

**Whys and Wherefores
in the Evolution of Sow-Keeping Systems**

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As we as a nation and as an industry grapple with the issues associated with accommodating pregnant sows in commercial pork production, it is good and right to mention that sage admonition of the intellectual George Santayana: *“Those who cannot remember the past are condemned to repeat it.”* Hence, the following remarks are intended to remind us of the evolution of systems for keeping dry sows. What about the nature of that evolution? What about the rationales behind that evolution? Why are those rationales now being called into question? Why are stakeholders of all stripes in a quandary as to what to do next?

Some say that, although individual farmers may make mistakes, the changes farmers as a group make usually are rational and effective in achieving their goals of producing an abundance of nutritious, safe food in an efficient and profitable manner. So it is with sow-keeping systems as they have evolved in the USA over the past 50 or 60 years. Some critics of modern pork-production systems apparently and quaintly believe that that evolution occurred willy-nilly and for no good reasons. They are wrong.

With respect to gestation accommodation, hog farmers traditionally have assumed that high rates of reproduction—and hence adequate profitability—indicated that at least most of the sows’ needs were being fulfilled, otherwise a production system would not have been widely adopted. It turns out that there are sound biologic reasons for this, which I have tried to codify in the Performance Axiom*, the essence of which is that unperturbed biologic functioning indicates that an individual animal is experiencing a high state of being. But some people outside the pork-production industry in our pluralistic culture have goals other than or in addition to efficient and profitable production of nutritious, safe pork, and they have assumed the role of activist. Their promoting those agendas has fomented the issue that now swirls around us, energizing this forum.

* **The Performance Axiom:** For a constitutionally fit animal of any kind, in the continuing absence of an adequate scientifically informed understanding of its conscious feelings, the best single set of measurable—hence, manageable—indicators of that animal’s state of being will be its rates of productive and reproductive performance relative to its predicted potential to perform. Feed-conversion efficiency, inter-individual variation in performance, body condition index, lesion score, and rates of culling, morbidity, and mortality will provide valuable additional information on animal state of being.

People and pigs go way back. Pigs hung around pre-human hominids to scavenge their leavings at least as early as a half million years ago. We know this because fossil remains of those hominids and pigs in prehistoric times often are found close by each other. And 100,000 years ago—long before domestication took place—early humans and early pigs were buried together in the same grave (presumably so the dead would not go hungry).

By 10,000 years ago, the pig had become fully domesticated—the earliest live-stock species to be so. The Chinese were among the first keepers of swine, and the family pig often lived in the same house as the people. But then, as now, not everyone wanted to raise his own meat. So there was a need for some people to raise meat animals for the nourishment of others. A ceramic rendering of a commercial Chinese pig farm around 2,000 years ago has survived to the present. It shows that the ways and means of pig farming changed little between then and 50 years ago—a shed open to a sty.

Several points of foundation, now, upon which to build the history of sow-keeping technology since the 1950s.

- **First:** An animal's state of being reflects its success in coping with a stressful environment. If it is successfully coping, it has adapted to its surroundings and it is well. But it also is—if not ideal—natural and normal for an animal to more or less succumb to a stressor and thereby become, for a while, fair or ill.

- **Second:** An animal's state of being is determined by the success of its coping, not by the magnitude of the environmental impact it is experiencing. And, at any given time, individual animals vary in their respective abilities and successes in responding to the same stressor complex.

- **Third:** An important fact to keep in mind is that we humans have domesticated for agricultural purposes only a tiny fraction of all the animal species on earth—a couple of dozen of the more than 15,000 avian and mammalian species extant today. Why cattle but not antelope? Why dogs but not hyenas? Why chickens but not eagles?

