to help bring sows into oestrous. Where boars are kept as teasers or housed on their own, the lack of social contact and confinement may lead to welfare problems similar to those seen in confined sows, such as stereotypies.

Meat pigs

In intensive farm systems pigs are reared in barren conditions with part-slatted (left) or fully slatted flooring (right) and no enrichment

Rearing pigs

Pigs raised for meat are usually housed together in groups from weaning at about 3–4 weeks of age. In intensive farming, growing and finishing pigs are kept in barren pens that are often highly crowded. This can lead to:

- **Aggression:** hostility can increase, due to crowding and can lead to fighting and physical damage (scratches and bites). In cramped conditions pigs are unable to escape from aggressors[36]. Unfamiliar pigs will fight to establish a hierarchy and so mixing should be avoided. Aggression can also be a problem when there is competition for resources such as food (pigs can't all get to feed at the same time) or space. Problems can be exacerbated by poor environments e.g. those lacking bedding (e.g. Straw).
- **Disease**: high stocking densities can lead to stress which can make pigs more prone to disease[37].
- **Increased risk of mortality levels**: stress can lead to lower growth rates[38] and may ultimately lead to higher levels of mortality.

Enrichment

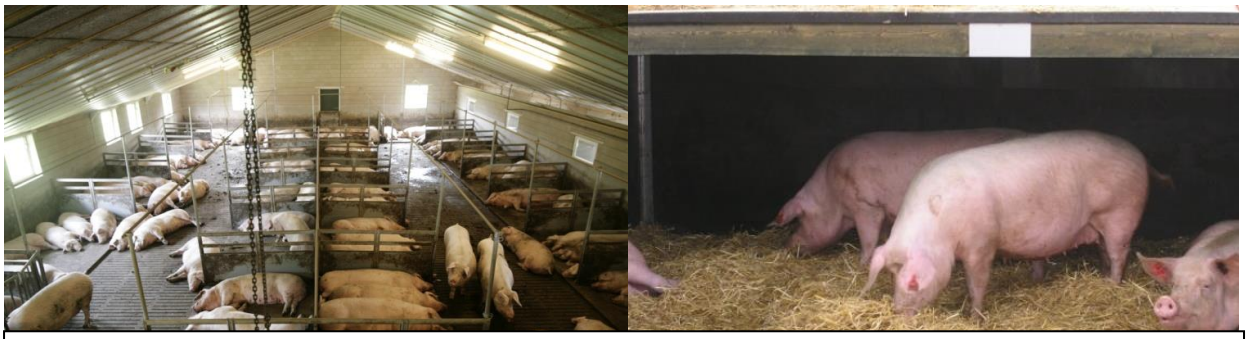
Pigs reared in intensive farming systems often live in barren conditions. Outside the EU there is no legislation requiring this as compulsory. The EU Pig Directive requires that all pigs must have permanent access to manipulable material to enable proper investigation and manipulation activities[39]. However, in most Member States, pig producers are not complying with this legislation[40].

Good manipulable materials (or enrichment) for pigs need to stimulate pig-specific behaviours such as exploration and foraging and sustain the pig's attention over time[41] [42]. This should also be practical to employ[43]. Bedding consisting of straw (or other materials such as saw dust or rice hulls peat, compost, and various wood chips[44]) has the highest potential to be successful enrichment and it also reduces the occurrence of harmful social behaviours such as tail biting[45] [46].

Intensive farming systems often use pens with fully or partly slatted floor, to aid removal of pig waste. Such floors do not allow for bedding, as this would fall through the slats and may block up the slurry system underneath. If bedding cannot be used, point-source enrichment objects or pig 'toys' can be provided. If well-designed (e.g. they are complex, can be manipulated and chewed and are partly edible - see references above), they can occupy pigs. However, it is more difficult to maintain their interest in toys compared to (straw) bedding[47].

