Farrowing Systems for the Sow and her Piglets

Objectives
• Define the farrowing systems used in the U.S.
• Discuss the challenges and merits of each farrowing system.

Introduction
In the U.S., housing for the lactating sow and her piglets can be divided into five main areas. Total confinement (farrowing stall) houses 83.4 % of the sows. Remaining operations house far fewer sows with open buildings that have outside access at 12.4 %, open building with no outside access, 2.9 %, pasture with hut or no building, 0.7 %, and lot with hut or no building the lowest at 0.6 % [1]. Farrowing stalls have become widely accepted by the industry for numerous reasons: they have made sow management easier, efficiently utilized space, and they can help to reduce piglet mortality [2]. However, the farrowing stall has received criticism due to potential detrimental effects it may impose on the welfare of the sow (such as occurrence of shoulder ulcers [3, 4], behaviors considered problematic [5, 6, 7], and sow’s movements are more restricted). The development of an alternative, economical farrowing system that retains the advantages of the conventional farrowing stall, and provides welfare benefits to the sow and piglets, could be beneficial to the industry [8, 9].

Standard Farrowing Stall
The standard farrowing stall is usually a tubular metal construction fixed within a pen of about 7 ft × 5 ft (2 m × 1.5 m) with recommended dimensions of around 7 ft (2 m) long, 2 ft (60 cm) wide and 3 ft (1 m) high. According to McGlone and others [10] producers are still using gestation stalls that are smaller than this, irrespective of the fact that sow size continues to increase, but there is limited information on farrowing stall dimensions for the sow. There are a wide variety of designs, but most have common features in that they have a built-in feed trough with a water supply for the sow and her piglets at the front, metal work running horizontally the whole length of the stall with some bars running across the width over the front two-thirds to prevent the sow from escaping by climbing upwards. The rear usually has a removable frame, the position of which is adjustable depending on the length of the sow. Flooring may be solid concrete, with some slatting at the rear of the stall, or fully-slatted. Solid flooring can have bedding, such as straw, sawdust, or shredded paper added. Slatted floors can greatly reduce the labor required to remove manure, and provide drainage for urine and soiled drinking water. Other floor types include bare woven wire, metal, plastic-coated metal, and plastic [11]. There is usually a creep area (0.5 m2 or 5½ ft2) set to the side or front of the stall, which provides a warm lying area for the litter, with the heat source either from a heated mat or an overhead heat lamp. Stalls are usually placed in rows.

Figure 1: Conventional tubular metal farrowing stall, with forward creep area supplementary piglet heating lamp (photo source: J.N. Marchant-Forde)
within a room. The number of stalls per room is dependent on the farm size. Good disease management practice dictates that all sows should enter and leave the farrowing accommodation at the same time (all in–all out). Thus, the number of farrowing places in a room should be related to the number of sows that are due to farrow in a given cycle. The partitions between the stalls are usually about 1½ ft (0.5 m) high, which is high enough to prevent piglets escaping but low enough to allow a standing sow to see her neighbor (Figure 1).

“Turn-Around” Stalls

Designs of this category include ellipsoid farrowing stalls [12], and modified triangular farrowing stalls [13, 14]. These systems also attempt to take up an amount of overall space slightly larger than that used by a conventional stall. The designs utilize an overall pen size of ellipsoid: 6½ ft × 5¾ ft (2.0 m × 1.75 m; Figure 2), and triangular: 8½ ft × 5 ft (2.6 m × 1.5 m). Turn-around systems are similar to conventional stalls, in that they are made out of tubular metal and the system incorporates a piglet creep area. The systems would usually be installed on a fully-slatted floor as maintaining hygiene would be difficult if used on a solid floor with bedding, due to accessibility problems for cleaning given that the sow can potentially defecate and urinate at both ends of the stall (Figure 2).

Hinged Stalls

Another design that has become popular over the last few years within Europe is a system that is essentially a compromise between a conventional stall and an open pen. As much of the piglet mortality due to crushing occurs in the first few days after parturition, systems have been developed in which the sow is stalled around farrowing, but the stall can then be hinged open. A common practice is to open this between 5 to 7 days after farrowing, to allow the sow space to turn around for the remainder of lactation [15]. However, the caretaker still has the ability to restrain the sow if necessary for safety when carrying out routine husbandry tasks. As with turn-around stalls, these systems also try to take up space similar to a conventional stall with pen (Figure 3). The system incorporates a piglet creep area and can be installed with solid floors with bedding or on a fully-slatted floor [15].

Open Pens

Before the development of farrowing stalls, indoor-housed sows gave birth in simple open pens, that were basically rectangular in shape, straw-bedded, and may have incorporated a heated creep area in one corner. Over recent years, the open pen has been subject to a great deal of research in the search for alternatives to close confinement. As piglet mortality has been an acknowledged problem in open farrowing systems, the major emphasis has been towards modifications that afford the piglet a greater degree of protection. Many open pens now contain rails that run around the pen perimeter, usually about 6 to 8 inches (15 to 20 cm) up from the floor and out from the wall [13, 16], giving the piglets an escape area should they become trapped by the sow. Other designs incorporate sloping walls which again have built-in escape areas at the bottom [17, 18]. Heated creep areas are commonplace, in either one corner, along one of the pen short sides, or occasionally centrally placed in pens that are divided.
into nesting and dunging areas (Figure 4). Many systems are still straw-based, as using bedding tends to fit with the ethos of alternative farrowing pens, but open pens have been developed with fully- or part-slatted floors [19].

