Overview of System Options: Economics and Production

Dr. Mark Honeyman, animal scientist
Iowa State University

Mark Honeyman is assistant professor of animal science at ISU and teaches swine management and animal nutrition. He also coordinates ISU's network of 11 research and demonstration farms. He conducts research in swine nutrition and production focusing on alternative feeds and systems; he is keenly interested in the role of livestock in sustainable farming systems. He was previously a partner in his family's farming operation in southwest Iowa. He earned his B.S., M.S., and Ph.D. degrees from ISU.

It's very heartening to have you all here today. I need to tell you all a little story. As I get older I realize how smart my dad was, but he did one really dumb thing. He raised purebred Landrace hogs and he built a clothesline right along the fence. And right across the fence from that clothesline was where we watered those Landrace sows, and there was a big mud hole there. When my mom would do the wash, she'd hang the sheets out there on the line. It would get hot and those sows would go lie in the wallow and they'd stand up and shake their heads, and there would be these little brown spots all over my mom's clean sheets. Well, dad never moved the clothesline, but he did move the sows.

My talk's going to be a little bit like that. I'm going to flop around, and I hope a little bit sticks on you.

We've seen a lot of quotes today. I want to show one that I like:

A pig in palms is still a pig. —Jewish proverb

No matter what system we put these animals in, they are still living, breathing pigs. And each is unique. The other thing that the attendance here testifies to is the quote by Mark Twain: The reports of my death are greatly exaggerated.

There's been a lot of press about the moderate and modest-sized producers in Iowa, and how they're disappearing. I think that's been a little bit overstated.

Our industry has been in the midst of a lot of change, and with that there is lot of opportunity. Some of the alternatives we'll talk about today are those opportunities. These options or alternatives have a whole list of characteristics: They generally allow
the pig more freedom. To some producers that’s a little scary, because the pig is “in charge.” We’re not manipulating the animal with equipment or with gates. These options also require a unique management style, and it gets back to what’s been said many ways better than I can say it. We have to be keen managers. We can’t rely on the thermostat or the farrowing crate. We’ve got to rely on the gray matter between our ears.

I think most people who raise pigs want to be good stock people, good stock men and women. These alternative systems rely on husbandry and the ability to see what’s going on. They rely less on equipment and buildings and more on bedding for the pigs to create their own micro-environment. And they’re less capital- and energy-intensive. For that reason I believe they will become the systems of the future. Other reasons for adoption include producer health considerations, producer risk perceptions and preferences, producer location relative to his/her neighbors, tax considerations, land characteristics (soil type, topography, vegetation), climate, producers’ personal values (e.g, likes to work outdoors, feels pigs should be allowed outdoors, prefers this type of stockmanship), and the integration of pigs, land, crops, labor, and other livestock and management.

Frequently we say that these systems are more labor intensive. I believe that’s because many of us grew up with scoop shovels in our hands that our parents handed us. But these systems don’t have to be that way if we structure them correctly. A study that Mike Duffy and I did several years ago, with several pasture-farrowers who are in this audience, demonstrated that they only used three hours of labor per litter. I think if we allow that animal to feed itself, to water itself, to spread its own manure, to make its own nest, we’re going to end up with systems that are actually less labor intensive but more management intensive.

These systems tend to be more sensitive to the weather variation. And certainly we live in a climate, a region, that has incredible weather variation. But we are here, and we are descendants of people who have been here. We are genetically selected to manage that weather variation, in my opinion (laughter).

Today we’re going to talk about outdoor production. Dr. Curtis did a nice job of bringing John McGlone’s work to us. We’re going to talk about the deep-bedded Swedish systems, and again, we have experts here. We’re going to talk about hoop structures. They haven’t been mentioned much today. I have slides on all of these. We’re going to talk about remodeling existing structures. You know Iowa is covered with abandoned
farm buildings. I think there is an untapped opportunity there. In fact, for my post-doctoral research, I think I’m going to try to figure out how to raise pigs in these cylindrical blue structures, because they’re all over the place! (laughter) And we’re going to talk about open-front Cargill units.

