Extensive bedded indoor and outdoor pig production systems in USA: current trends and effects on animal care and product quality

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Abstract

The objective of this review paper is to document extensive bedded indoor and outdoor pig production in the United States, which has expanded due to growing niche markets for natural and organic pork. Bedded hoop (tentlike) barns are used for finishing pigs and gestating sows. Seasonal outdoor farrowing and some indoor bedded farrowing systems coupled with group lactation are used also. Most natural pork markets require outdoor or bedded settings, no subtherapeutic antibiotics or growth promotants, no animal by-products in feed, and a family farm production setting. Hoop-fed pigs have more backfat, smaller loin area, and lower carcass yield compared with confinement-fed pigs. Hoop-fed pigs have fewer aberrant behaviors and handle easier than confinement pigs. Health is similar except for an increase in internal parasites in hoop-fed pigs. Pigs in hoops are in larger groups than in confinement. Biosecurity in hoops is more difficult due to incoming bedding and open access. Hoop-fed pig performance varies depending on thermal environment, which is closely related to season and climate. Bedded hoop barns with individual feeding stalls provide an acceptable environment for gestating sows. Overall, product quality differences are relatively minor compared with wide variations in rearing environment for extensively reared pigs.

Keywords: Alternative pig production; Outdoor pig production; Pig performance; Housing; Animal care; Pork quality

1. Introduction

Extensive bedded indoor and outdoor swine production systems are receiving increased interest in the United States. Forces related to animal welfare, environmental protection, farm size and structure, and increasing building and energy costs have fueled the interest. Some of these forces are in response to the rapid recent industrialization of the US pig industry. The development of niche or special markets for pork that require production systems with certain attributes (outdoors, bedding, etc.) also are encouraging interest. This paper’s objective is to review the current trends related to extensive bedded indoor and outdoor swine production systems in the USA and their effects on pig care and meat quality.
2. Background

2.1. Definitions and scope

“Extensive” can be defined in several ways. Synonyms for extensive include expansive, spacious, large, broad, widespread, or elastic. Extensive agriculture is defined as “farming in which large areas of land are utilized with minimum (capital) outlay and labor.” Thus, extensive swine housing is characterized by ample space for the pigs, low capital investment, and the ability to be expanded readily. Outdoor swine production is defined as a system that allows the pigs outside access including contact with soil and growing plants (Honeyman et al., 2001c).

For the purpose of this paper, extensive swine housing will include outdoor or pasture systems, and a more recent development—the bedded hoop barn system. It is important to note that although both of these systems are extensive by definition, for the systems to be used widely in modern swine production they need to be coupled with intensive management practices. Extensive bedded indoor and outdoor swine production systems linked with intensive management can produce very good production levels, excellent animal care, and high-quality pork.

2.2. Outdoor pig production systems

Outdoor pig production has expanded rapidly in parts of Europe, South Africa, and the United States. Outdoor pig farms now include a wide range of sizes from small (<10 sows) to very large (10,000 sows). Producers in England have been progressive in developing and refining intensively managed outdoor swine production systems (Thornton, 1990). Estimates are that about 20% or more of the sows in England are kept outdoors (FAWC, 1996). Although rearing pigs outdoors dates back to ancient times, recent advances such as electric fence, all-terrain vehicles, plastic ear tags, low-cost plastic water pipes, and improved farrowing huts have allowed modern outdoor pig production to be competitive and more easily managed (Honeyman et al., 1999). The high-traffic areas for feeding and watering are covered with concrete. When hoops are used for gestating sows, individual feeding stalls may be used to ensure that each sow receives the daily feed allotment (Brumm et al., 1999).

Bedded hoop barns were developed first in Manitoba, Canada, and have been used there for housing finishing pigs for about 15 years (Connor, 1993). They were introduced to the United States in the mid-1990s and were adopted rapidly because of their low cost and versatility. By 2001, approximately 2100 hoop barns had been built in Iowa by 760 farmers, with 90% of them used for finishing buildings with outdoor access. In 19% of the US farms with gestating sows, the sows are kept outdoors. In an additional 45% of the US farms with sows, the sows are kept in buildings with outdoor access (NAHMS, 2001).

