COMPASSION in world farming **Food Business**

Indoor housing systems for dry sows – practical options

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Photo © D.Arvey/CIWF

Indoor housing systems for dry sows – practical options

Individual stall housing for dry sows beyond a period of four weeks after service is no longer permissible in any EU Member State (as of January 2013). Producers need either to convert existing housing or construct new housing to comply with the legislation. It is imperative they invest in systems that deliver good standards of welfare for their sows and respect all elements of the legislation affecting dry sow housing.

MAIN LEGISLATIVE REQUIREMENTS FOR DRY SOWS:

For all holdings as of 1 January 2013

Minimum space allowance for gilts and sows in groups must be 1.64m^2 and 2.25m^2 per animal, respectively*. At least 0.95m^2 per gilt and 1.3m^2 per sow must be solid flooring (Article 3-1b and 2a)

Sow stalls will be prohibited from four weeks after service to one week before the expected time of farrowing (see Article 3-4)

Sows and gilts must have permanent access to manipulable material to enable proper investigation and manipulation activities (Article 3-5)

In order to satisfy hunger, all dry pregnant sows and gilts must be provided with bulky or high fibre food (Article 3-7)

Since a range of systems are adopted by producers, this leaflet considers the factors that affect the welfare of sows in group housed systems, describes the main group housing and feeding systems in commercial use and how they perform in relation to the needs of the sow, and suggests ways of assessing the welfare of sows in group housed systems. Only systems capable of complying with the legislation fully are considered.

Compassion recommends

A good dry sow housing system should provide an interesting environment which allows for the expression of a wide range of behaviours. Feed and fibre provision should reduce aggressive behaviour, particularly around feeding, and allow for satiety. Aggression and the number of stressors during mixing of unfamiliar animals should be minimised. Attention should be paid to:

Non aggressive behavioural expression, by providing

- material for rooting and foraging (example straw, rice husks, woodchip bark)
- a space allowance of 3m^2 per sow or more
- functional areas in the pen (example separate feeding, resting and activity areas).

Improving satiety, by providing

- fibre in the diet (example maize silage)
- a feeding method that minimises aggression and maximises duration of foraging.

Minimising aggression during mixing, by providing

- a specialised mixing pen with additional space per sow to allow subordinate sows to escape more aggressive sows
- gradual familiarisation of sows via fence line contact
- flexible barriers or large straw bales to escape behind
- feed *ad libitum* for the mixing duration until sows have settled their social order.

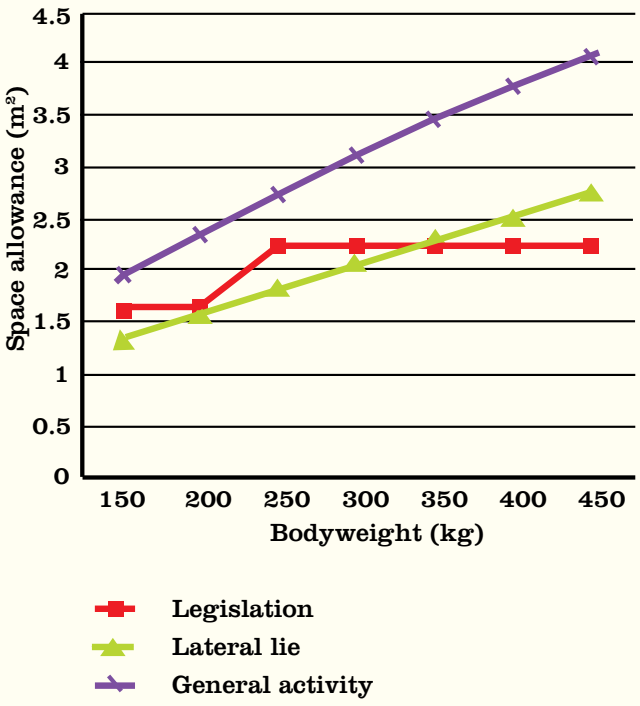
* Unobstructed floor area must be increased by 10% for groups of fewer than 6 animals and can be decreased by 10% for groups of 40 or more animals.