I’ve got a slide here of the ISU Western Research Farm at Castana, Iowa, in the beautiful Loess hills. That’s where we’re doing our work with outdoor pasture farrowing, and you can see some of the huts in the foreground (slide). The man who raises these pigs is here with us today. There is a pocket of outdoor pig producers in western Illinois who I am convinced are some of the best in the world. Gary Johnson is here and manages several of those farms. Dr. Christian and I were on this farm last summer (slide). Two brothers raise 5,000 head of pigs a year, and every one of them is born on dirt. And they are doing it on a 50-50 livestock share. They farm 240 acres. They’re making a good living, and their landlord is making a good living.

At Castana we have been comparing different hut styles since 1990. You can see a number of them there. We’ve got a homemade A-frame, a plastic hut, a western Illinois modified A-frame, and the Port-a-hut that’s manufactured in Storm Lake. We did a test over three years to see how well these huts modified the environment. We found out that they’re all about the same except for the plastic hut, and it’s the hottest. That may be good in November, but it may not be good in July.

Certainly there are many styles of huts. This is a picture I took in Sweden (slide) of a British hut. I think there are advances in hut technology that would help these outdoor systems raise more pigs per litter.

As for genetics, this is a Yorkshire Landrace gilt (slide) that I believe will do well in an outdoor environment in western Illinois. And I believe it will produce pigs with as good a carcass as anyone could want. This gilt is rugged, and she’s got mothering ability. She’s the kind of female that we need in these systems.

Also, look at the grass growing around that gilt. Farmers in western Illinois are concerned about soil erosion in their pasture systems. They farrow on hilly ground. They’re working with the Soil Conservation Service to determine which grasses will stand up to the high traffic of intensively managed outdoor pig production. This happens to be fescue, and they’ve also looked at perennial rye grass. They’re doing a good job.
Certainly, if we put enough pigs in a small enough space, they will take care of all the vegetation. In fact, we took this picture (slide) because it shows a situation even worse than the last slide: there is sloping ground and soil erosion. We have to be aware of that, especially when it rains. Those of you who were pasture-farrowing in 1993 (during severe flooding in Iowa) have nightmares about the mud. These systems can really be a challenge. But I believe that swine producers in Iowa are better equipped to handle the challenges of weather and mud and predators than they are to become electricians, and electronics people, and the welders and mechanics that many of our intensive confinement systems have asked you to become.

You raise pigs because you want to make money. And you raise pigs because you like pigs. And you want to be stock people. I think some of these alternative systems allow you to become stock people and to be paid for your management skills.

The important thing is the microenvironment for that animal. It’s been discussed. But when we use bedding, and that’s one of the “silver bullets” of these systems, then the pig can either burrow down in or lie on top and create its own microenvironment. It doesn’t matter if it is a fat pig or a lean pig. As for new technologies: Dr. Curtis did a wonderful job of opening that subject up. An electric fence—wow! This kind of electric fencing you can carry under your one arm and just walk across a field and put it in place. We’ve used it to do grazing studies. As long as these animals are out there, they’re gestating, and they benefit from exercise and fiber intake. Let’s let them harvest alfalfa in this case (slide). We’ve got some data on that. One of the problems if you feed these animals too much forage is that you’re going to get creatures that look like this (slide of Holstein cows with pigs’ snouts—laughter). But I haven’t seen that happen very often.

We have four years of replicated studies that show we can cut the feed use by gestating sows in half by using growing forages. We’re now into a series of studies to look at rape and other annuals.

This outdoor trend is incredible. My understanding is that over one out of five pigs in the United Kingdom is born on dirt.
If you believe, as I do, that what happens in Europe comes here, we are headed toward more outdoor production. You know, the Beatles came from the United Kingdom.

You can learn as much from the people who raise pigs as you can from the pigs. I've collected some quotes. If you're one of the people who said these, I apologize. "Cold weather is better than hot weather." Many of those outdoor producers told me that they can manage cold weather better than hot weather. They can bed huts and bed sows and really make a difference. But when it gets really hot and humid—I think that's one of the differences between Iowa and Texas, the humidity—things can go to pieces. Pigs do not handle heat and humidity well.