Stephen Budiansky, in his book *The Covenant of the Wild: Why Animals Chose Domestication*, wrote about the high failure rate of the human as domesticator. This, as well as other instructive insights from the book, helps us understand the relationship of humans to domesticated animals:

"The only way out is to recognize that, in an evolutionary sense, domesticated animals chose us as much as we chose them. . . . If life with man was a better evolutionary bargain for domesticated animals than was life in the wild, then it makes no sense to say that nature . . . ends where man's presence begins. And it raises doubts about larger judgments based on the premise that whatever is wild is pristine, whatever is human is tarnished. We are easily shocked by the horror stories of the laboratory and barn in part because we are ignorant of the greater horrors of the wood and water, horror stories written by nature herself."

● **Fourth:** Then why did some species, but not nearly all, become domesticated? Certain characteristics made those animals that did become domesticated more amenable to domestication in the first place than were their cousins that were left in the wild. E. B. Hale listed the behavioral traits he concluded were favorable to domestication. He theorized that the following descriptions of those special wild animals were among those that favored their domestication:

- *social groups*
- *social dominance orders*
- *promiscuous mating*
- *females accept other young soon after parturition or hatching*
- *precocial young*
- *short flight distance to humans*
- *little disturbed by humans or sudden changes in the environment*
- *omnivorous*
- *adaptable to a wide range of environmental conditions*
- *limited agility*

So, domestic animals are extremely special creatures because they are so flexible, so highly adaptable to a wide range of environmental circumstances. Rather than being finicky and requiring only one sort of accommodation, they can adjust to a variety of keeping systems. They possess a huge amount of constitutional adaptability and fitness. This is why, of course, at the dawning of the agricultural revolution, that particular handful of species became domesticated, with the pig at the head of the line.

● **Fifth:** Once we decided 10,000 years ago to keep animals for human use, we had crossed the line in terms of our ethical responsibilities. We had moved from animal rights to animal welfare. No longer did those animals that were domesticated have the right to exercise unfettered freedom of movement and migration, the right to exercise mate preferences, the right to exercise food preferences, the right to exercise shelter preferences, the right to have much opportunity to alter their environments for themselves, and so on. Whether or not humans thought much about it back then, they took it upon themselves to make many important decisions for their animals, to play God, if you will. We intervened in the lives of the animals that were domesticated, and with that intervention came what we would come to consider the ethical responsibility to ensure their well-being.

Now, we should not delude ourselves into thinking that, for example, by moving dry sows from individual stalls to group pens we would fully and instantly re-establish all of the freedoms those sows would have in the wild. They still could migrate no further than the sides of the pen permitted them to. They still would have to eat what we rationed out to them. Most of them would never see the boar that would sire their next litter of piglets. Yet they would have reached what has been called the *welfare plateau*, which is to say that, in either a stall or a pen, a sow can lead a humane existence, one in which her most important needs—the physiologic and safety needs—are very well met. All that provided the system is designed and operated properly. With the application of proper husbandry practices, sows can and do adapt to most of the systems that have been

tried. Each of those systems has its advantages, and each has its disadvantages, with respect to an individual sow's overall state of being. Regardless of the enclosure in which they are kept, the sows still would have to live in the thermal, air, and microbic environments we provided them. And in neither system would they be able either to seek a different place or to modify the present one for themselves. Once we decided to keep pigs for our purposes, we put ourselves in the realm of animal welfare—the realm of deciding just exactly how the pigs would be kept, the realm of line-drawing.

In the 21st century, such delineations should be based primarily upon scientifically informed knowledge. And, where only very incomplete knowledge exists upon which to base those decisions, we should be extremely cautious when it comes to recommending and codifying husbandry systems. There are horror stories from around the world with regard to one government or another laying down the law and the animals suffering from the unwise, inhumane result of a flawed law . . . government-mandated cruelty. In the absence of sufficient scientific knowledge of such matters, we should err on the side of caution lest we inadvertently codify cruelty.