A barren environment can lead to welfare problems as described in the previous sections on sows and boars. For growing pigs, it can also mean:

- **Frustration and boredom:** They are unable to express their natural behaviour such as foraging and rooting. This can lead to frustration and boredom[48].
- **Lameness:** The lack of (straw) bedding **stops pigs being able to rest comfortably** and can lead to higher lameness levels as pigs are in direct contact with the floor[49]. Inadequate flooring is a main factor for physical damage to the legs and claws of pigs (as a result of slipping and consequent muscle and joint injury, or cuts and grazes to the pig's knees, fetlocks, hocks and elbows). Pigs can also develop bursitis, which is swelling of the hock joint. All these injuries can restrict their behavioural freedom[50].
- **Tail biting:** With a lack of a suitable substrate in crowded conditions, the need to bite and chew that pigs have can be re-directed towards pen fittings and other pigs. Bitten tails can bleed and this attracts other pigs, so that the behaviour can quickly spread throughout the whole group. **Tail-biting is more common when pigs are frustrated or uncomfortable**, for example, because of inadequate air quality, poor flooring or crowding[51] or after mixing unfamiliar pigs[52]. Tail docking (see section on mutilations) is practiced to minimise the risk of tail biting.
- **Thermal control is limited:** as (straw) bedding allows thermal comfort[53].



Pigs (including sows) reared in intensive systems often live in barren conditions. Slatted or partially slatted flooring is typically used to aid removal of waste (left).In the EU, all pigs must have permanent access to manipulable material to enable proper investigation and manipulation activities (e.g. straw bedding, right)

Mutilations

Piglets

Shortly after birth, piglets are given a series of vaccinations and a number of painful mutilations are carried out, often without any sedation or pain relief. These procedures include:

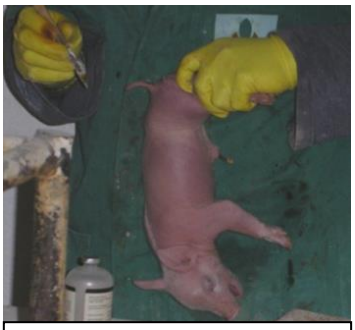
Tail docking
Tails are docked by removing up to two thirds of the tail with a hot blade or sharp pliers. This is to try and reduce the incidence of tail-biting later in life (see previous section on tail biting). Tail docking can lead to the development of neuromas (a growth or tumour of nerve tissue) which occur when the severed ends of

nerves attempt to regrow[54]. The neuromas may cause chronic stump and "phantom" pains, similar to those suffered by human amputees[55]. Tail docking causes pain as indicated by increased tail wagging and grunting immediately after the procedure[56]. Tail biting should not be a problem in well managed farms that provide enough manipulable material to occupy the pigs (see section on enrichment). Routine tail docking is banned in the EU but this rule is not adhered to[57].

Teeth clipping/grinding

The piglets' sharp corner teeth are removed down to the gums by clipping them with sharp pliers or the tip of these teeth is removed with special grinders. The EU Pig Directive does not allow the routine teeth clipping of pigs[58]. Teeth grinding and clipping can cause wounds, bleeding, fractured teeth and infections (more severe with tooth clipping) and has been associated with pain[59]. Teeth clipping also results in behavioural reactions such as more frequent opening and closing of the mouth[60]. Teeth clipping/grinding is done to reduce the risk of piglets causing damage to each other (while fighting for a teat) or the sow's udder, however, the incidence of teat lesions are similar if the piglets' teeth are ground or left intact[61] [62]. Teeth reduction is not necessary on well managed farms with sows that do not have very large litters, as there will be less competition for teats in smaller litters.

Piglets teeth a clipped to help reduce injury to the sow's teat



A piglet about to be castrated without any pain relief

Castration

In some countries, male piglets are castrated by surgically removing their testes with a scalpel or sharp knife. This is to reduce 'boar taint' which is a flavour in meat from mature pigs that is produced as a consequence of sex hormones. Castration causes considerable pain and distress[63] [64]. Castrated piglets are less active, take longer to lie down and are more likely to tremble, shake their legs, slide or jerk their tails[65]. Immuno-castration, involving a vaccine against the male hormone GnRH, has recently been licensed in the EU (Improvac). It prevents testes development and requires two injections at least 4 weeks apart. Immuno-castrated pigs show less aggressive behaviour than intact boars[66].