Key features of group housing for sows

Space

Insufficient space in group housed sows can increase the level of aggressive behaviour, particularly during feeding and mixing. This can lead to high rates of skin lesions, physical injuries and greater variation in condition throughout the group. Detailed requirements for space allowance according to body weight are obtained from recognised allometric equations which estimates the space required for lateral lying and general activity.

Space requirements (m^2/sow) for sows according to bodyweight and i. legislation, ii. lateral lying and iii. general activity.



The space required for a sow to lie in lateral recumbency is given by the allometric equation $A=kW^{0.67}$ where A is space in m^2/animal, k is an empirical constant set at 0.0457 for lateral lying, and W is bodyweight. Extrapolation of the k value for general activity (of an animal in straw based systems with natural light) estimates k at 0.068 (see Information sheet 3 listed in references).

This approach suggests the space required by law is low in terms of providing space for general activity, whilst experimental evidence suggests increasing space allowance above 2.25m^2 per sow can have beneficial effects in reducing aggression and injury. Although further work on social space requirements is required, a more generous space allowance, closer to 3m^2 per sow is advisable, and fits with the estimated value required for a group of average weight 300kg (see general activity line in graph opposite). Pen layout and sufficient space should allow sows to develop functional areas in the pen, for resting, feeding, drinking, rooting, and social interaction, whilst limiting aggression.

Flooring/bedding

Solid flooring, with good quality straw bedding which is changed regularly to maintain good hygienic conditions, has a positive impact on thermal comfort, hoof condition, lameness and skin lesions in sows. Straw bedding also has benefits in terms of providing gut fill and allowing for foraging behaviour. Additional substrates, such as woodchip bark, allow for other oral behaviours and may be appropriate in warm climates where the priority is to keep the sows cool. Foot lesions and lameness are prevalent in sows, and higher levels are associated with slatted flooring and lack of bedding. All flooring should be non-slip, clean and dry.

Solid floors with quality bedding increase comfort, foraging behaviour and physical health, and help provide satiation

Fibre and foraging

In practice, conventional feeding systems provide pregnant sows with a concentrated diet aimed at maintaining condition without excessively increasing body fat. This is usually provided in one meal of 2-3kg per day, which can be eaten in 10-20 minutes. Although the Directive does not indicate levels of bulk or fibre in the diet, there is clearly a discrepancy between what legislation requires (the provision of enough bulky and high fibre diet to prevent hunger) and commercial practice. Straw-based systems provide some opportunity for increasing gut fill and foraging behaviour, whilst conventional feed delivery systems are not designed to deliver large quantities of bulky food. Research shows that providing silage on the floor, in a trough or in a rack on the wall, increases satiety and resting behaviour and can reduce aggression around feeding.

Photo © CIWF

Providing extra fibre increases satiety and foraging behaviour and reduces aggression by occupying sows

Managing aggression

Social interaction, including aggression, can occur in any group-housing system for sows, especially during mixing. High levels of aggression can result in injury, lameness, stress and return to oestrus. Space allowance, pen layout and feed delivery system are key factors affecting aggression. Group size may be less important, as successful systems can operate with a wide variety of group sizes falling into three main categories: small stable groups of approximately 4-6 sows which stay together until farrowing, large dynamic groups of 100 or more in which small groups of sows are removed and added on a regular basis, and groups built up over a period of 2-3 weeks to a group size of 30-50 which remains stable until farrowing. Group size is related to housing/feeding system (see later).