Supposedly, in a capitalistic economy, once the various goals of all stakeholders have been taken into consideration, letting *laissez-faire* and the Performance Axiom prevail will result in a free market for experience with and adoption of sow-keeping systems, and then that free market will result in optimal systems being widely adopted. Central planning of the ways and means of sow husbandry inevitably would run the risk of burdening our sows with inhumane technology. As has been said, when it comes to governmental intervention, it is infinitely more difficult to undo a regulation than it was to set it in the first place. Nevertheless, unethical renegade producers can tarnish the image of an entire industry, and, sad to say, they do exist and they have played the role of spoiler. The ideal solution to the American pork industry's current dilemma—the American way—would be a free market for ideas plus industry self-policing by assessment and accreditation programs. Those programs would be based upon rational, reasonable welfare standards arrived at by a consensus process involving all stakeholders to the issue. Producers whose operations did not meet those standards would not be accredited to sell hogs on the self-policing open market.

● **Sixth:** In this matter, we should practice critical thinking and *caveat emptor!* Just because some scientist or some self-appointed expert says something is so does not make it so. Just because someone styles himself an authority does not make him an authority. Much of what passes for science-based fact in the industry today is actually either scientific theory or intuitive opinion. And often, alas, some such theory was developed by people who well may be scientists of a sort, but have neither the requisite education, training, or research experience to be spouting off about animal state of being.

Just as some of us—educated, trained, and experienced in the science of animal adaptability—should not opine with an air of authority on matters genetic or health or nutritional or reproductive, scientists not so educated, trained, and experienced ought to confine their statements to matters in which they actually are expert. Such meanderings outside one's expertise confuse stakeholders of various sorts, who, in the midst of the cacophony, have trouble knowing whom to believe. And listeners and readers of much of what is meant to pass today for expert fact or opinion should exercise critical thinking. They should avoid being snookered by people with activist agendas of various kinds who

employ illogical appeals to authority, despite their perhaps having Ph. D., D. V. M., or some highfalutin title after their names.

The history of sow-keeping systems in the USA since the 1950s. “*The more things change, the more they are the same,*” wrote Alphonse Karr (emphasis added). That might seem to well-describe the sow-housing situation in recent times. We may seem now to be close to having gone full circle, back to the ways of the 1950s, before the gestation stall. But in actuality, this case is one of: “*The more things change, the more they are somewhat similar.*” We shall explore that discrepancy and its ramifications. But before that we should review what we know about social groupings in wild and feral sows as they pursue their motivations and volitions.

In his book *Animal Husbandry Heresies*, Allan Fraser had it right: Absent the husbandry they receive at the hands of humans, the domestic animals would, in one generation or less, revert to the wild state. In other words, domestic animals that have gone feral are basically wild animals. What do we know about the social groupings of wild sows and of feral sows?

Frädriich, the German behavioral scientist, studied the behavior of wild European swine in their natural habitats. The sows organized themselves in groups of around six sows in a straight family line—the matriarch and five or six of her daughters, granddaughters, and so on. Their weanling piglets left the group and went out to meet their own fates. Additions to the group occurred only when a sow died and there was a re-ordering of the dominance hierarchy. In such times of flux, there was an opportunity for a self-confidently aggressive and tenacious yearling granddaughter to re-join the group. Otherwise, a sow group was an absolutely closed society, and interlopers were summarily dealt with in ferocious, injurious, and often debilitating fashion.

More recently, H. B. Graves studied feral sows and David Wood-Gush and Per Jensen studied domestic sows in large wooded pastures, and they found that those animals’ behavior to be very much as Frädriich had described for wild sows. Most recently, John McGlone has studied the sociobiology of feral swine in the wilds of Texas. Again, those creatures—as few as one generation after living on a commercial farm—behave just as the wild swine characterized by Frädriich did. And in one group of three sows, the alpha and beta individuals enjoyed a high state of being, but the gamma sow—with a load of internal and external parasites and enzootic infectious diseases no better or worse than those of the alpha and beta—was thin . . . body-condition score 2 or 1. She was being bossed away from the meager food sources in natural habitats. Again, this is in a small sow group subsisting mainly on mast and roots.