Outdoor farrowing and finishing is less common. In the United States, only 1% of sows are farrowed outdoors, and an additional 3% of sows are farrowed in buildings with outdoor access. In 6% of the sites sows are farrowed outdoors, and in an additional 17% of the sites sows are farrowed in buildings with outdoor access. Only 1% of the finishing pigs are kept outdoors or in outdoor lots, and an additional 9% are housed in buildings with outdoor access. In 6% of the sites with finishing pigs outdoor systems are used, and in an additional 33% of the sites finishing pigs are housed in buildings with outdoor access (NAHMS, 2001). Reports have been made of new large outdoor commercial gestation and farrowing installations in Georgia, Colorado, Missouri, and Oklahoma.

2.3. Bedded indoor pig production systems

Hoop barns are large, simple, tentlike shelters that can be used for pigs (Brumm et al., 1997). The low-cost structures have been adopted rapidly in Iowa. Hoop barns consist of steel pipe arches or trusses covered with an ultraviolet-resistant polyvinyl fabric. The hoop arches are attached to wooden sidewalls that are 1.2–2 m (4–6 ft) high. The ends are open most of the year except for winter in cold climates, when one or both ends are partially closed. Typically, most of the floor is earthen and covered with bedding. The pigs are kept inside the hoop barn, and large bales (e.g., straw or cornstalks) are used for bedding (Honeyman et al., 1999). The high-traffic areas for feeding and watering are covered with concrete. When hoops are used for gestating sows, individual feeding stalls may be used to ensure that each sow receives the daily feed allotment (Brumm et al., 1999).
pigs (Honeyman et al., 2001b). Assuming 200 pigs per hoop barn and 2.5 turns per year, the hoop barns in Iowa can produce 1 million pigs annually, or about 4–5% of Iowa’s market pig production. Also, existing livestock buildings, particularly poultry buildings, have been converted to large group deep-bedded swine finishing facilities. Bedding usually is straw or corn stalks, although sand is used in the warmer regions of the United States. The solid manure system has little risk of spills or runoff and comports easily. Although primarily used for finishing pigs, the bedded hoop barns also can be used for gestating (Brumm et al., 1999) and wean-to-finish systems (Larson et al., 2003).

2.4. Historical context

In the wake of rapid widespread industrialization of the US swine/pork industry, there is a proliferation of niche markets for export and domestic pork occurring. The markets have coupled small packing plants with small- and medium-sized independent swine farmers in the Midwestern United States.

Several factors have contributed to the pork niche market phenomena. Some factors are historical, others cultural. The Midwestern United States was settled about 150 years ago as a patchwork of diversified family farms and small towns. The settlers, primarily of Northern European descent, built a productive network of self-sufficient farms that quickly grew into enterprises that marketed surpluses. Grain, primarily corn and later also soybeans, was fed to livestock, particularly pigs. Iowa and surrounding states have led US pork production for decades. The infrastructure of pig production was well established. There were many small- and medium-sized family-based farms that produced corn and pigs in a dominant mixed farming agricultural system.

Industrialization of pig production occurred rapidly and dramatically in the Midwest during the 1980s and 1990s. For example, in Iowa, the leading pig-producing state, the number of pig farms decreased from 65,000 in 1980 to an estimate of less than 10,000 in 2002. The size of the average Iowa pig farm increased from an average 200 head in 1980 to 1400 head in 2002. In 1998 market pig prices fell to historic lows, further discouraging family pig farmers that were active in the commodity pig market. Also, consumers became increasingly aware of environmental, animal welfare, and health issues. Health issues especially became heightened, and consumers wanted more labeling and assurances that antibiotics were not fed to meat animals. Recently, McDonald’s announced that they would purchase meat only from antibiotic-free farms beginning in 2005 (Muirhead, 2003).

