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Swine Housing and Management in Confinement Production Systems

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Confinement production of swine is not necessarily suited to all producers, and, in part, may in certain instances be undesirable. It does, however, offer the advantage of greater production potential per unit of labor expended through maximum use of mechanization and automation. In addition, confinement protects the animals from the environmental extremes which cause wide variations in level of performance.

Deterrants to confinement swine production have largely involved disease buildup and the difficulties associated with manure disposal. Since their introduction in the early 1950's, antibiotics have been a valuable aid in preventing disease buildup, but handling and disposal of the large volumes of hog wastes have frequently continued to be major obstacles. Mechanical means of cleaning--scraping (by hand or tractor scrapers), water pressure, gutter-cleaner equipment, and various combinations of these--reduced total manual labor but in many cases accentuated the inadequacy of collection and/or storage units. This latter problem deterred many producers from changing from pasture programs and their "built-in manure disposal system."

Most of the housing and management systems developed during recent years involve the following buildings:

1. Farrowing unit - usually completely insulated, tightly enclosed to provide the exacting environment required by the newborn pig.

2. Nursery unit - the term is used here to describe the housing for pigs from the time weaned at 3-to-5 weeks of age until 60 to 75 pounds in weight. Frequently less elaborate than a farrowing unit, but insulated and tightly enclosed, special care to provide warm, draft-free environment. One to five litters per pen.

3. Growing-finishing unit - designed for pigs from weaning at six to eight weeks (30 to 40 lb.), or from a nursery unit, to market weight. Building is usually enclosed, partially or completely insulated. Number of pigs per pen varies with size of animals.

4. Farrow-to-finish unit - design and construction provides for environments suitable for farrowing and for the finishing period.

Thus, a management system may involve from one to three different units during the period from birth to market weight.

An additional unit would be for the breeding herd. In a majority of the cases, this will mean the use of open-front or portable sheds in dirt or pasture lots. A few very specialized producers keep the breeding herd in strict confinement.

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Many modifications of any one or all of these systems can be found, but of primary concern in each case is maximum utilization of all units commensurate with good management practices.

The increase in size and number of confinement swine production units has been markedly influenced by the introduction of slotted floors. These "self-cleaning" floors employ the structural concept of providing openings in the floor through which manure will drop or be trampled. When properly managed, these floors essentially eliminate the time and labor of regular cleaning frequently associated with solid floors. Slat describes a fabricated material of long narrow dimension and when spaced at appropriate intervals, provides a slotted floor. Non-slat materials, such as flattened expanded metal having diamond-shaped openings, also provide the "self-cleaning" principle.

Slotted floors have reportedly been used in sheep housing in Iceland for over 200 years! However, they have been incorporated into swine housing design in the United States only within the last three years.

Closely associated with the effective and efficient use of slotted floors is the waste disposal pond or lagoon. The manure is retained under the slotted floor or in collecting tanks for later removal to fields, or in many cases is drained directly into a logoon. This latter approach may seem an economic waste, but the fertilizer value is frequently considered insufficient to pay for the labor and facilities necessary to deliver it to the fields.

It must be recognized that slotted floors represent but one part of the building design, and their effective use is dependent upon and only as good as the management being exercised. From research and other observations, many factors have been shown to affect behavior and performance of swine in confinement. And from the management viewpoint, flooring material and design must satisfy two basic requirements: (1) minimize labor expended per animal unit, and (2) cause no adverse effects on the well-being and total performance of the individual animal. In these respects, many different arrangements have proven satisfactory under specific circumstances.

Floor Design

Partially slotted floors have slat-covered gutters, and the surface area ratio of solid floor to slotted area runs about three to four to one with the solid portion sloping toward the slat-covered gutter. Under optimum conditions the slotted area serves as a dunging area and cleaning chores are at a minimum. Locating the water on the wall side of the gutter or over the gutter encourages desired behavior patterns. Floor space per pig and season are two factors important in keeping these pens clean, "housekeeping" usually being easier during cool weather. Pen shape has generally been narrow and long, and of 8- to 20- pig capacity.

On-floor feeding is very suitable to partially slotted floor pens since the feed can be placed on the solid portion, usually the sleeping area. This helps maintain cleanliness in pens since pigs seem to refrain from dunging in the eating and sleeping area. Feed wastage is at a minimum if the animals do not have more feed available than they will consume at one eating. And this can be accomplished by correct use of the recently developed feeder systems permitting automatic feeding of specified quantities at prescribed intervals of time.

Completely slotted floors. On completely slotted floors pen shape is apparently of little concern to the pig, and can frequently be designed for convenience of the operator. A one-inch or two-inch slot should be left next to walls or partitions to reduce area of potential manure buildup.

The on-floor type of feeding program can be followed by allowing enough trough space for each animal, and making the pen deep enough to provide the necessary floor space. A solid strip under the trough, or a feed-saving lip as part of the trough, should be used to prevent loss of feed through the slots. Liquid feeding could be readily adapted to this system.

Floor Materials

Wood, concrete, steel masonite board and other materials have been evaluated. Completely enclosed buildings have usually been used, although open-front sheds have been employed in moderate climate areas.

Farrowing units - Slotted floors are effectively used under farrowing crates with many different arrangements being evaluated. Frequently a solid floor area, 2' to 4' wide, is used across the crate to provide sleeping area for the baby pigs. Slotted floor "porches" attached to portable individual houses have been effectively used for sows and litters on pasture, the units being moved as dictated by manure buildup under the slats.

Nursery units - Flattened expanded metal, having diamond-shaped openings 5/8 inches x 1 1/2 inches, has proved a very effective flooring material for pigs from two weeks of age to 60 pounds in weight. Durability and usable life are limited when exposed to concentrated traffic of heavier animals.