The point is that domestic sows, even today, are innately much the same as they have been for hundreds of thousands of years. A sow is a sow is a sow, be she wild, feral, or domestic. And woe be unto those who do not honor that fact.

Anyway, in the 1950s—when a Midwest farmer keeping 50 sows in an extensive outdoor production system was considered to be a “big operator”, and most kept herds

numbering in the range of eight or ten—the sows were, for the most part, all related to one another and had been socialized with one another since a few days after birth. The social tension in such matriarchal hierarchies—just as in the wild—was low. Every individual knew her place, and the farmer—wanting to minimize the natural squabbling at twice-daily feedings—made sure there were enough places at, and enough slop in, the trough that every sow had access to as much feed as she wanted and usually more than she needed. Some farmers even policed the sow-squabbling with a canvas slapper or some such to protect the interests of the lower-ranking sows. And, yes, that also was the era of fat and extremely fat sows—an uneconomical and unhealthy situation.

What happened next? And, more importantly, why?

- **1. Enter the structural changes in production agriculture.** As the structure of production agriculture changed at an increasing pace in the 1950s, more hogs were produced on fewer farms, so average sow-herd size grew. And with that, as group and pen sizes became larger, the natural reinforcement of the dominance order that comes when two sows' normal paths cross became less frequent and hence less effective. As a consequence, there were looser social bonds and more and more intense social revolts among the sows.

- **2. Enter more sow competition at feeding time.** Hog farmers soon noticed sows showing up with injuries due to being attacked by higher-ranking group mates as well as less altruistic behavior at feeding time, resulting in some sows being denied satiety and appearing undernourished, even emaciated. In attempting to circumvent the diseconomy associated with the culling of poor-doing sows, farmers sought ways to reduce competition and plain old aggression at feeding time.

- **3. Enter the feeding stall.** Feeding stalls—these typically were as deep as a sow is long but had no gate at the back. And they worked *to a point*. But at feeding times, a sow that had gobbled her feed ration could exit her stall and start pestering other sows that were still eating, biting their tails and their vulvas and nosing and mounting them.

- **4. Enter improved diet formulations and the limiting of sow feed intake.** The problems at feeding time were exacerbated when nutritional research in the 1960s resulted in refining gestation-diet formulations and, to promote sow health and extend productive lifetime, sows' rations of the improved feeds were reduced. Feeding four or five pounds of feed per day amounted to less than a third of a sow's voluntary feed intake if given free access to feed. The sows were better nourished but hungrier than before. And hungrier sows are feistier, more aggressive, more vicious sows, and something had to be done to minimize the havoc being wrought by fast-eating, bossy sows.

- **5. Enter ad-libitum access to special feeds.** In trying to reduce competition at feeding time, animal scientists and pork producers tried to formulate diets that could be self-fed to groups of sows. They added bulking agents such as cobs and hay as well as other ingredients aimed at controlling the intake of metabolizable energy. These initiatives generally did not succeed, as the sows tended to adjust gut capacity and overeat.

● **6. Enter the skip-a-day feeding of sows.** Some producers tried giving sows access to self-feeders for limited periods, such as a few hours every other day or two. But, presumably because the sows were so hungry when they were turned into the feeding area, the ensuing fights were horrific. Moreover, the sows' reproductive performance waned, at least partly, scientists found, because the digestibility of crude protein (dietary nitrogen) was decreased with this feeding regimen.

● **7. Enter the back-end gates on feeding stalls.** Back-end gates were added to sow-feeding stalls. They were shut for 30 minutes or so at feeding times to protect the rear ends and rumps of sows from attack by an aggressive group mate that had finished eating her twice-daily rations of feed. Also with this approach, there were needs for more shelter for sows and herder alike in temperate regions.

