Managing Alternative Production Systems: 
A European Perspective

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First of all, I’m very happy to meet with you here today, to speak with you and also to attend the discussions this afternoon, because I’ll be very interested to hear what you have to say as well. On behalf of the Swedish group here, I’d like to thank Dr. Lauren Christian and Dr. Dennis Keeney, Dr. Mark Honeyman, and Marlene Halverson for inviting us here today. It is a thrill to meet with United States farmers and to listen to what you’re doing, what you’re up to, and your thoughts for the future. I am going to give the European perspective on managing alternative production systems. That is very difficult, because there are many different perspectives in Europe. Therefore, I think you’ll find that my perspective as a Swede will be a Swedish one, which involves food safety, our concern about animal health and welfare, and the animals’ natural behavior as defined by the (Swedish) Animal Protection Act of 1988, which says that “Animals which are bred and kept for the production of food, wool, skins, or furs shall be kept and handled in a good environment for animals and in such a way as to promote their health and allow natural behavior.” However, even if we have been working with that perspective for quite a few years, our membership in the European community gives us another perspective, and that is the perspective of competing. So we have to do this [raising swine according to this act], we have to do this well, and we have to be very efficient too.

Our starting point has always been the pig, and I’ll tell you why. We had a great concern in Sweden among consumers, producers, and others, that animals didn’t thrive in the intensive systems that we too had been using there. Signs like bar- and back-biting in sows are considered signs of a “disease” of sorts in Sweden. Other signs of this disease
include tail biting. If you cut the tail of a pig, you are just blindfolded in that you can't see what problems there are, so we choose to leave the tails on and try to get rid of the problems. Because aggression and fighting can be a problem, we have to deal with it by "asking" the pig [via careful observation] how we can raise it without it fighting all the time. Consumer concern about the use of antibiotics, growth promoters, and hormones makes us choose methods that work despite banning of growth promoters in the feed, using as little antibiotics as we can, and not using hormones.

So, if we're to accomplish all this successfully, we need to go about it, and we need to "ask" the pig: how is it functioning? We can start by asking the wild boar, which is the pig's wild ancestor. We've gained a lot of knowledge from that. However, we've been told, and I think correctly, that we couldn't expect the domestic pig of today to be similar to the wild boar. Instead, we should ask the domesticated pig. So, over the past nine years, we have conducted experiments in semi-natural environments of different kinds, including large enclosures, and we've studied their behavior and tried to identify the crucial points. Have we learned anything from the pig that we can utilize when we design new systems? To make this long story short, I'll give you a few glimpses of what we've found. I suppose that some of you will think I'm talking about things you already know, and I think I am. However, if I'm able to systematize that knowledge a little bit for you, I'll be happy with what I've achieved here today.

[Under natural circumstances] Pigs live in small maternal groups: three, four, five sows, some juveniles, a boar—not close to the group, he'll be adjacent enough to be available at mating times, but otherwise he'll be on his own. And these pigs will spend most of the day exploring their environment, searching for food sources, and consuming food. That's what their motivational systems are designed for, and that's what they'll do. They'll take a break and rest in the afternoon. When a gestating sow is coming close to the time of farrowing, she will leave the flock all of a sudden. She'll go away and look for a suitable site to give birth. What causes her to do this? We've found that a hormone called prolactin suddenly rises and is released in the sow's bloodstream, and that endogenous mechanism triggers nest building by the sow.

She will walk for many miles to find a suitable nest site. I'd always wondered what a suitable nest site was. Now I have some ideas: it will be a place with well-drained ground soft enough so the sow can root in it. It will be shielded from wind and rain, and it will be away from the original group. If you follow a sow, she'll know where you are.
They keep track of you. This is quite logical because they need to find a site away from you. So a lot of external information is taken in and processed by the sow. She makes decisions and she goes to places that fit with her ideas. Once she's found the place she'll begin the nest-building activity by rooting a shallow hole in the ground. She will rip branches from nearby small trees and bushes and arrange them in that nest. After that, she'll start collecting softer nest material. If you're still there watching, you'll realize she's not worrying about you at all. She's walking back and forth, carrying nest material, and you can stand on the edge of the nest and she doesn't worry. She might go 60 to 80 times to find nest material, because she's being driven by more internal forces, more endogenous forces. She's close to farrowing—a matter of hours—and she needs to be quick about it. So she can't be worried about what's going on elsewhere. She arranges the nest material very thoroughly.