2.5. Pork niche market phenomena

With the Midwest’s tradition of a corn-hog family-based agricultural system, the stage was set for the pork niche market phenomena to take root. In response to these dramatic changes, some farmers in the early 1990s began to search for alternative pig production systems. More recently in the mid- to late 1990s, farmers began to gain confidence in alternative pig production and search for higher value for their pigs. In response to consumer interest in food safety and food origins, niche pork markets emerged quickly. There are approximately 35–40 pork niche markets currently active in Iowa (Ennis and Andreasen, 2003). A multistate Pork Niche Market Working Group (PNMWG) was started in 2002 in Iowa to “support the development of niche markets for pork, to foster the success of highly differentiated pork value chains that are profitable to all participants that incorporate farmer ownership and control, and contribute to environmental stewardship and rural vitality” (PNMWG, 2003). Pork niche markets embrace a variety of approaches including direct marketing, internet sales, small locker plants, farmer groups, and organized marketing groups.

There are indications that US consumers are interested in the environmental, pig welfare, and pig farm ownership and structure characteristics of the pork they buy. Many consumers may be willing to pay more for pork with positive attributes in these areas.

A major US consumer-oriented magazine—Better Homes and Gardens—conducted a comprehensive survey of 500 nationally distributed female members of their consumer panel on pig production attitudes and their pork-buying habits (Better Homes and Gardens, 2000). Of those who responded, 57% said that they were “very or moderately concerned” about the “well-being of pigs raised for pork production,” 68% were “very or moderately concerned” about...
“environmental pollution” caused by pork production, and 73% were “very or moderately” concerned about the “preservation of smaller, family-based pig farms.” Of those who purchase pork, a majority indicated that they would be willing to pay more for pork produced in a desirable way. Specifically, 80% said they would pay more for pork reared in an environment-friendly way. About 68% said they would pay more for pork reared in an animal-friendly way, and 72% said they would pay more for pork reared by smaller sized family-based pig farmers (Better Homes and Gardens, 2000). Additional work using experimental auctions showed that the consumer participants were willing to pay a premium for pork with positive environmental attributes (Hurley and Kliebenstein, 1999, 2003).

Natural pork is usually defined as pork from a family farm production setting, reared outdoors or in bedded settings, with no subtherapeutic antibiotics or growth promotants, and no animal by-products in feed. One of the larger and more successful niche marketers of natural pork is Niman Ranch Pork, Thornton, Iowa. When started in 1994, Niman Ranch Pork provided pork to a specialty food supplier, Bill Niman, in the San Francisco area. Niman Ranch Pork now supplies natural pork to hundreds of restaurants and retailers nationwide. Niman Ranch pork has more than 200 farmer-producers in Iowa and surrounding states and processes about 2000 pigs weekly. Niman Ranch Pork now is connected with a major supplier of restaurant and institutional food and also supplies pork for McDonald’s new upscale Chipotle Mexican Grill restaurants. Farmers must follow guidelines of the Animal Welfare Institute, Washington, DC, that require that pigs be allowed to behave naturally with ample space in outdoor or bedded settings. Humane husbandry by family farmers is required. Weaning must be 5 weeks or older. Confinement crates, electric prods, antibiotics, growth promotants, and tail docking are prohibited. Farmers receive about a 15% premium for pigs sold to Niman Ranch Pork. Niman Ranch Pork has grown 40% annually and continually is seeking new farmer-producers (Hermann and Honeyman, 2002).