● **8. Enter the diseconomies of increased labor requirement.** So hog farmers found themselves with larger, feistier sows herds and each sow needing to be isolated at feeding time. Trouble was, it took labor to shut all those back-end gates and to stand around till 30 minutes later to re-open the gates. That system, with groups of 40 or 60 sows in feeding stalls with back-end gates, was requiring a lot of labor, and that increased the cost of production.

● **9. Enter the new farm generation's notion of a quality work environment.** Already in the early 1970s, farm boys were telling their hog-farmer fathers things along the line of: "Either get the hogs inside and out of the ice and rain and mud, or I'm going to find a job somewhere else. And I want some weekends off, too."

● **10. Enter the scarcity of farm labor in general.** At the same time, the local pool of potential hired men, which had been the mainstay of the farm labor force for generations, was withering due to the growth of higher-paying jobs and more pleasant working conditions off the farm, even in rural areas.

● **11. Enter the scarcity of skilled labor in particular.** So livestock farmers turned to nontraditional pools of barn workers, people who in many cases had little or no experience whatsoever with commercial swine production. This presented new challenges to producers, who had to simplify herder duties, go to great lengths in training herders, hire full-time supervisors, and often even learn a new language.

● **12. Enter once-a-day feeding.** To reduce the labor requirement, instead of feeding sows twice daily, they were fed once a day. Nevertheless, as breeding-herd size grew, so inevitably did the labor requirement. And so the cost of labor remained, in traditional terms, a disproportionately large part of the cost of production. The hog farmer searched for a more labor-economical way to keep dry sows separated at feeding time.

● **13. Enter the weakening of the bond between herder and individual sow and the consequent waning of individual husbandry.** As group size grew, the bond between the herder and the individual sow naturally weakened. Sows now had ear-notched num-

bers, not names. And the herder was no longer the owner or the owner's son or nephew. More and more herders were people having no prior experience with pigs in any connection except at the dinner table. Consequently, the sow became even more emboldened to act aggressively toward her herder. This, coupled with the fact that there were more sows with which the herder had to contend when working in their midst, led to the serious injury to and even the death of herders.

The herder's attention to the sow inevitably changed at the same time. With more sows to attend to, frankly, each sow received less attention. Moreover, human nature being what it is, the needs and wants of "Sow 3041" were less compelling than were those of "Rosalie". The quality of stockmanship decreased.

● **14. Enter the concerns over point sources of manure in terms of environmental pollution.** As the sow herds grew, so did the accumulation of manure on farms that were still mostly farrow-to-finish operations. State environmental-protection regulations and then federal encouraged swine producers to keep their hogs and pigs in facilities from which the manure could be handled without risk of its entering natural waterways. As a practical matter, this meant decreasing the number of animals per unit of pasture or keeping them on solid or slotted concrete, so their excreta could be collected and disposed of in any of several ways. This was the major reason swine started coming in out of the fields in the late 1960s.

● **15. Enter the straight-sided gestation stall.** The dual jobs of containing manure and keeping sows separated at feeding time were handily executed by the straight-sided stall with slotted floor. The straight stall had been tried as early as 1800 in England, but perhaps its earliest trial in the USA was in the mid-1950s at the hands of Euel Liner of Lubbock Swine Breeders in Texas. It took a while for the straight stall to catch on in the industry, partly because of the higher capital cost of this system. But with the confluence of the urgent needs to separate sows, to feed sows according to their individual needs based on body condition, to contain manure, and to protect inexperienced herders came together, the industry soon flocked to adopt the straight stall over slotted floor. It was, all in one package, the answer to most of the producer's facility dilemmas. A straight stall over a slotted floor—designed and operated as it should be in an otherwise supportive environment—was and is to this day an acceptable way to keep pregnant sows. In fact, given the caveats indicated in the foregoing statement, it is today the best way to holistically meet the dry sow's needs.

