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Competitive Feeding Systems

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We define competitive feeding systems as those in which an animal can obtain more feed by winning a fight. However, this does not necessarily mean that you will observe a lot of fighting in such a system. Often, the majority of fighting will occur within a couple of hours after mixing. Once a sow's dominance status has been established by aggression (fighting), it is often maintained by very subtle agonistic behaviour. These behaviours include threats through head movements and body posture by the dominant animals, and, for subordinate sows, moving in such a way as to avoid dominant animals. One study even referred to the social order among sows in a group to be one of 'avoidance' rather than 'dominance' (Jensen, 1982). However, if a sow is able to obtain more feed by any of these means, it is a competitive feeding system. Some feeding systems, such as gated stalls and ESF stations, protect a sow while she is eating and eliminate the possibility of obtaining more feed by fighting. We will discuss these in later articles. In this article we will discuss the ultimate competitive feeding system, floor feeding, and non-gated feed stalls that reduce but don't eliminate competition.

Competition is a characteristic of the social system within a group of animals. In its simplest form we have dominant/subordinate relationships among the animals. The definition of dominance is that it results in priority of access to limited and defendable resources. Pig producers are generally comfortable with group housing if the resource (feed) is not limited: e.g. finishing pigs fed ad-lib. But sows are almost always limit fed to control their body condition, and so we have the possibility of competition. Our management of competitive systems is such that we attempt to reduce the dominant sows' ability to control the resource. We do this in two ways: social and physical management. We will look at different competitive systems and how they can be managed most effectively.

FLOOR FEEDING

Dominant sows have a distinct advantage in terms of feed intake and weight gain in floor feeding systems (Brouns and Edwards, 1994). Subordinate sows, who are also usually younger and lighter, will fall behind in body condition and may have to be removed. A 'relief' rate of 15% is common when floor feeding. Social management is the primary means of evening out feed intake in floor feeding systems. In non-competitive systems, such as finisher pigs, there is some advantage to having a significant variation in the size of the pigs. This is because the social system actually operates better with some variation, i.e. if there are many individuals of the same competitive status, there will be increased aggression until a hierarchy is established. The opposite is the case when dealing with competitive situations, especially situations of competition over feed. To ensure the most even feed intake among a group of sows, the sows should be as similar as possible, making them equally competitive. This will take the form of sorting sows by parity, weight and body condition. The result is a group of sows having the same feed requirement, and the same potential to compete for it. This sorting within a breeding cohort obviously results in smaller group sizes.

In order to have sows enter the system with similar body condition, it is advantageous to house them in stalls until confirmed pregnant (normally 35 days post-breeding) and feed them to achieve similar backfat levels by that time. Use of such 'breeding and implantation' stalls is particularly important for floor feeding systems as excessive competition and poor feed intake during this critical phase can affect reproduction

(Spoolder et al., 2009).

In terms of physical management, it is possible to use some dividers within the pen to create several feeding sites. This is only possible with larger groups. In general, the feed should be spread about as much as possible (multiple drop sites), to prevent a sow from defending a large drop of feed.

Using bulky, high fibre feed will extend the feeding time and reduce the incidence of stereotypic behaviours, but may contribute to more aggression. Similarly, feeding on a strawed floor will extend feeding periods and increase aggression (Whittaker et al. 1999).Feeding a bulky diet ad-lib allows the subordinate sows to avoid peak feeding times and consume normal levels of feed (Brouns and Edwards, 1994), but it must be bulky enough to limit total energy intake.

Keys to successful floor feeding

- Sort sows by parity, size and body condition.
- Use the time in breeding/implantation stalls to even out body condition.
- Spread feed as evenly as possible.
- Use dividers within the pen.
- Remove sows that fall behind.

Large group floor feeding?

Several farms in Ontario have adopted a novel floor feeding system that differs from most in three ways: the groups are large, and may include sows of different parities; the pen has a number of partial divisions in it that provides some separation of the multiple feeding sites; and, the feed is dropped in several (typically 6) drops per day, spaced 30 to 60 minutes apart. Large, non-uniform groups reduce the social tension in finisher pigs, but are not generally advocated for competitive systems such as gestating sows. The barriers provide sows some physical protection as seen in short-stall systems, but several sows still eat from the same feed drop. The key to the system may be the frequent feed drops that allow subordinate animals to eat from the later drops as the dominant sows feel satiated from eating from the first.