Niche markets are attractive to small- and medium-based farmers who have swine experience and facilities. The markets offer price premiums and in some cases price security to the producers in the highly competitive pork industry. Noted agricultural economist Glenn Grimes of the University of Missouri stated at the 2003 World Pork Expo, Des Moines, Iowa, that “Unless small pork producers have captured a niche market within the pork chain, they will disappear” (PNMWG, 2003). The niche markets seek product differentiation via quality and social or credence attributes. The recognized measurable pork quality attributes of color, water-holding capacity, intramuscular fat, and ultimate pH usually are not promoted. Quality attributes that are claimed by the niche market include certain breeds or genetics, taste or flavor, high quality, freshness, and tenderness. Social or credence attributes often are claimed and include antibiotic and growth promotant-free, family farm raised, natural or organic, outdoor or bedded rearing, locally raised, humane rearing, known origin, environment-friendly rearing, and no animal by-products in feed (Ennis and Andreasen, 2003).

Along with pork niche markets and the attributes claimed, there is a proliferation of food animal certification or audit systems. These certification systems establish criteria and verify that pig farmers are compliant. Some systems currently active are led by the Animal Welfare Institute, the US Humane Society, the Food Alliance, and various other organic certification organizations.

One of the challenges for pork niche marketers is maintaining a steady supply of pork. Because most of the markets require that pigs be born outdoors or on bedding, a majority of the pigs are farrowed outdoors during favorable periods, such as late spring through early fall in the Midwest. Indoor farrowing is avoided because of high labor requirements, cold temperatures, lack of facilities, or higher piglet disease due to colder weather. This creates a shortage of marketable pigs during the summer for many niche markets. Some niche markets will not accept new producers unless they agree to farrow pigs during the winter.

Farmers have tried various approaches to improve alternative winter farrowing systems. Many involve using the outdoor farrowing huts in various indoor structures including pole barns, greenhouses, and hoop barns. Supplemental heat is essential. Iowa State University is documenting these approaches. The use of radiant tube heaters may be a positive development. Replicating a deep-bedded Swedish model in Iowa was successful except for high
3. Research in extensive pig production systems in USA

3.1. Hoop finishing research

Scientists in Iowa have been actively researching the use of bedded hoop barns for finishing pigs. A long-term (3-year) comparative study was conducted to document the performance of finishing pigs in hoops during summer and winter in Iowa, and to evaluate pig performance in bedded hoops compared with a confinement housing system (Honeyman and Harmon, 2003).

Three hoop barns (designed for 150 pigs per pen, one pen per hoop) were compared with a mechanically ventilated confinement barn with slatted floors (designed for 22 pigs per pen, six pens in barn). A total of 3518 pigs started the trials. Summer trials were June through October and winter trials were December through April. Target stocking density was 1.11 m²/pig in hoops and 0.74 m²/pig in confinement. Identical corn-based diets were fed ad libitum from 16 to 118 kg for 127 days. Pigs were scanned before harvest for backfat and loin muscle area.

Although these two housing systems are markedly distinct, overall pig performance and carcass characteristics differed slightly. These results concur generally with the results of Canadian work with finishing pigs in hoop structures bedded with straw (Connor, 1993, 1994; Matte, 1993). Pigs can compensate for wide variations in thermal environment when housed as a group with bedding. Generally the pigs performed well with major similarities, although there were some seasonal differences (Honeyman and Harmon, 2003).

During the winter, the environment in the confinement housing was less variable than in the hoop, because supplemental heat was added. Temperatures of −10 to −12 °C occurred an average of 18 days during the winter trials in the hoops. Summer temperatures in the two housing systems were similar and only slightly higher than outside temperature (Honeyman et al., 2001a), although the confinement had mechanical ventilation and the hoops relied on natural air movement.

Under ad libitum feeding conditions, pigs adjusted feed intake in response to changes in ambient temperatures. Feed intake in the quasi-thermally regulated confinement barn did not differ seasonally, but in the hoop barn, feed intake was about 8% higher during winter.