Key factors to minimise potential aggression are:

- Gradual familiarisation of unfamiliar animals (via fence line contact between sows about to be mixed)
- Prevention of competition at feeding, for example by use of individual feeding stalls, electronic sow feeders (ESF) or of *ad-lib* feeding to reduce competition at feeders
- Provision of ample space for sows to resolve their social order and for less dominant sows to escape from more aggressive ones
- Do not mix sows in cubicle systems (where space is limited and fleeing sows can be trapped)
- Consider the use of a specialised mixing pen (see below)
- Provide non-slip solid flooring with straw bedding, with no sharp protrusions in the pen which may lead to injury
- Create stable groups post mixing, and ideally throughout life
- For sows in dynamic groups with ESF feeders, ensure all sows/gilts are well trained in the use of the feeding station and consider a two-pen system (pre- and post-feeding), which separates those sows that have fed from those that have yet to feed
- Consider keeping boars in sow pens, as they can reduce aggression and identify sows returning to oestrus
- Avoid aggression around feeders and lying areas by providing sufficient numbers of feeders and space
- Provide opportunities for subordinate sows to escape and hide from aggressive sows, via the provision of flexible barriers or large straw bales.

CONSIDERATION SHOULD BE GIVEN TO THE FOLLOWING CONDITIONS ESPECIALLY IN EARLY PREGNANCY:

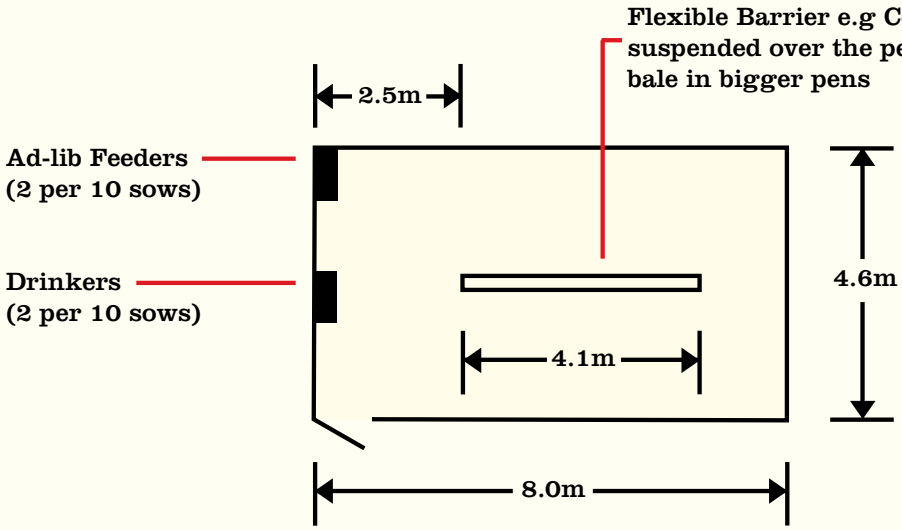
- Reduce the number and intensity of stressors (for example, change of diet and, social mixing) on the sows and gilts pre-oestrus
- Group house sows and gilts within 4 days of insemination, as the critical period for implantation is day 7-21 of pregnancy
- Ideally, group according to body size and group gilts (and first parity sows) separately to sows
- Avoid heat stress in hot climates by providing good ventilation, a cool surface to lie on, shade and shelter if outdoors, adequate water, and evening time feeding.

Specialised mixing pen

Fighting for social dominance in a newly-formed group is a temporary activity and more space should be provided to allow sows to move away from each other – a minimum space allowance of 3.5m^2 per sow is recommended during mixing. As this is probably too high to provide in many systems on a permanent basis, there is a good argument for providing a specialised mixing pen with high space allowance which allows less dominant sows a reasonable flight distance, and physical barriers such as hanging colliery belting or big bales to escape behind. All sows should have easy access to food, water and a lying area, and the use of *ad-lib* feeding for the short period spent in the mixing pen (a few days) should be considered. Group formation usually takes place at weaning or shortly after service, to avoid stress during the vulnerable implantation period during weeks two to three of pregnancy. Early mixing, if conducted well, does not impact on reproductive performance.

Once the avoidance order has been formed in the group, sows can be moved to a smaller pen for the remainder of pregnancy. In the case of small groups being moved into a large dynamic group, for example in an ESF system, they are likely to integrate with less aggression when introduced as an established group from the mixing pen. If possible there should be some physical contact (for example via a gate) between the sub group and main dynamic group before addition. Gilts should have a separate group, and be introduced to the main dynamic group during second pregnancy. A suggested layout for a mixing pen is given below.