Beginning about 20 hours before farrowing, prolactin starts rising. During nest-building (14-15 hours) it peaks. Then the hormone oxytocin starts to rise, and that shuts off the nest building behavior. We've found that other hormones are also involved, such as the hormone somatostatin, which is like the brake pedal on digestive processes. Sows that are high in this hormone spend less time in nest-building (which incidentally piques our interest in genetic variations in this regard).

This sow (slide of hog in small confinement stall) also has a rise in prolactin. But what can she do? She can root a little in the feed trough (as the slide shows she has done). However, she got no functional feedback on her behavior, so you could say this sow was frustrated. That frustration might result in some stress. If you look at the cortisone levels of sows that are confined in crates or pens, you can see a difference. Sows that can move around freely release a relatively even amount of cortisone until farrowing starts, when it rises as a result of the stress of the farrowing process. However, the crated sow's cortisone levels begin to rise the day before farrowing. Her prolactin rises, and she should be nesting. So it's not surprising that as a result of this stress, for example, stress-triggered diseases such as Agalactia toxaemica (MMA), are more common in caged sows than in loose sows. [Swedish research also shows that sows not given oxytocin as a regular treatment when they are farrowed in crates have longer farrowing hours, higher disease incidence, and higher medication needs than if there were farrowed in pens.]

This is a nest (slide) built by a sow during the wintertime. We put out some straw bales so they had some nest materials to use. And the sow farrows in the nest and stays there
for about a week, 10 days, maybe more in wintertime. Why? First of all, the nest provides a good microclimate for the piglets. They don’t freeze, even at minus 20 Fahrenheit. Deep in the nest, the temperature can be close to room temperature, where the piglets stay when it’s cold. The nest period has several purposes. One is to let the sow adjust to the litter size she has. The unused teats will have time to atrophy so she won’t have to produce milk for stray piglets, and the risk of cross suckling can be reduced. There are several features of the nest that I think we could learn from and use that prevent a sow from crushing her piglets. The sow enters the nest from the same angle every time, for example. The second is that she vocalizes as she comes to the edge of the nest, which gets the piglets up on their feet; that’s anti-crushing feature number two. She roots herself through the nest, creating a piglet-free canal, pushing aside any sleeping piglets (anti-crushing feature number three). She then lies down very slowly (number four). A crated sow, on the other hand, more or less of falls down. The mattress effect of the nest itself is that fifth anti-crushing feature. And if we use these features, we will have better results than if we violate these principles.

After these ten days or so, the sow tries to get her piglets to follow her back to the rest of the flock and to integrate with that flock. If you look at the social behavior of the piglets when they’re integrated with other litters of piglets from other sows, you’ll see a lot of interaction but very little aggressive behavior. Nature did not intend for small piglets to fight with strangers.

To sum up, there are some social dynamics of free-ranging pigs that we could utilize. First of all, before farrowing females live in small groups, and just before parturition, sows are alone with litters, there are no boars around, and there are strong interlitter bonds. The nest building consists of several phases: site choice, rooting, ripping of branches and gathering, carrying, the deposition of softer materials, and arranging.

Our animal protection act says that animals should be able to behave naturally, that the natural behavior of the animal should be promoted. But what is the natural behavior of a pig? (illustration slide of a pig swimming in a lake). If you put a pig in lake, it will swim. That’s natural. However, pigs that aren’t in a lake won’t swim. So we don’t put them in a lake, because we don’t need to see swimming pigs around. But sows that are about to farrow will try to build nests even if you don’t give them a nest site and materials. The difference is that nest-building behavior is driven by internal factors in the sow, and the hormones released that govern these behaviors, and you won’t stop those
hormones from being released merely by crating the sow. So if you want to keep pigs according to their natural behavior, you don’t have to give them a lake. But you do have to give them a chance to build a nest. And that is how we interpret our animal protection act. And that’s the reason why we have a ban on cages with tethers in Sweden.