Bedding was an important environmental factor in the hoops. In addition to absorbing urine and feces, the bedding was used by the pigs to modify their environment, particularly during winter. Portions of the bedding pack composted in situ generating temperatures above 40 °C at 15- to 30-cm depths and above 30 °C over approximately half of the bedded area (Honeyman et al., 2001a). During cold months, the effective temperature experienced by hoop pigs was moderated by the pigs burrowing in the bedding and from heat generated by the bedding pack. During the summer, the pigs sought out the cooler, noncomposting areas of the bedding pack. The bedding also created an enriched environment for hoop pigs that may have contributed to “enhanced welfare” compared with pigs in confinement (Lay et al., 2000). Pigs in hoops had fewer aberrant behaviors, more play behavior, lower plasma cortisol in response to handling, and fewer injuries than the pigs in confinement (Lay et al., 2000). Also, pigs in hoops ingested some bedding, which may affect behavior or growth (Huenke and Honeyman, 2001).

Seasonally, feed efficiency was similar in the summer for the two housing systems. During the winter, hoop-finished pigs gained about 8% less per unit of feed than the confinement-finished pigs (Honeyman and Harmon, 2003). These results generally agree with work from Canada, where feed per unit of live weight gain was similar during summer but not in winter compared with pigs fed in confinement (Connor, 1993, 1994; Matte, 1993). These results indicate that hoop-fed pigs were using more of the feed nutrients consumed for thermoregulation during the cold months.

Hoop-fed pigs were less lean than confinement-fed pigs (i.e., about 1 mm more backfat, 0.17 cm² smaller loin muscle area, 1 percentage unit less lean, and 0.9 percentage unit less yield carcass yield). During the cold months, lean gain per day and efficiency of lean gain was reduced in hoop-fed pigs compared with confinement-fed pigs.
Summer hoop-fed pigs had 4% higher growth rate and required 3.6 fewer days to 113 kg. During winter, hoop-fed pigs had similar growth rate and required 3.8 more days to 113 kg (Honeyman and Harmon, 2003). These results also agree with Canadian work, where marketing age tended to be less in summer but more in winter for hoop-fed pigs than confinement-fed pigs (Connor, 1993).

During summer, there was a trend for fewer light pigs at marketing (<100 kg) from hoops. During winter, there were more light pigs at marketing from hoops than from confinement. Cornstalk bedding use in hoops was 92 and 122 kg/pig for summer and winter, respectively. Health comparisons of the pigs in hoop barns and confinement found few differences except a higher incidence of internal parasites (ascarids) in the hoop pigs, presumably because they had access to their feces. Aggressive deworming programs are essential for finishing pigs in bedded hoop barns. Keeping unwanted birds and animals out of the hoop barns is difficult. Biosecurity also can be jeopardized by animals such as cats or raccoons defecating in the stored bedding.

3.2. Hoop gestation work

The effects of swine gestation housing on sow and litter performance are being evaluated at the Iowa State University Lauren Christian Swine Research and Demonstration Farm near Atlantic, Iowa. The gestation housing systems are (1) individual gestation crates in a mechanically ventilated, partially slatted floor, manure flush confinement building; and (2) group pens in deep-bedded, naturally ventilated hoop structures. The sows in hoops are fed daily with individual feed stalls.

The sows were artificially inseminated in a confinement breeding barn with slatted floors and later were moved to their assigned gestation housing treatment. All first-litter gilts were gestated in individual gestation crates to minimize sow size differential in the group pens. There were 35 sows per group in bedded hoop barns. Farrowing occurred every 2 weeks on a year-round basis. All sows were fed 2.0 kg/day of a corn–soy diet and increased to 2.7 kg/day during the last trimester of gestation. During the winter, the sows in hoops were fed 25% more and the crated sows were fed 5% more.

At this writing, sows gestated in bedded hoop barns in groups and the individually crated gestation housing systems performed at similar reproductive levels. The group-housed sows in the bedded hoop barns, in fact, may have slightly better reproductive performance than the crated sows (i.e., fewer days in the breed-to-wean interval and more pigs born alive per litter). Also, the sows gestated in bedded hoop barns may have an equal or lower cull and mortality rate than the individually crated sows. These are preliminary results of a study in progress, but group housing of gestating sows in bedded hoop barns seems to be a viable alternative to housing sows in gestation crates.