Suggested layout for a mixing pen, suitable for 10 sows



In the longer term, now that EU legislation requires all pregnant sows to be group-housed, breeding programmes should take into account sow temperament as well as production factors. Some behaviours related to aggression have been found to have moderate to high heritability.

The main group housing and feeding systems in commercial use

Photo © C.Sneddon/CIWF

Dump delivery provides feed onto a bedded lying area; it can increase the duration of foraging behaviour and, if spread widely, can reduce aggression

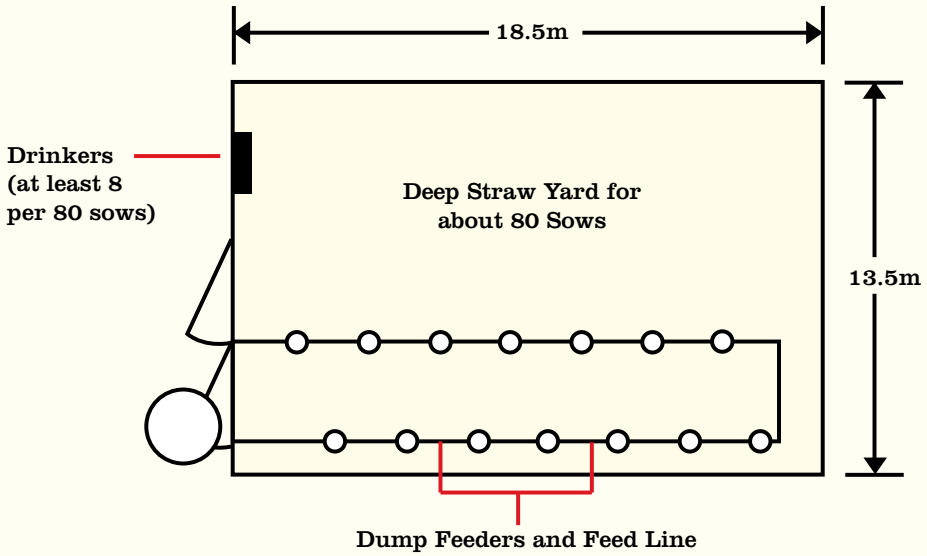
Floor feeding

This involves delivering feed to groups of sows on a bedded lying area, and is suitable for a wide variety of building types and group sizes. Feed can be delivered by hand, or from a series of containers suspended above the lying area which are connected to a bulk bin via an auger. Food can be dropped directly from the containers (dump feeding) or thrown over a wider area (spin feeding). Mechanical feeding can be automated so that the stockperson does not have to be present, although this is the ideal time to observe sow condition and levels of aggression. Regular calibration of equipment is essential to ensure even feed supply. An example layout is given below.

The obvious disadvantages of any group feeding system are the inability to individually ration sows, and the likelihood of aggression at feeding, especially if food is dumped too close to corners or not spread widely enough. Feeding over the bedded area can result in long settling times after feed delivery, so space allowance needs to be generous. Wastage of feed by trampling and loss in the bedding, as well as setting feeding levels to the thinnest sows in the group, can mean higher feed allowances per sow to ensure adequate intake. While floor feeding systems can be designed to provide for the needs of the sow in terms of space allowance and straw provision for fibre and foraging, their major drawback is in the inability to ration sows individually and to prevent bullying of thin or timid sows. A suggested layout for a dump feeding system is given below.

In 1997, the UK Pig Welfare Advisory Group estimated the cost of typical dump and spin feeding pen layouts. The dump feeding layout (below) was costed at £353 per sow place, and the spin feed layout was costed at £339 per sow place.