Ear notching

This is a method of identification which involves cutting several notches around the tip of each ear using notching pliers. Other methods of identification such as ear tagging are also used. Both methods are painful, and piglets display pain-related behaviours such as being awake and inactive after the procedures[67].

Pig's ears may be notched as a form of identification, this is a painful method

Female spaying

Female pigs may be spayed at an early age without any pain relief so that they can be fattened for longer, while in contact with male pigs. This is known to be the case for Iberian pigs in Spain[68].

Adult pigs

Tusk-trimming

Boars may have their tusks cut to prevent injuries to stockpersons and other pigs. Tusks are usually removed down to gum levels using bolt cutters or saws, but clippers should not be used as they risk fracturing the tusk root. This may leave the pulp cavity (that contains sensory nerves), open to infection[69]. This procedure can therefore cause considerable pain[70].

An Iberian pig with nose rings – used to prevent rooting. This is a painful method

Nose ringing

Nose ringing involves the insertion of metal rings into the nose. This is painful because of the high level of sensory nerves in a pig's snout[71]. Nose ringing aims to prevent rooting and other exploratory behaviours that can be destructive to

the environment[72]. Environmental and management considerations should therefore be made before resorting to nose ringing.

Early weaning

Piglets are removed from their mothers when they are 3-4 weeks of age, though it is also done when they are only one week of age (this is more common in the USA). Normally, a sow would not begin to wean her piglets until they were at least 12 weeks of age. EU rules prevent weaning before 28 days for most pig-rearing systems, except in "all-in, all-out" units where the limit is 21 days[73]. Some organic farm schemes in the EU require weaning no earlier than 8 weeks[74].

On intensive farms, weaner piglets are in placed in so-called flat deck pens, which are often barren and have slatted or part-slatted floors or litters are put in straw pens. Litters are often mixed with other litters. Weaning is a highly traumatic event for piglets as they:

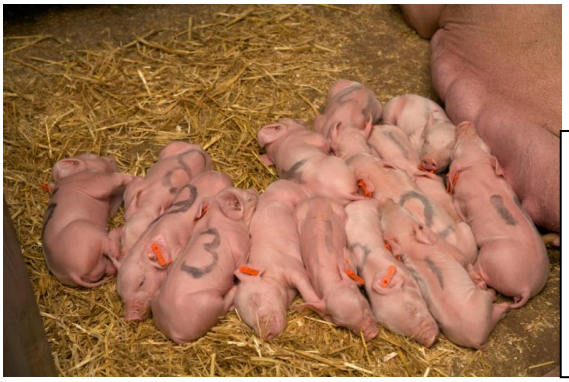
- **lose their mother for** feeding, nurturing and protecting;
- are being put on an **unfamiliar diet;**
- moved to an **unfamiliar** and often **featureless environment;**
- are often being **mixed with other litters,** which can **lead to fighting**[75];
- **can re-direct suckling behaviour** to pen mates. Piglets will look for a substitute udder and suck on the bellies and other parts of their pen mates, causing sores and irritation in order to fulfil their motivation to suckle[76];
- can experience stress, which reduces immune function leaving them **more prone to diseases such as PMWS**[77] (Post Weaning Multi Systemic Syndrome)[78] and **PRRS** (Porcine Reproductive and Respiratory Syndrome) [79] and **scouring** (diarrhoea)[80].

Piglets reared in intensive conditions will be born in a farrowing crate where there is little or no enrichment (left). They are weaned at 3–4 weeks, but sometimes as young as 1 week old. This leaves them more susceptible to diseases like Post Weaning Multi Systemic Syndrome (PMWS).

Genetics

The selection of modern pig breeds has led to a number of welfare issues:

- **Predisposition to tail biting:** genetic factors appear to have some influence on tail-biting behaviour, and there is some evidence that leaner animals are more predisposed to tail-bite[81].
- **Litter size:** sows have been selected for greater litter size. This can increase the number of weaker piglets that find it difficult to feed and therefore survive. It also leads to more competition at the udder[82].
- **Body condition**: modern pigs have been bred for reduced backfat which can lead to problems with body condition during lactation[83].
- **Growth rates:** selection for rapid growth rates has led to more pressure on the heart and lungs to keep up with the speed of growth[84]. It can also lead to problems with large appetites in adults that need to be feed restricted[85].