The bedded hoop barn environment may have partial positive reproductive influences, perhaps because of increased exercise for the sow and a group setting. Many factors including breeding protocol, sow management, sow genetic lines, feeding levels, and farm health status could impact the results from these distinct gestation housing systems significantly.

Housing sows in groups poses unique challenges. Keeping the sow groups static is preferable to a dynamic housing system that adds or removes sows from the group often. Introducing young, small sows to the group, although necessary, can be problematic. Introduction of young sows occurred only after their first farrowing and second breeding were complete.

3.3. Outdoor finishing systems

There has been considerable work comparing the performance of outdoor to indoor finishing pigs in Europe, but it is limited in the United States. Pig performance has been variable due to many factors including climate, genetics, nutrition, health status, management intensity, and housing. In Texas, outdoor-finished pigs had higher Average Daily Gain (ADG) than indoor-finished pigs during warm months, but similar ADG during winter months (Gentry et al., 2002). There also is an indication that the bedded hoop environment may be somewhat superior to an outdoor environment in both summer and winter for feeding finishing pigs.

Gentry et al. (2002) found that pigs fed outdoors in Texas during the summer were fatter than indoor-fed pigs. An enriched environment may improve growth rate and increase backfat (Beattie et al., 2000),
although other studies found no differences when the environment was enriched (Pearce and Paterson, 1993; Blackshaw et al., 1997).

A recent review of the effects of rearing environment on pork quality concluded that the relationship was not well defined. There are studies showing positive, negative, and no effects, and that pigs reared outdoors produced pork of at least equal and at times better quality than the pork from pigs reared indoors (Gentry and McGlone, 2003). More research is needed to clarify linkages between rearing environment and pork eating quality.

3.4. Outdoor gestating and farrowing systems

The farrowing environment poses the greatest housing challenge in pig production, particularly for alternative systems. The newborn piglet is susceptible to chilling, crushing by the sow, and disease, particularly from enteric pathogens. Piglet crushing is the leading cause of preweaning mortality, which is highest during the first 3–5 days postfarrowing (Tubbs et al., 1993; Vaillancourt and Tubbs, 1992). In alternative farrowing, the farrowing hut is the principal modifier of the environment for the sow and litter. The hut also is the primary structure to reduce crushing and protect the piglets. With bedding, the hut creates the critical environment for the newborn piglets.

At Iowa State University, various types of farrowing huts were evaluated for incidence of piglet crushing by the sow and overall prewean mortality. Five types of commercially available huts were compared during September farrowings using primiparous gilts for 4 years. Two types of huts-steel arc style and plywood blunt–top A hut—had lower rates of prewean piglet crushing by the sows for the first 14 days postfarrowing (Honeyman and Roush, 2002). Piglet welfare and survival can be improved in alternative farrowing systems by careful selection of superior huts that have ample piglet protection space.

Additionally, sows that are gestated outdoors on high-quality pasture will get some nutrients by grazing. Primiparous midgestating sows rotationally grazed on high-quality alfalfa fed 720 g/day of corn maintained equal weight gains as gestating gilts in drylot fed 1800 g/day of a complete corn–soy diet (Honeyman and Roush, 1999). Increased fiber intake for gestating sows is positive for animal well-being.

4. Discussion

4.1. Welfare and stockmanship

Pig welfare is tied to the quality of stockmanship. Extensive indoor and outdoor pig systems pose unique challenges for stockmanship and pig care. The pigs often are in larger groups than in confinement and almost always have more space, particularly in outdoor settings. The stockman must take extra care to observe pigs in these extensive settings. At times, bedding, although beneficial overall, can mask pig problems and even hide sick pigs.

Pigs are subjected to wider environmental variation in extensive settings. The able stockman must be aware of this thermal variation and provide appropriate responses. In extensive systems, the pig stockman usually has fewer tools of automation and convenience in caring for the pigs and thus must rely on keen observation and husbandry skills. The pigs also may be more challenging to observe and to isolate and treat if needed. Therefore the extensive pig system stockman also must have a strong commitment for animal care and welfare.