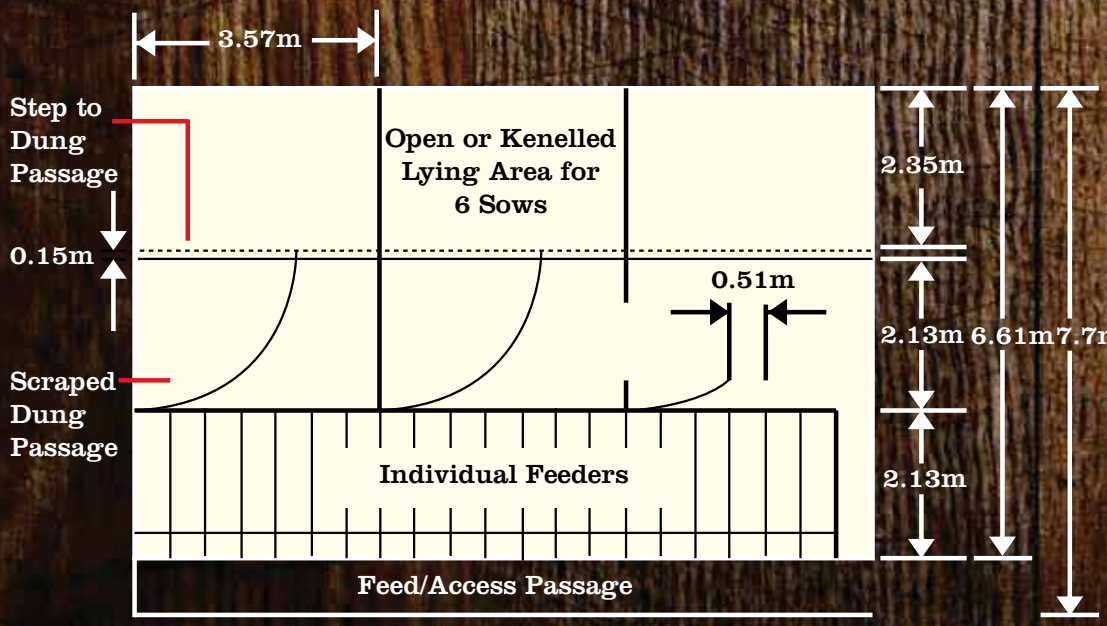
Layout for dump feeders - large group



Costings	£
Building Shell	20,093
Dump Feeders	2,100
Feed Line & Bin	3,900
Gate	200
Miscellaneous	2,000
Total Costs	28,293
Costs per head	353

COSTINGS GUIDE. These costs were assembled in 1997 and were based on information from SAC Farm Buildings Cost Guide and from ADAS on typical costs for specialised equipment. They are for the layout in the diagram referenced and will vary according to precise specification, and today's prices. Costs applicable to your own particular situation will be affected by your location, the size of the proposed development and other factors. Before you make your decision you will need to obtain a full quote for your required specification.

Layout for yards and individual feeders



Costings	£
Building Shell	43,920
Pen Walls	2,900
Gates	5,000
Feeders	12,000
Kennel Lids	1,560
Miscellaneous	2,000
Total Costs	67,380
Costs per head	562

Lockable feed stalls

These are full length stalls which are locked by the stockperson, or by the sow via an up-and-over back gate. They can be incorporated into a system with a separate straw-bedded lying area (which may have a roof) and a dunging area between the feed stalls and kennels, which can be scraped out during feeding. Alternatively, the feed stall and lying area are combined, with a shared dunging space behind the feed stalls (sometimes called a cubicle system). The second option requires less space, but it is possible that sows may be left in the lying/feed stalls for long periods of time after feeding, so are not ideal.

These systems are usually (but not always) associated with small, stable groups of 4-6 sows, and can be installed in large open buildings. Kennelling of lying areas may be required in large open buildings in order to maintain thermal comfort.

These systems offer protection during feeding, and the possibility of individual rationing, for example by topping up a ration which is delivered by auger. Inspection, separation and treatment of sows are relatively easy. However, space required can be high, especially if there is a separate dunging passage and kennelled lying area and the system is relatively expensive to install. Group size is inflexible, and if a sow has to be removed from a group, it is difficult to use that housing space.

The layout above was costed at £562 per sow place for a 120-sow house, in 1997.