Increased litter size, body condition and higher growth rates are all traits that have been selected for when breeding pigs for meat. This selection can have negative welfare impacts.

Higher welfare systems

Alternative pig farming systems aim to address the two main welfare issues - pigs in alternative systems often have more space and are group housed. The environment can also be enhanced, for example with indoor enrichment and/or with an outdoor area. Alternative systems offer the potential for higher welfare compared to intensive systems, but welfare is not guaranteed, as this also largely depends on good management.

Enriched Indoor housing

Group housing for pregnant sows

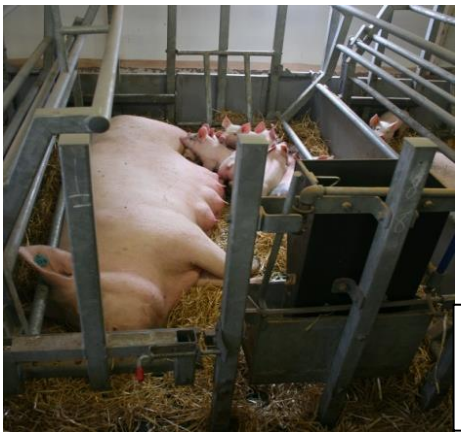
The welfare of dry sows can be improved by providing **more space to exercise, to rest comfortably and to dung away from lying areas**. Solid flooring with good quality (clean) straw bedding helps to maintain good hygienic conditions and has a positive impact on thermal comfort, hoof condition, lameness and skin lesions in sows[86]. Housing sows in groups allows them to socialise.

Several feeding systems have been developed to overcome problems with aggression at feeding time. In some systems the sows are separated at feeding time in individual (lockable) feeding stalls with electronic sow feeders[87] or with trickle-feed systems that release food at a slow rate[88]. Scatter feeding distributes food over a large surface area so that sows have more room to avoid each other while eating[89].

Pregnant sows in the EU are required to be housed in groups after the first 4 weeks of pregnancy. Sows and gilts should have manipulable material at all times. These sows are tail docked, but in well-managed systems, with enough manipulable material like straw, this should not be necessary.

Free Farrowing systems for sows

The welfare of sows can be improved by providing farrowing systems in which they are not restrained. Group farrowing systems allow the farrowing sows freedom of movement, the sows farrow in individual boxes. Piglet survival is a key parameter for economic viability; so alternatives to the farrowing crate must have comparable performance in order to be adopted[90]. There are a number of different systems that have been, and are continuing, to be developed[91] and they need to be well-designed and managed to enhance the welfare of sows and piglets[92]. Maternal behaviour by the sow can be optimised by providing more space, a nest area with long straw bedding and the right physical and thermal environment[93].



Individual farrowing pens (for example PIGSAFE and free farrowing system[94]) can overcome the problems of group farrowing systems where sows can enter each other's boxes, and meet the sow's need for seclusion. The provision of deep straw bedding in farrowing pens can satisfy the sow's motivation for nesting. The piglets have bedding that provides both physical and thermal protection. Other protection devices such as anti-crush bars and escape areas are essential for reducing piglet mortality.

Free farrowing systems allow the sow to move around and are designed to ensure the piglets can easily move away when the sow is lying down

Weaner pigs

Higher welfare systems for weaners consist of **indoor deep-bedded systems**. The weaning process challenges the immune system and so fewer weaners are reared outdoors. Piglets are prone to chills, so the best forms of enrichment, such as straw bedding, also provide thermal comfort. **Bedding** also encourages play and the development of natural foraging behaviours. In different parts of the world, **different substrates** have successfully been used as bedding including straw, wood shaving, rice hulls and peanut straw. **Outdoor rearing generally provides the most enriched system.**

Pigs in higher welfare systems are reared on solid floors with straw bedding. This provides enrichment and thermal comfort

Rearing pigs

Higher welfare systems for rearing pigs are spacious deep-bedded barns. **Bedding allows for pig-specific behaviours (for example foraging, rooting, temperature control and chewing), this improves their welfare**[95]. Various bedding substrates can be used, such as straw (wheat, barley, rape, peanut), wood shavings, sawdust, peanut and rice hulls, peat or spent mushroom compost. Bedding also improves physical and thermal comfort and provides a good foothold to reduce the risks of leg injuries and lameness[96].