An indication of greater emphasis of swine welfare in the United States is the recent release of the National Pork Board’s new Swine Welfare Assurance Program. The new endeavor is an educational program to increase awareness of pig care and an on-farm assessment program of swine welfare (NPB, 2003).

4.2. A proposed model for alternative production of natural pork

Based on the research and demonstration work in Iowa and other US locations, a model for alternative pig production is proposed (Fig. 1). It is a mix of bedded indoor and outdoor settings. Additionally, the pig production should be linked strongly to a pork niche market to capture premiums related to quality and credence attributes.
For the breeding and gestation phase, sows could be kept outdoors or indoors in a bedded hoop barn. Outdoor sows have the advantages of grazing (seasonally), no manure to spread, and low-cost housing. In most Midwest settings, however, the indoor-bedded hoop barns may be preferable because less land is required, labor needs are probably lower, and sows can be managed intensively with more ease. The indoor setting is more compatible with heat detection, artificial insemination, and rechecks. The hoop environment is more controllable than an outdoor setting. Biosecurity and management can be more intensive with less effort. But the pigs can live in a stimulating environment with bedding, group interaction, and space that is less limiting than typical confinement.

Seasonally, outdoor farrowing with superior huts has proven successful. Outdoor farrowing allows sows to be isolated during parturition. Paddocks and huts can be moved to fresh, clean land to minimize pathogens. Sunshine, wind, time, and space help minimize disease buildup and transfer.

But outdoor farrowing is not possible on a year-round basis in many regions due to cold weather, including the Midwest where many pigs are reared. Therefore, bedded indoor farrowing would be used during the cold periods. These systems are not well developed, however, and have the potential to be labor intensive. They also may lead to pathogen buildup and disease outbreaks if used continuously. The break during warmer seasons when farrowing can occur outdoors allows time for the indoor facility to be thoroughly cleaned, disinfected, and dried.

Whether indoor or outdoor, at about 10 days of age the piglets begin to move from hut to hut and group lactation occurs. It is important that the piglets are similar in age and size so that the negative effects of piglet competition during group lactation is minimized. Weaning typically occurs later than conventional systems, at about 5 weeks of age or later.

The Iowa and Canadian work on finishing pigs in bedded hoop barns clearly documents their feasibility and competitiveness. They are preferable to outdoor finishing because of a more manageable thermal environment, more consistent growth rate, more efficient feed utilization, and better runoff control than outdoor finishing settings.

5. Conclusion

Interest in extensive bedded indoor and outdoor pig production in the United States is growing. Pork niche markets have proliferated in number and size. In these markets, small- and medium-sized farmers receive premiums for pigs reared with certain pork quality and social or credence attributes. Consumers are willing to pay more for pork with attributes linked to rearing conditions that are perceived as positive to the environment and pig welfare and originating from
small, family-based farms. Most niche markets require outdoor or bedded settings, no subtherapeutic antibiotics or growth promotants, no animal by-products in feed, and a family farm production setting. Bedded hoop barns have been adopted rapidly for finishing pigs. Hoop barns also are well suited for gestating sows.

The extensive pig production systems—both bedded indoor and outdoor systems—require distinct husbandry and pig care skills. The influence of extensive rearing conditions on pork quality is not consistent, and more research is needed in this area, particularly as this pork is linked to premium niche markets that make claims of superior quality. A proposed model for alternative pig production was outlined that includes using bedded hoop barns for breeding, gestation, and finishing. Farrowing and lactation would occur outdoors in warm seasons and indoors during cold seasons. The bedded indoor farrowing/lactation system is the segment that is least defined and needs further development. Sustainable pork production is characterized by being environmentally friendly, having a positive quality of life for the producer, being profitable, and producing high-quality pork (Honeyman, 1996). Quality of pig care also should be added to these characteristics.

References