"What I thought was the worst day of my life was really the best day of my life. I drove in the driveway and found my farrowing house in flames. I knew I had a whole bunch of sows ready to farrow. The farrowing house burned to the ground. I started farrowing outdoors the next week. I love it, and I haven’t changed back!"

"Outdoors requires a totally different managing style. The sows are in charge. You need a shepherd’s mentality to make it work. I watch the pigs very closely; they tell me what to do. You have to create a setting for the sows to do what you want them to. All in/all out? Hell, it's all-out all-out!"

I need to be more scientific here. We went to the Iowa State University swine enterprise records. We looked at five years of data. We found each one of those years had between five and 12 outdoor producers that owned somewhere between 130 and 220 sows each. They were farrowing from 188 to 350 litters a year, and we compared that group, although it was small, to the indoor producers, a large group of 180 to 200 producers. They were a little smaller and had about 100 sows each. What did these data show us?

<table>
<thead>
<tr>
<th>Year</th>
<th>% sows outdoors (estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>less than 2</td>
</tr>
<tr>
<td>1980</td>
<td>5</td>
</tr>
<tr>
<td>1985</td>
<td>5 – 8</td>
</tr>
<tr>
<td>1990</td>
<td>10 – 12</td>
</tr>
<tr>
<td>1995</td>
<td>20+</td>
</tr>
</tbody>
</table>
Pigs weaned/litter | Outdoor | Indoor | Difference
--- | --- | --- | ---
Pigs weaned/sow/year | 7.6 | 8.4 | -.74
Fixed cost/pig weaned ($) | 13.4 | 15.5 | -2.1
Production cost/cwt. marketed ($) | 6.46 | 9.79 | -3.33
Feed/cwt. gain (lb) | 39.02 | 40.97 | -1.95 or $4.88/pig

The outdoor producers were weaning 3/4 of a pig less or two pigs per sow per year less. That doesn’t bother me too much because some of these are all-gilt producers. Their fixed costs were lower: $3 per pig less. Their total cost of production was $2 per hundredweight less, or about $5 per pig. So they had a five-dollar-bill advantage, mostly because of lower fixed costs. And their feed efficiency was much poorer. It took them about 50 pounds more feed per pig to get the pigs to market. So we’ve got two weaknesses—poor feed efficiency and smaller litter size. I think the feed efficiency is related to parasites. We know that soil-borne parasites can be a problem. We have to be very aggressive in parasite control.

There are some other things that would be helpful in terms of weaning more pigs per litter. I think it’s been mentioned, but we need to start selecting sows for mothering ability. I’m afraid the farrowing crate has allowed us to use sows with poor mothering ability. And certainly, if she’s out there in a hut, in a nest, by herself, you’re relying on that sow’s mothering ability to keep her from lying on pigs. Use bedding and keep that breeding window narrow so that you’ve got pigs of the same age. That’s one of the things that pasture farrowers understand well and do well.

Wean early? Maybe. We tried segregated early weaning (SEW) with pasture-born pigs. They were a little confused, but it worked great! Use bigger, better insulated huts. Some of these producers have some nurse sows that farrow early. They put them in their old farrowing house, maybe the one that didn’t burn down. Then they pick up those small pigs when they’re out there watching what’s going on—the ones that are just the squeakers. And they put them on that nurse sow, and those pigs will wean.

We did a study at the ISU Western Research Farm that involved 280 litters. These were all gilt litters. We’ve had 11 percent overall crushing rate for the first ten days to two weeks of life. We compared crushing rate by these different huts (see p. 49). We went from over 20 percent crushing rate down to 7 percent just on hut type. There’s a correlation. The biggest huts had the lowest crushing rates. And these were all gilts.
What if we had sows in these smaller huts? I wouldn’t want to be born in one of these huts.

Let’s look at some slides from Sweden. Group housing of lactating sows in deep-bedded systems is common, and I believe it’s a place to start (see summary of discussion beginning on p. 88). It runs against conventional wisdom. What they’ve done is to remove feed as the aggression focus by feeding animals individually. You’ve got first-litter gilts with tenth parity sows like these Landrace “dinosaurs” (slide). They’re doing great. Look at the building it’s in. There are cracks between the boards. This is an old barn. We’ve all got old barns.