Although several farms are using the system, it has not been studied in comparative tests. As with any floor feeding system, some sows have to be removed. At least one producer does not include gilts with the sows. The system as a whole, and particularly the multiple feed drops, should be studied before being adopted. However, it illustrates that floor feeding can be managed in many different ways.

PROVIDING PROTECTION: NON-GATED STALLS

As an alternative to floor feeding, producers should consider the use of feeding stalls in order to provide protection during eating. In this article we will only discuss non-gated (no back gate) systems, as gated stalls will be discussed as a type of non-competitive feeding system in a future article. Recalling the earlier statement on dominance, we note that dominant animals will exert themselves when resources are both limited and defendable. Defendable refers to the ability of the dominant animal to control more than their share of the resource. Non-gated stalls prevent the dominant animal from monopolizing the feed by allowing the subordinate animals to defend a small portion of the total feed available, that is, their share of the feed. However, with enough

Two Types of Problems

If the performance of your sows in a competitive feeding system is below your expectations, it is very easy to blame the feeding system. That is not always the problem. Two types of stressors can affect animals in groups: competitive and general. To determine which is most likely within your system you need to determine the demographics of the problem. If the problem affects younger, smaller animals more than larger, older animals, that is, an uneven distribution, it is likely a competitive issue. A common problem in competitive feeding systems is the fat sow/ thin sow syndrome, in which smaller sows get thinner and larger sows get fatter. In this case you should attempt to reduce the effect of competition during feeding. However, if your problem is just as common among larger sows as it is among smaller ones, then it is likely a general stressor that is affecting all of the pigs similarly. Examples of these types of stressors would include high temperatures, poor flooring, poor air quality or space restriction. The solution to these problems is quite different to that of a competition problem. In some instances, the problem may involve both general and competitive stress. For example, if poor flooring results in 10% of the sows becoming lame, evenly distributed across all sizes, the smaller lame sows may be at a greater disadvantage when they try to compete for feed. If you can identify that lameness was the initial problem, and improve the flooring, you will be more successful in correcting the subsequent problem caused by competition.

effort dominant sows will be able to force a subordinate out of a non-gated stall and thereby obtain more feed.

Non-gated systems should make use of the social management techniques outlined for floor feeding (e.g. sorting by size and body condition). However, these systems also use physical methods to interfere with dominant sows attempting to displace subordinates from their feed. Non-gated stall systems use feed troughs so that the feed can be delivered and limited to a defined area. These troughs are divided so that individual allotments of feed are dropped into each division. Stalls are added to these divisions to provide protection to each sow as she eats. The longer the stalls, which typically vary from shoulder length to full body length, the less aggression and more even intake of feed (Barnett et al., 1992, Andersson et al., 1999). Floor feeding gives a distinct advantage to the dominant sow. Partial stalls reduce this advantage and allow the subordinate animals to spend more time eating and achieve a higher intake.

Shorter stalls, such as those that only extend back to the animal's shoulders, will not fully protect a subordinate animal. In systems with these stalls, it is common to see cuts and scratches on the sides of the lower ranking individuals where the dominant sows have attempted to displace them from the feed trough. Longer stalls will provide more protection, but some displacement may still occur. If longer stalls are better, then why would a producer use short stalls? It is a balance between protection during feeding and the amount of space the system requires. Group housed sows should have a sufficient amount of free space (outside of the stall) to move about freely. If a producer uses long stalls, additional space is necessary behind the stalls to provide this loafing area. Longer stalls also represent a greater capital expense, in addition to the increased floor space.