Photo © CIWF

Lockable feed stalls provide full body protection and suit individual sow rationing and inspection. Straw bedding provides comfort and opportunity to forage.

Photo © M.Barker

Partial barriers (short shoulder barriers shown here) offer some protection for the sow during feeding whilst trickle feeding keeps the sow at her feeding station for the feeding duration

Partial stalls (free access)

Open feed troughs, with no barriers between feed spaces, are not generally used for sows. Partial barriers, at least to shoulder length, offer individual feed space and some protection at feeding. Without a locking back gate, some other means must be found to 'fix' sows to an individual feed space. Trickle feeding involves dispensing small amounts of feed at intervals which allow slow-eating sows to feed, and keep faster-eating sows in place waiting for the next portion of feed. It is most suited to small groups so that sows can be matched for size and farrowing date, allowing the group to be fed an increasing volume towards farrowing, although individual rationing is difficult. A scrape-through dunging area and a distinct bedded lying area are provided. Liquid feeding can equalise speed of eating/drinking as consumption rate is more even between sows.

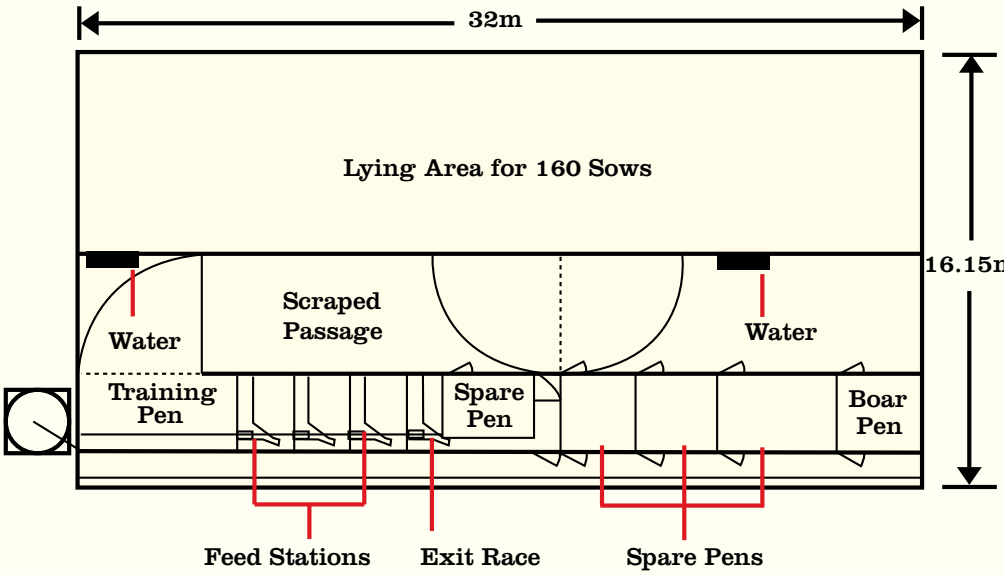
Electronic sow feeding (ESF)

This is the most technically complex of group-housing systems for sows, as each sow carries an eartag or neck collar containing a transponder with a unique signal. When the sow enters the feed station, her unique ID is detected and feed is dispensed. The day's ration is dispensed in several drops during one visit and takes 12-15 minutes to eat (longer for gilts, and if meal is being fed). At the end of feeding the feed station opens when the sow chooses to leave, unlocking the back gate (sow-operated system) or the computer unlocks the back gate after a time delay following the last feed drop (computer-operated system). At the end of each 24-hour feed cycle, an action list is generated by the computer to indicate which sows have not eaten their entire ration. Typically, ESF systems are straw-based and are installed in general purpose buildings with natural ventilation and minimum width of 12-15m. Sow-operated feed stations cater for about 40 sows per station, while computer-operated systems can have a higher number of sows per station (approximately 50). Group size can be flexible, with most systems operating with a large dynamic group using two or three feeders, with regular removal and addition of trained sows (see mixing section). New groups added to the system will generally lie together, and feed later in the cycle. Gilts should be housed separately, as they can find it difficult to compete at the feed station and they take longer to feed.