● **16. Enter, alas, the opportunity to neglect a sow's individual needs.** To be sure, on one hand, the straight gestation stall made it possible for the herder to give the sow more individual attention than she had been receiving in large groups. But, on the other hand, it also made it possible for a wayward producer or herder to feed the sows first thing in the morning and never look in on them again till the next morning. Not all producers followed that practice, but some did. Some swine-equipment and facility manufacturers touted the concept of "push-button farming", one even using that as an advertising slogan in the trade press. But, of course, there is no such thing as "push-button farming" of animals in a humane world, and this laxity in terms of sound stockmanship is where the neglect of the sows' needs and inhumane treatment crept into

the system on some farms. The system itself, designed and managed correctly, was acceptable in terms of our ethical responsibilities to the sow. At fault was not so much the system *per se*, but rather the unfortunate opportunity for herders to neglect the sows' needs for individual attention.

● **17. Enter, alas, the tethering of pregnant sows and stress.** The practice of tethering pregnant sows at the neck or at the girth came across the Atlantic from Europe around 1960. Although some producers found them useful, research by John McGlone and others found that they were chronically stressful and that the sows' reproductive performance was deleteriously affected. Tethering was never widely adopted in the USA and was generally abandoned by US producers by the 1990s.

● **18. Enter, alas, the too-narrow, too-short gestation stall and abuse.** Once gestation stalls had become widely adopted by pork producers, the incessant drive to reduce capital and production costs—often fomented by unrealistic expectations of ignorant and unrealistic investors and lenders—led delinquent equipment manufacturers to offer stalls that were too narrow, too short, or both, for most sows. The sow zone in some stalls was as narrow as 19 inches and as short as 78 inches, whereas the required space was several inches wider and longer. Frankly, the lack of attention to this by black-sheep producers, lenders, equipment manufacturers, and facility-construction firms alike, starting in the early 1980s, led to the adoption on many farms of inhumane and inefficient straight-stall/slotted-floor sow-keeping systems.

As a consequence, some sectors of the interested public started to raise legitimate questions about the ethics of using straight stalls at all. Those animal-protection activists who truly were interested only in seeing to it that sows are treated humanely, though, painted the industry's adoption of straight stalls with too wide a brush. Their point that too-narrow, too-short stalls that were an abomination was right-on. But, in their exuberance they went too far. They used a broad axe when a rapier would have been more appropriate. They called for the outlawing of all straight stalls for dry sows when what was indicated, instead, was the industry's policing itself and discrediting straight stalls that are too narrow and too short. But the industry did not do—and has not yet done—that.

Again, the straight-stall/slotted-floor system itself, designed and operated correctly, was acceptable in terms of our ethical responsibilities to the sow as well as the sows' primary and secondary biologic needs. Those small, inhumane dry-sow stalls represent an example of a good idea taken to untoward and perhaps even perverse extremes.

● **19. Enter the turn-around stall—a useful hybrid.** In the mid-1980s, the turn-around stall emerged as an alternative sow-keeping technology. In my opinion, the turn-around stall as introduced by University of Illinois animal scientists and designed and developed by Richard Balsbaugh and Ian Taylor, then with the now-extinct Moormans Livestock Equipment Division, is the hybrid that simultaneously best integrates the advantages and best neutralizes the disadvantages of both the straight stall and grouping.

Forty years ago, the British Parliament commissioned an investigation of animal-production technology. A critical report resulted. Since then, animal-protection activists have been demanding that kept animals be able to exercise Five Freedoms, namely:

1. Freedom from thirst, hunger, and malnutrition
2. Freedom from discomfort due to environment
3. Freedom from pain, injury, and disease
4. Freedom to express normal behavior for the species
5. Freedom from fear and distress

With but one exception, sows in turn-around stalls enjoy all of these freedoms. (That exception is that, with modern dietary formulations, it is in the sows' best interests to limit their feed intake. The innate voluntary-feed-intake rate of modern sows was designed by nature for a time when food was scarce and not reliably nutritious and attempts to modify it genetically have been unsuccessful.) And, in fact, the turn-around stall ensures those freedoms to a greater extent than do group systems.