Are there other means to reduce aggression and displacements among sows in non-gated stall systems? There appear to be at least two: increasing the eating speed of the sows will reduce the time required to consume their feed and decrease feeding associated aggression (Andersson et al., 1999). One of the easiest ways to increase the speed of eating is to provide wet feed, either as a slurry, or by adding water in the feed trough. By eating faster, the subordinate sows are nearly finished their feed by the time the dominant sow is able to displace them from the stall. Although reducing aggression and displacements, the rapid eating may increase other problems associated with short meals, such as increased stereotypic behaviour.

Keys to successful non-gated stall systems

- Longer stalls will reduce aggression
- Wet diets take less time to consume and reduce aggression
- Trickle feeding prevents the accumulation of feed in front of slow-eating sows

The second method used to reduce displacements from short stalls is trickle feeding. Typically all of the feed for a sow is dropped into the trough at the same time. Faster eating sows consume their feed and then attempt to displace slower eating animals and steal their remaining feed. Trickle feeding meters the feed into the trough over an extended time, typically 30 minutes or so (Hulbert and McGlone, 2006). Ideally, the rate of feed supply should be as slow as or slower than the eating speed of the slowest eating animal. If a faster eating animal decides to leave its stall to displace a slower eating one, no feed would have accumulated in the slower one's trough. The advantage to displacing another sow is lost. However, if the drop rate is the same as the eating speed of thefaster eating sow, the slower eating animals will accumulate feed in their trough space and be vulnerable to attack from other sows. Trickle feeding has received mixed reviews. If it is well managed it may well reduce feeding associated aggression among sows. However, this is not always the case (Hulbert and McGlone, 2006).

Floor Space for Floor-fed Sows

The floor space allowance for floor fed sows should be fairly easy to define in terms of productivity, incidence of injuries and level of aggression. The system is basically an open pen with the proviso that sufficient solid floor area is provided for feeding. However, few studies have examined the question of floor space allowance. One such study, by Sequin et al (2007), reported no advantage in any of these measures among space allowances starting at 2.3 m^2/sow (24 ft^2) and going up to 3.2 m^2/sow (34 ft^2). Salak-Johnson et al (2007) reported problems at 1.4 m^2/sow (15 ft^2) compared to 2.3 m^2/sow (24 ft^2), but did not examine any intermediate levels. So 1.4 m^2 is not enough, and 2.3 m^2 is sufficient; but there is a large range in between that has been poorly researched.

If we look to grower/finisher pigs, who are also housed in open pens, we see effects on productivity below a space coefficient of k=0.034 (Gonyou et al., 2006) and lying posture (comfort) when k drops below 0.038 (Averos et al., 2010). Using weights from our facility for females near the end of gestation we see gilts at 220 kg and mature sows (3+ parity) at 310 kg. Applying the k values given above we see gilts requiring between 1.24 and 1.39 m^2/gilt (13 to 15 ft^2) and sows between 1.56 and 1.74 m^2 (17 to 19 ft^2). The European Union specifies different amounts of floor space for gilts (1.6 m^2/gilt; 18 ft^2) and sows (2.3 m^2/sow; 24 ft^2) (Mul et al., 2010).

We require additional research on floor space allowances in the range of 1.4 to 2.3 m^2/sow (15 to 24 ft^2). Until that research has been conducted we would suggest 1.4 – 1.6 m^2/gilt (15 – 18 ft^2) and 1.7 – 2.3 m^2/sow (19-24 ft^2). Again, there must be sufficient solid floor area to feed the sows without excessive aggression.

THE BOTTOM LINE

Choosing Between Floor Feeding and Non-Gated Stalls

Both systems are less expensive than the non-competitive gated stall and ESF feeding systems. Producers who use these systems are looking for a less expensive system and are prepared to accept more aggression and to give up some control over feed intake. If the producer is prepared to place a great deal of emphasis on social management, then they are more likely to choose floor feeding. It is the least expensive of all of the systems. However, if they find social management difficult, they may want to spend more and provide their animals with the partial protection of short, non-gated stalls. In larger operations, the decision may be based on the confidence the operator has in the ability of their staff to socially manage the animals. As in every system, better management will result in better production.

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Sows in a floor feeding system. Note the divisions within the pen to separate feed drop areas. (Courtesy of Franklin Kains)