As for farrowing in pens or in the system that Dr. Algers mentioned, we’re going to try to replicate this in southwest Iowa at an ISU research farm. These very prolific sows are either moved into a group lactation room or they’re farrowed in the room and the partitions are taken away. As you look into a room, it will be quiet. There are 10 to 15 sows and 100 to 150 pigs. It’s an incredible sight!

The sows are taken away, and the pigs remain. They minimize that weaning stress; it happens at five weeks. And they (the Swedish) are not using any antibiotics in the feed. I was very impressed. Then the pigs are moved to a more conventional finishing room. I’m not going to go into that system. We’ve got the experts here. I challenge you to find them and talk to them.

I mentioned abandoned farm buildings in Iowa. These buildings are all over. You have them on some of your properties. Somebody went to the bank, borrowed the money, signed the note, paid somebody to build it, or did it themselves. They thought they had to have these structures. But they’re empty. They’re either too small, too labor intensive, too expensive to maintain, but in any case, they’re empty. I think in agriculture we’ve spent too much time and money building buildings that are outdated almost before we use them. They are certainly outdated before they’re worn out. This hooped structure attracts my attention. We need a versatile building for the hog business. It’s rapidly changing, we all agree. Let’s get a building that we can raise pigs in year-round, but one in which we could also do something else. We could rent this out to a rich neighbor to park a boat in. Or we could park our combine in there.
Pig crushing losses by hut type (1990 - 1995)
(279 litters born, 2,566 pigs born, 11% overall average crushing rate).

<table>
<thead>
<tr>
<th>Hut Type</th>
<th>% live pigs crushed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quonset (curved steel)</td>
<td>12</td>
</tr>
<tr>
<td>A-frame (wood)</td>
<td>21</td>
</tr>
<tr>
<td>A-frame (plastic)</td>
<td>16</td>
</tr>
<tr>
<td>Modified A-frame (plywood)</td>
<td>8</td>
</tr>
<tr>
<td>Pig Saver (plywood)</td>
<td>7</td>
</tr>
<tr>
<td>Pig Saver (plastic)</td>
<td>9</td>
</tr>
<tr>
<td>English (curved steel)</td>
<td>7</td>
</tr>
</tbody>
</table>
Hoop structures are tent-like structures made by several manufacturers. This one comes out of Manitoba, Canada, where I’m told about a fifth of all pigs are fed out in buildings like this. They’re easy to build. With the one that we have on our research farm, they even let me come over and help build it. There are no threads, there’s no tools. We’ve got 150 head of grow-finish pigs in there ready to go to market.

They’re the same ones we put in SEW. They’re really confused because we went from pasture to SEW to the hoop structure. Agricultural engineers have hung some probes in there, that’s what’s hanging down from the ceiling (slide). Those are big round bales of corn stalks. Now one thing Iowa has is a lot of corn stalks. 150 pigs came out of an SEW nursery in mid-November at a 55-pound average. We put them in this hoop structure and they’re doing great. One group. Again, it runs against our conventional thinking that we’ve got to put these pigs in small pens, 25 per pen, for them to perform well. The other concern is that the humidity is going to build up. It’s 20 below out; there’s no insulation. That’s just a thin plastic tarp. Yes, there’s some humidity that builds up. You’ll see it in there, but the door in the back hardly ever closes. The caretaker might have closed it that one Friday night (of the blizzard). The other end is completely open. So we’ve got natural ventilation; we’ve got air volume. And when it does condense, it’s on a curved surface and it ends up on the outside of the building.

I think this is one of the most exciting things to happen to the hog business in Iowa for a long time. And we’re eager to get busy on research projects to document it.

Inside the hoop structure, the back is dry. Pigs sleep there; the middle third is where they dung. That two-thirds of the building is dirt floor. It’s all bedded. The front third is concrete and that’s where the feeders and waterers are located.

We had an open house that day, and it was ten below zero. The surface of the manure pack was not frozen. Those pigs were living in an uninsulated building, naturally ventilated, ten below zero, but where they were it was above freezing. That’s going to impact their performance.