Moreover, the beneficial features of the straight stall also are present in the turn-around stall, namely:

1. Protection against fear, discomfort, pain, and injury due to group-mate aggression
2. Opportunity to express normal behavior patterns, including some social interaction
3. Opportunity for feed to be rationed according to individual needs
4. Protection of herder from injury by sows
5. Efficient manure disposal

Alas, the turn-around stall has not yet been widely adopted by US pork producers. The perceived flaws—the criticisms of the system by producers—do not strike the developers of the system as being fatal. The suggestions here are that the turn-around stall hit the scene about 20 years too soon and that now its time has come and that it ought to be re-considered in terms of the industry's current needs.

● **20. Enter more alternatives to the straight stall.** By the late 1980s—and certainly by the mid-1990s—the industry's thought leaders and early adopters could see the writing on the wall. Enough of the industry's producers, lenders, equipment manufacturers, and facility builders had followed mistaken priorities that, by then, activists and consumers were making headway as they demanded significant changes in sow housing. Unfortunately, neither the pork industry, the land-grant research system, nor the animal-protection sector has sufficiently promoted and supported bona fide scientific research on sow-keeping systems. Instead, for the most part, they have watched—and even touted—the emergence of sometimes ill-conceived, often half-baked alternatives to the straight stall. Following, in no particular order, are some of the more prominent systems.

- *sows in groups in various outdoor pasture systems*
- *sows in groups in deep-bedded hoop structures*
- *sows in groups indoors, deep-bedded floor, feed nuggets broadcasted daily*
- *sows in groups indoors, deep-bedded floor, electronic feeders*
- *sow in groups indoors, solid floor, electronic feeders*
- *sows in groups indoors, deep-bedded floor, shallow feeding stalls (no back-end gates), drop-feeding*

- *sows in groups indoors, deep-bedded floor, shallow feeding stalls (no back-end gates), trickle-feeding*
- *sows in groups indoors, solid floor, shallow feeding stalls (no back-end gates), drop-feeding*
- *sows in groups indoors, solid floor, shallow feeding stalls (no back-end gates), trickle-feeding*
- *straight stalls a few weeks after mating, then some sort of grouping system*

Other speakers in this forum will address the pros and cons of some of those regimens.

Fillips. Just as no natural setting provides a perfect environment for sows, no artificial system of sow-keeping will be perfect. Recent meta-analyses and emerging experimental results show that both straight stalls and group-pen systems have plusses as well as drawbacks. Yet the public clamors for the transition of the industry to group-house sows. Of course, troubles in the life of the sow did not start with the straight gestation stall, and they would not end with an *en masse* shift to any other system now on the horizon.

Then, faced with (a) the want to satisfy the consuming public and (b) the need to employ systems of sow-keeping that gibe with the nature of the sow, whither should the industry go?

First, we should accept the fact that, regardless of the feelings, intuitions, and opinions of anyone, the dry sow's needs would continue to be what they actually are. And we cannot come close to fulfilling the sow's needs in sustainable fashion until we first know better what those needs are. And the only way we can increase our knowledge of the sow's needs is to investigate the matter via the scientific method.

Second, we should follow the approach of Ragnar Tauson, who identified the good features of various existing laying-hen cages and incorporated and integrated those good features in a brand-new design. A few additional tweaks resulted in a cage that virtually eliminated all of the disadvantages recognized in earlier models.

Third, we should become more broad-minded and open-minded. A radically new technology of sow-keeping well might emerge from the first ever thoroughgoing scientific analyses and development efforts. If so, then we must be ready and willing to embrace the huge paradigm shift that would naturally follow.

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