Growing-finishing units - Certain materials have proved unsatisfactory when used in totally slotted floors, but could be used satisfactorily over gutters in partially slotted floors where pigs spent relatively limited time on them.

Slat Width and Spacing

Growing-finishing pigs gained at comparable rates whether on solid concrete, five-inch wide concrete slats spaced one inch apart, four-inch wide wood slats spaced at one-inch intervals, 1 1/4-inch wide wood slats at 1/2-inch intervals, or solid oak floor. However, spacing the 1 1/4-inch wide slats at one-inch intervals adversely affected performance of pigs from 100 to 200 pounds, and with increasing weight the animals became reluctant to move about, evidenced soreness of feet and weakness of legs. Voluntary feed intake was markedly reduced and rate of gain significantly slower than that by pigs on the same slats spaced at 1/2-inch intervals. Uneven heights of slats and variation in spacings contribute to restricted movement of animals.

Space Allowance

Relative crowding of animals on slotted floors is essential to keep (1) the manure trampled through the slots and (2) animals clean. But the extent to which pigs can be crowded without adversely affecting growth rate may depend on many factors, including:

1. Size of animals
2. Number per pen
3. Pen design
4. Ventilation
5. Season--particularly temperature
6. Method and level of feeding

All of these are interrelated. For example, number of pigs per pen is more critical during high temperatures than during cool temperatures. Self-feeding and limited feeding affect rates of gain and could modify minimum space allowances.

On the basis of research at the University of Illinois, the following tentative minimum space allowance on slotted floors are suggested to allow a maximum rate of gain for growing-finishing swine.

Space on Slotted Floors

Weight of animal	Square feet per animal	
	Winter	Summer
25 to 40 lb.	3	3
41 to 100 lb.	4	4
101 to 150 lb.	6	6
151 to 210 lb.	8	9

Current test results indicate space requirements for growing-finishing swine confined to pens having complete concrete floor or partially slotted floor are very similar to those on slotted floors.

Environment Control in Confinement Housing

(a) Temperature and drafts. It is particularly important to provide warm temperatures for young pigs, and in completely slotted floor units drafts cause added stress since the animals have no solid floor sleeping area.

(b) Odor and ventilation. Method of manure handling or length of time manure accumulates may affect ventilation requirements. Although apparently largely immaterial to the pig, odor can become quite offensive to workmen. Rate and pattern of air replacement will modify odor intensity. Buildup of manure and urine under slotted floors results in an as yet incompletely defined gaseous production which will vary with temperature and environment. With mechanical ventilation failure in tightly enclosed buildings, oxygen lack would perhaps be of more concern than accumulation of gases or odors. In a few reports of "slow-up" in growth rate after 150 lb. in weight, accumulation of carbon dioxide has been suspected, but other gases may have been involved. However, it is likely that either inadequate floor space or defective floor material and design was a major factor.

Additional Management Consideration Resulting from Use of Slotted Floors

Advantages

(a) Sanitation - slotted floors aid in sanitation since the animal excreta drops or is forced through the slots, and this reduces direct contact of the animal with material possibly carrying pathogenic organisms and/or parasites.

(b) Labor - daily cleaning chores have been reduced up to 95 percent of that required on solid floors.

(c) Bedding - properly designed and effectively used slotted floors in tightly enclosed, insulated and ventilated units eliminate use of bedding.

Disadvantages

(a) Feed wastage - spilled feed is lost feed since it falls through the slots and cannot be reclaimed by the pig.

(b) Fighting - if different groups of pigs have to be mixed and fighting results, more extensive injury to feet and legs may result than on solid floors.

(c) Cost - initial cost of slooted floors will be greater than for solid floors and with certain materials maintenance may be excessive. This added cost cannot be justified on the basis of an assumed increase in production efficiency, but is more often justified on the bases of labor saved, the possible increases in volume of production because of labor efficiency, at least partial solution to manure handling problems, saving in bedding costs, and convenience to the operator.

Tail biting and cannabalism are apparently no more or less frequent on slotted than on non-slotted floors, management considerations being equal.

Summary

The percentage of the total number of swine produced in the United States that come from confinement systems has increased dramatically during the past three to five years. Unit components of housing systems suitable to specific age and size of animal have been developed. Handling and disposing of waste materials have been greatly facilitated by use of completely or partially slotted floors.

Research to date suggests that total swine performance on slotted floors is comparable to that from animals on conventional floors. Slotted floors, both partially and completely, have been effectively used in housing units for swine of all ages.

Optimum width and spacing of slats varies with size of pig, design and kind of slats. In general, for cleaning efficiency, wide slats are most effectively used in finishing units, with narrow slats more effective in farrowing and nursery units. Narrow slats and wide spacings caused feet and leg injury to finishing (100 to 200 lb.) swine.

Space allowances for growing-finishing pigs have been suggested. Space needs can be affected by factors such as size of pigs, number of pigs per pen, air temperature and method of feeding. Relatively restricted floor space encourages maximum cleanliness of pens and pigs.

Effective use of slotted floors will save labor and improve sanitation. Care should be taken to avoid use of materials having rough or sharp edges or other characteristics that would result in injury to feet and legs. In tightly enclosed insulated buildings bedding has been eliminated.

The ready acceptance and almost immediate use of the slotted floor principle in commercial swine units preceded availability of good research data. While many advantages have been realized, a few new management problems have developed. It should be emphasized that slotted floors can be a strong assist to swine management and a key part of the manure handling and disposal system, but they cannot be expected to replace, or be a substitute for, the good manager.