I was over at the farm one day and noticed a big hole in the tarp. The guys hadn’t even told me about it. I said, “What happened?” Well they’d caught the tarp with the loader and tore a hole in it. So I’m showing this photo because it proves that this tarp is patchable. It’s guaranteed for ten years and they send you some patches.
Let me show you some data on these hoop structures from Canada. Canadian scientists at Manitoba have compared these hoop structures to a conventional partially slatted confinement unit. Here’s what they found. Overall they performed very well. Feed to gain ratio or feed efficiency was 10 to 20 percent poorer during the winter. The animals ate more feed to stay warm. They gained the same. They got to market at the same age. They had lower pig deaths in the hoop building, about one percent less than in confinement.

Some of you want to know how much bedding it’s going to take in the hoop structures. In Manitoba they used wheat straw and barley straw. It took between 200 and 350 pounds per pig in a grow-finish system. They did a slaughter check to see how healthy these pigs were. They had better lungs in the hoop than they did in confinement. They certainly did record high humidities during the winter. When it’s 25 below in Manitoba and you button up the back side of that hoop and it’s full of pigs, the humidity goes up.

They recorded labor use, and it was similar to a confinement building. The hoops are cleaned out only after the pigs go to market. That took about 12 to 15 hours for this 175-180 head, 30' x 72' structure. It’s solid manure. Even at 17 below the straw pack remained above freezing. Again, the Canadians emphasized management.

Here at ISU, our results show they’re easy to put up. They’re durable and patchable. I think the important thing is that they’re versatile. In U.S. dollars they’re about $50 per pig space for grow-finish. That’s about a third of what the double curtain-sided, totally slatted buildings that are going up between here and Minnesota are costing. They’re about $150 and hold about a thousand pigs.

I did some economics. If there’s 12–18 percent poorer feed efficiency for two months of the year—that’s a sixth of the year—we’re going to have in a whole-year period about 2–3 percent poor feed efficiency, or require more feed per year. On 200 pounds of gain, 50 to 250, that’s going to take 12–18 more pounds of feed per pig. At ten cents a pound, that’s $1.20–$1.80 more per pig over a year period. As for bedding, I don’t know what corn stalks are worth, but probably the cost to get them wind-rowed, baled, and hauled in is about a cent per pound. That’s three bucks a pig for bedding. So in total, everything else being equal, I come up with a $4 to $5 advantage per pig for the hoop building.
Then I looked at confinements. If it costs $150 per pig space to build a new confinement building minus the $50 for the hoop, the difference is $100. At seven and a half percent interest, two and a half turns per pig, it’s about $3 per pig. You’ll notice the cost of bedding is about the cost of interest. No wonder the bankers aren’t pushing these.

Operating expenses: I don’t know what they are for a finishing unit, but there’s heat, lights, ventilation, and so on. I’d guess $2.50 per pig space, at $1 per pig per year, and depreciation at about $4 per pig. I get a total of $8 for confinement. Again, this assumes that labor is equal. The difference is about a $3 to $4 advantage for pigs in hoops.

We have some producers here today who are truly experts. They’ve managed many of these hoop structures. The advantages of hoop structures are that you’ve got small, self-contained groups of pigs of the same age and you can do all in/all out easily by building. Solid manure and less odor are advantages. These days, a liquid manure spreader or a liquid manure lagoon is suddenly a liability. Flexibility, versatility, and reduced risk are additional advantages. You can fold these things up and move them. You have lower fixed costs, lower total costs of production, healthier pigs, home grown bedding, no energy costs, and natural ventilation. When I compare them to a Cargill unit, I see no runoff problems, no snow removal needs. The pigs are under a roof, and I think that’s good. The hoop structures are simple to build. Ph.D.’s can do it!

At another one of our research farms we took an old cattle shed and tried to convert it. We tried deep-bedded farrowing. We took pasture farrowing huts and put them indoors. It worked pretty well. It worked very well in March and December. We farrowed four times a year. It didn’t work well in June or any of the hot-weather months. It was just too hot in them. So this is what we decided to do: in the cooler months we could wean over a nine-pig average, but in the summer our weaning average went way down. So we’re going to pasture-farrow outdoors with the same huts and move them inside in the colder months so we can go year-round.

Open-front, Cargill style buildings certainly offer the advantage of lower cost, but they require a lot of management. We’ve got some people who are very successful with them.