Training of sows and staff to use the system is crucial. Feeders must be calibrated regularly, hoppers checked, and adjustments made to the layout of the system and timing of the feed cycle in the early stages following installation. Many systems start the feed cycle at night so newly-introduced/less dominant sows can feed during the day when the majority of the group have fed and are settled. There is a high level of wear and tear on feeding stations, so weld points and bearings have to be maintained. In computer-operated systems, speed of gate closing must be adjusted to prevent sows from being followed into the station. A computer check list is used in conjunction with a daily sow check, as sows with health and injury problems are difficult to spot in a large group with deep straw bedding.

An unimpeded one-way flow of sows toward, through and away from the feeder is essential, with 180-degree access being preferable, rather than placing feeders against a wall. There should be at least 3m of free space behind feed stations. All gates must be one-way and sow

Layout for electronic sow feeders



Costings	£
Building Shell	48,330
Internal Walls	2,224
Gates	2,300
Feed line & Bin	2,500
Feed equipment	14,400
Miscellaneous	5,000
Total Costs	74,754
Costs per head	467

proof, with an exit race of at least 2m which directs sows into the drinking/dunging area. While a two-yard pre- and post-feed system can be used, space allowance is high, group composition and space allowance is constantly changing, and it must be impossible for a sow to be chased through the feeder without eating, as she cannot return. A sample layout from a commercial system is given above:

The layout above was costed at £467 per sow place for a 160-sow house in 1997.

While ESF systems require a high level of stockmanship, especially during installation and training stages, they can work well, resulting in a settled group of sows which is easy to move through for selection and removal of sows if necessary, and they provide the benefits of individual rationing in a deep-straw group housing system.

Assessing welfare

Regular observation of sow behaviour, especially at feeding time, is essential to detect any welfare problems. A combination of the following factors will indicate a reduction in welfare:

- Wide variation in body condition (more sows with lower and higher scores, fewer at the ideal score 3; standard scale 1-5)
- More than 3 aggressive interactions per sow in the hour following feeding
- The majority of trough-fed sows still active one hour after feed delivery (longer settling times are more usual in floor-fed sows)
- An increase in fresh (pink or bleeding) skin lesions on head, rear or flank to more than 5 per sow
- Any occurrence of vulva biting (sows queuing for an ESF station particularly vulnerable).

The above is only a guide, and the stockperson will quickly pick up on any restlessness or other behaviour changes, resulting in the removal of sow(s) and modifications to the system.

REFERENCES

Information contained in this leaflet is taken from:

Compassion in World Farming, 2012. Good Pig Award: Information sheet 3 (Group housing systems for sows) and Guidance Notes 2012. Available at: **http://www.compassioninfoodbusiness.com/good-farm-animal-welfare-awards-information-sheets/**

Compassion in World Farming, 2006. Animal Welfare Aspect of Good Agricultural Practice – pig production. Available at www.ciwf.org/gap

Pig Welfare Advisory Group Leaflets: 1 - Introduction of sows into groups (PB3083) / 4 - Cubicle and free-access stalls (PB3086) / 5 - Yards and individual feeders (PB3087) / 6 - Yards or kennels with short stall feeders (PB3088) / 7 - Yards or kennels with floor feeding (PB3090) / 9 – Electronic Sow Feeders (ESF) (PB3092). Now available on subscription to ADLib at: **http://www.adlib.ac.uk/adlib/browse.aspx?group=106&id=148784**

Sow Welfare: Promoting the welfare of floor and trough fed dry sows: now available at: **http://www.thepigsite.com/articles/853/promoting-the-welfare-of-floor-and-troughfed-dry-sows**