Outdoor systems

Sows

In several countries around the world, dry sows are kept in groups in outdoor paddocks enclosed with electric fencing. Shelter is generally provided by huts/arks with deep bedding that can be moved around to manage the damage done to the soil. Outdoor systems have the highest welfare potential because they allow a full range of natural behaviours.

Destruction of the pasture can be a problem with outdoor sows. In some countries, the sows have their noses ringed to discourage rooting (see section on mutilations). In outdoor systems pigs need protection from extremes of temperature. In hot countries, this must be provided by

Outdoor systems for sows have the highest potential for god welfare, if bedding and shelter is provided and no mutilations are performed

shaded areas and wallows. In colder climates deep bedded farrowing huts/arks can provide both thermal and physical protection for the piglets and meet the sow's need for nest building.

Organic free range systems[97] keep sows outdoors and nose ringing is not permitted (in EU). Pasture is protected by:

- keeping **stocking densities low**;
- regularly **rotating** paddocks to allow them to recover;
- providing additional **high fibre forage**;
- using **breeds that graze** more and root less e.g. Saddleback pigs.

Rearing pigs

Well-managed outdoor systems for growers generally provide the highest welfare potential as long as they offer protection from extremes of weather. Data from the UK shows that pigs reared outdoors can show better growth rates and lower mortality than those kept in intensive systems[98]. Growing meat pigs are not usually kept outdoors as they can be highly destructive to the pasture. In some countries, they try and manage this by using nose rings, but this limits natural behaviour (see section on mutilations). In organic systems, where pigs must spend the majority of their life outdoors, outdoor areas with bedding are often provided instead of keeping pigs in fields.

Wallows allow pigs to cool down them to cool. It is important that free range pigs have the ability to control their body temperature.

Transport & Slaughter

Transporting pigs to slaughter can be very stressful. Pigs do not travel well and they find the vibrations associated with travel uncomfortable[99]. They can suffer from motion sickness due to vibration, acceleration, braking and cornering[100]. Pigs are particularly susceptible to heat stress during transport because they are unable to lose heat through sweating[101]. If pigs suffer from some degree of lameness, it will make it difficult for them to negotiate ramps during loading and unloading especially during wet (winter) conditions or when they suffer from lameness[102]. When pigs have been stressed by transport and pre-slaughter handling, it can also affect meat quality[103]. Pigs may die during transport or in lairage at slaughterhouses, due to poor welfare. For example, American yearly estimates for transport losses are currently 1.1 million pigs (1%)[104].

The **slaughter process** has a number of welfare issues affecting all types of pigs. In many slaughter houses, the pigs are driven up narrow races in single file. This is stressful because the pig's natural reaction to being fearful is to back away and huddle together.

In most modern slaughter houses, pigs are rendered unconscious by stunning them with an electric or captive bolt device (that shoots a metal pin into the pig's brain) [105]. This is relatively quick and painless if carried out efficiently. After stunning, the pig's throats are cut to kill them ('bleeding out'). If pigs are not stunned before bleeding, this will lead to a slower and more painful death. In some slaughter houses, gas is used to induce unconsciousness or even death. Carbon dioxide is most commonly used for this, but pigs find it aversive. However, Carbon dioxide has an anaesthetic effect and results in loss of consciousness more quickly than some other non-aversive gas mixtures that are used, such as argon or nitrogen[106]. Modern slaughter houses gas pigs in groups, thus reducing the stress caused by moving pigs in single file. In the EU, the killing of animals is regulated by the Slaughter Regulation[107] others countries don't have such legislation to protect animals during slaughter.

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