Traditionally, we’ve had one-site production. We did breeding, gestating, farrowing, nursery, and finishing on one farm, one place.
But I think that you should think about layouts that will work for you. This is what I call the two-site boomerang. Everybody has a south place. You've got water there. You've got electricity. Maybe you should put your nursery there or take pigs down there to finish them. I think it will work about as well as a three-site situation.

**Configuration A:**
- Site 1: breed-to-wean, sows and suckling pigs
- Site 2: Nursery, 10 – 50-lb. pigs
- Site 3: Finishing 50 – 250-lb. pigs

**Configuration B:**
- Site 1: breed-to-wean, sows and pigs
- Site 2: Nursery, 10 – 50-lb. pigs/Finishing, 50 – 250-lb. pigs

I don’t have data yet. I bounced this idea off Hank Harris, Chair of ISU’s microbiology department, and he said he thought it would work. Or keep the sows one place and put the pigs somewhere else. The big advantage here seems to be getting those pigs away from the sows. I’m not sure about how it fits with what Dr. Algers said about weaning. But right now we’re on an early weaning binge in this country. We’ll soon find out what its limitations are.

I challenge you to think about these different options. I challenge you to think about different layouts or configurations. The exciting part is when you start to mix and match. You know it’s been said many times, but we’re all as individual as our thumb print. And that applies to the way we raise pigs. I let my mind wander, and I want to challenge your minds to think outside the box. Test some ideas such as whether we can farrow to finish in a hoop. Bring 12–15 sows into a hoop. Set up the boxes or huts and let them farrow. Take the sows away, and leave the pigs there. They’ve never met a stranger, there are 150 pigs the same age, and we take them all the way to market. We know that every time we move pigs, it costs us in days to market. Maybe this hoop building would allow us to get rid of some of that. Summer pasture, winter deep-bedded, gestation in a hoop—I know it will work. Pasture-farrow, SEW, hoop finish—that’s what we’re doing. It’s working very well. Convert your open fronts to gestation. Build hoops to grow-finish, because I think the hoop finishing will easily outperform the Cargills.

What we’re after in this conference is to keep what I call the dream factor in Iowa pig production. The dream goes like this. You worked hard, had a little luck. You didn’t need much money, but you could build a future for yourself in agriculture. You could pay the bills, send the kids to college, buy the eighty next door, and drive green.
equipment (*laughter*). I don’t want to lose that in Iowa. Our secret got out. Now we’ve got to get a little better at it.

Dr. Lawrence said what we need are the people (consumers) to help us access new markets. If people knew the way pork was being raised, I believe they wouldn’t be eating it. I want to emphasize the importance of management and the person who’s managing the pigs. You have to be happy at what you’re doing.

This is a Mr. Bergvall from Saffle, Sweden, and his son (slide). And this is Gun Raguarrson from Sweden (slide). She weans 26 pigs per sow per year with a five-week weaning. Those pigs love her!

Thank you very much.

**Questions**

**Do we have carcass data on pigs finished in a hoop building versus finished in a conventional building?**

In other words, if we raise pigs in a colder environment are we going to end up with a fatter carcass with the same genetics? We don’t have hard data yet. I think that the environment in that hoop building is modified enough that we won’t see major differences. It goes back to the old myth that we’ve got to have fat pigs in these old-fashioned facilities, and that is just not true. We can have very lean pigs in fairly extensive facilities if we give them the bedding to protect themselves.

**How long will it take for what’s happening in Europe to get here, and how long will it take for the consumer to [buy the new products]?**

I don’t know the answer. I know people are interested in conducting focus groups to ask consumers how important the way pork is raised is to them.

(*closing comment*) Another producer that says that they split a group, raised them indoors and outdoors, and carcass results were very similar. Pennies difference in total outcome will lower fixed costs. We’ve got to stay nimble in this industry. If you’re going to dance with the dinosaurs, you’ve got to stay light on your feet.

**Tips for successful outdoor production:**

Take advantage of batches for improving herd health.
Control parasites aggressively.
Decrease feed waste and adjust feeders.
Buy feed wisely—beware of med packs.
Split-sex feed.
Phase feed.
Use grazing for sows.