**Outdoor Huts**

Several farrowing hut designs are available to the swine producer: plywood and plastic A-frames, steel English style arks, and other plastic and plywood models. Each hut differs in shape. For example, the A-frame is taller and shaped in a flattened triangle. The 'A' frame huts are usually constructed of plywood or tin over a wooden frame, with sloping sides and a flat roof. Dimensions are about 7 ft (2 m) wide × 7 ft (2 m) long × 3½ ft (1 m) high. The English style hut (Figure 5) is lower and forms an arc [19, 20]. As the name suggests, the semicircular hut is nearly half-a cylinder of corrugated tin over a wooden frame, with the ends filled in (apart from the entrance) by plywood. Dimensions are usually about 8 ft (2.5 m) wide × 5½ ft (1.7 m) long × 3½ ft (1.1 m) high. For all types, some versions have a solid plywood floor; others have no floor. In both cases, it is usual to use large amounts of straw as bedding. There is no heated creep area and no water supply for either the sow or her litter. Some arks do incorporate rails to help prevent piglet crushing, and some may have double skins for insulation, although research is lacking on the benefits of insulation [21, 22]. Some producers have each farrowing ark in its own paddock, and some put up to eight arks per paddock, depending on the paddock size. Fenders are fixed onto the front of farrowing arks, and serve to (1) keep the piglets close to the farrowing ark, (2) keep the straw in the huts for longer, and (3) allow unrestricted movement of the sow [22, 23]. Two fender designs that are currently used commercially are a low wooden fender that fixes underneath the front of the farrowing hut doorway, and the second is a taller metal structure. The taller metal fenders can have two types of front, wooden boards, or a plastic polyvinyl chloride roller. Fender design may influence the length of time that piglets are confined to the hut, and the work efficiency for the stockperson carrying out routine tasks [22].

**Swedish Style Multi-Suckling Pens**

Communal indoor systems have undergone a fair amount of study over recent years [24-30]. Although the notion of keeping farrowing sows in a group throughout farrowing and lactation does not appear to relate to what we know of the sow’s natural behavior, there are reasons for supposing communal farrowing systems could work commercially, by reducing the amount of mixing of sows after segregation in conventional farrowing systems and increasing the social skills of the piglets. In terms of design, many of the pens themselves incorporate the types of features seen in the development of single open pens, but with addition of barriers to contain piglets within the pen, yet allow the sow to come and go from communal areas.

There are two main types of multi-suckling management systems, which are in commercial use in Scandinavia [31], but have also been tried as a specialist system in other countries including the U.K. [32], and the U.S.A. [33, 34]. The first type is the Ljungström system, which involves farrowing sows in individual open pens, and keeping sows and litters individually until around 14 to 21 days of age [35]. Usually 6 to 8 sows and their litters are moved together into a large straw-bedded multi-suckling pen, and kept here up to weaning at 5 to 6 weeks post-farrowing, when the sows are moved out to the service area, leaving the piglets behind as a group until they reach a weight of ~55 lb (25+ kg). The second type of system is called the Thorstensson system, which utilizes a large multi-suckling room. In this instance, the sows are already grouped before farrowing [35]. Temporary farrowing pens are placed down the long side of the room on the day the sows enter the system. These pens allow the sow to come and go, but a barrier prevents the piglets from leaving the pen until piglets are 7 to 10 days of age. Before farrowing, the only straw in the system is within the pens, in order to encourage the sows to farrow inside. Once all sows have farrowed, straw is placed throughout the room. The pens contain no heated creep area, and no protection rails, placing the emphasis for piglet survival largely on the maternal qualities of the sow. Once piglet escape has become commonplace, all of the partitions are removed, and the system becomes a single large multi-suckling pen. As with the Ljungström system, at
weaning, only the sows are removed, and the piglets remain in place until market weight has been reached.

**Summary**

Seen in the context of natural sow and piglet behavior, it is hardly surprising that designing a farrowing system for use in commercial production that does not prevent one or more aspects of natural behavior is impossible. Every farrowing system in commercial use or in experimental development will contain a greater or lesser degree of compromise. There are a wide variety of options available for housing the farrowing and lactating sow and her litter. Likewise, there are options to keep litters segregated throughout lactation or segregated for the early part of lactation only and able to mix later in lactation. The most widespread system is the farrowing stall in which the sow is restricted, resulting in welfare concerns. A number of other systems are available that give the sow and her litter greater opportunity to move and behave more naturally, but which may have welfare trade-offs for the piglets. The choice of which system to use will be decided by a plethora of factors including cost of building, available caretaker skills, climate, availability of bedding, and potential marketing premiums for ‘welfare-friendly’ products.

**Literature Cited**


11. Stanislaw CM, Muehling AJ. 2002. Swine farrowing units. PIH-10, Purdue University.