SUMMARY

Key Features of Group Housing for Sows

- **Space:** provide at least 3m²/sow (for 300kg average group weight) in order to allow functional use of space (areas for resting, feeding, drinking, rooting and social behaviour) and reduce aggression.
- **Flooring/bedding:** provide solid flooring with quality bedding which is regularly topped up and mucked out. Bedding improves thermal comfort, and helps to reduce hoof lesions, lameness, and skin lesion issues, while improving gut fill and foraging behaviour.
- **Fibre and Foraging:** provide straw and extra fibre (such as silage) to increase satiety and foraging behaviour and reduce aggression.
- **Managing aggression, particularly during mixing:** mix sows within 4 days of insemination. Gradually familiarise unfamiliar sows via fence line contact and reduce aggression through *ad-lib* feeding and provision of ample space for less dominant sows to escape aggressors. Provide physical barriers (such as straw bales) for hiding behind and consider the use of specialised mixing pens.

Assessing Welfare

Regular observation of sow behaviour, especially at feeding time, is essential to detect any welfare problems. Varying body condition, aggressive sow interactions, skin lesions and vulva biting indicate a reduction in welfare.

Photo © CIWF

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The Main Group Housing and Feeding Systems in Commercial Use

Floor feeding: feed is delivered by hand or from suspended containers which drop (dump feeding) or throw (spin feeding) feed over a wide area onto the bedded lying area of a group of sows. Space allowance is usually fairly generous to accommodate the increased foraging behaviour of the sows.

✔ Suitable for a variety of building types and group sizes.
Increases the duration of foraging behaviour and can limit aggression if the food is distributed over a wide area.

✘ Unable to individually ration sows and difficult to locate individual sows for treatment etc.
May require a higher feed allowance to ensure adequate intake is provided due to feed wastage within the straw and feeding to the thinnest sow.

Lockable feed stalls: feed is delivered into individual troughs within full length stalls locked by the stockperson or sow for the feeding duration. System is suitable for small, stable groups of 4-6 sows and can be installed in large open buildings.

✔ Offers sows individual protection during feeding.
Allows for individual sow rationing.
Inspection, separation and treatment are relatively easy within the feeding stall.
Incorporation of a separate lying and dunging area creates functional space in the pen.

✘ Sows may be left for long periods of time in the feed stalls post-feeding.
The more natural foraging behaviour associated with feeding is lost.
Kennelled lying areas may be required in large open buildings.
Group size is inflexible.

Partial stalls (free access): feed is trickle fed into the trough to keep the sows 'fixed' to a single feeding point at the trough. Shoulder or partial barriers at the trough afford some protection from other sows in the group. System is suited to small groups matched for eating speed or body size.

✔ Offers group rationing and affords some protection during feeding.
Incorporation of a separate lying and dunging area creates functional space in the pen.

✘ Individual rationing is more difficult.
The more natural foraging behaviour associated with feeding is lost.
Group size is inflexible.

Electronic sow feeding: feed is delivered in discreet meals according to individual sow identification. ESF systems are straw-based and are installed in general purpose buildings with natural ventilation.

✔ Allows for individual rationing.
Results in a settled group of sows which are generally easy to move.
Provides the benefits of deep-straw.

✘ Technically ESF systems are more complex.
Training of animals and staff is crucial to a smooth operation.
Gilts need separate housing.
Health and injury problems are more difficult to spot in large groups.

COMPASSION in world farming **Food Business**

Indoor Housing Systems for Dry Sows – Practical Options

Compassion in World Farming

Compassion is recognised as the leading international farm animal welfare charity. It was founded in 1967 by Peter Roberts, a British dairy farmer who became concerned about the development of intensive factory farming.

For more information visit ciwf.org.uk

Food Business Programme

Compassion in World Farming's Food Business programme is generously supported by The Tubney Charitable Trust; a grant-making charity seeking to support activities that have a long-term, sustainable, positive impact on biodiversity and welfare of farmed animals in the UK and internationally.

For more information visit compassioninfoodbusiness.com

Contact us:

Food Business Team
Compassion in World Farming
River Court
Mill Lane
Godalming
Surrey GU7 1EZ
UK

Tel: +44 (0)1483 521 950
Email: foodbusiness@ciwf.org.uk
Web: compassioninfoodbusiness.com

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