My research colleagues thought that after doing all these studies we could try to develop systems that would go along with these natural behaviors that we believe we need to support. But the farmers around us were more rapid than we were and they started to develop systems according to these ideas. This (deep-bedded) system is just one we’ve developed in Sweden. The idea behind it is that sows should always be kept in a social group, yet be able to go away from the group when their nest-building behavior is triggered. Therefore, cubicles are put up on the sides (inside the building where the deep bedding is). Because the sow ought to be able to build a nest, straw is provided. Thus they should be able to practice all their anti-crushing behaviors. These cubicles are not narrow. Think about what Stan told you about huts.

Space is important here. The sow and her piglets should stay in the nest until the bonding between the sow and her offspring is assured. This means that you have to have a threshold with a roller on it so the small piglets cannot get out until they’re about 10 days old. We know that this bonding is also important to reduce cross suckling. Of course you’ll get some in a system like this, but if you reduce it and handle it properly, you can get rid of its most detrimental effects and take advantage of the positive aspects. So, while the piglets stay for ten days in the cubicle, the sow can get out and move around freely. Then the piglets are mixed, and the cubicles are taken out.

When farmers in Sweden changed from using crates as you use here and changed to systems based on the natural behavior of the sows, they realized that sows are not all alike, and that they’re really great individuals. They differ in their maternal abilities: some are good and some are poor. And so it’s important in using systems like this to use sows that not only have “talent,” but who also have experience. So you need the right breed, the right individuals, and you need to be systematic about how you do this. If you take a bunch of gilts and put them in a deep-bedded system, they will confuse each other. If you have a good age pyramid and add a few gilts each time you farrow, you’re going to improve the system and it will go smoothly. We’re now conducting more research on maternal abilities and how they’re linked to the release of hormones, for example, so we can assure that we have good maternal traits in our sows.
The weaning of piglets in a system like this is also one of its most important features. Nature tells us that weaning takes place later than we do it. Age and sucking rate has been correlated and has shown that pigs are naturally weaned at 14, 16, maybe 20 weeks of age. But weaning is a gradual process that can start as early as the first week. How is that? The sow doesn’t like to lose all her weight to the piglets. If you look at the number of nursings that the sow starts with, you’ll see that she initiates fewer and fewer nursings as time passes, and it’s more up to the piglets to see that nursing is started. The sow also—fairly quickly—starts to terminate nursings by rolling over or walking away. We know that the massage that the piglet conducts after the letdown of milk releases a lot of hormones that make the sow produce more milk. So that is a sort of tactile communication between piglet and sow which is very important for her lactation. The piglets like to put in a lot of massage because it pays off in terms of milk. But the sow doesn’t want them to, so she rolls over and terminates, reducing milk production, and it becomes more beneficial for the piglet to begin consuming other forms of feed. Also, the sow increases the proportion of nursings that she conducts while standing, making it more difficult for the piglets to conduct this massage.

So if you have a system where the sow can regulate this litter and move away from the piglets, part of the weaning is done when you take away the sow. And that’s what you need to know if you’re going to use this system without any antibiotics, because the abrupt change from milk to feed is too difficult for the pigs’ intestines. Then you get weaning diarrhea. But if the piglets have started to increase feed before they leave the sow, enzymes are developed, the microflora are there, and they can be weaned. Colleagues of mine have conducted a study of different types of weaning systems that we use in Sweden. We have a one-unit pen where the sows farrows and leaves the pen; a feeder pen where piglets are moved to a new pen, and then the deep-bedded system. My colleagues looked at the amount of medicated feed that was needed per year per sow in each system and the proportion of piglets that were treated for diarrhea. There was a large positive difference between the systems where part of the natural weaning can be conducted versus ones where the pigs are just [abruptly] moved away from the sows.

Before 1985, we were not allowed to use antibiotics and chemotherapeutics in feed to treat sick animals without a veterinarian’s prescription. And after a ban in 1985 we were able to reduce the use of these drugs and at the same time increase our results. It took a few years for the farmers and feed companies to adjust, but now we’re better off than we
were before. The results from these systems show that in comparisons between lactating sows in groups and more conventional systems, the former produce a little better, are larger, and piglet mortality, for example, is just as low.

The take-home message here is that when we design systems like this, you may think they are low-tech because we don’t put up a lot of fittings inside or purchase costly devices. But a farmer with a cellular phone (slide) shows this is a high-tech system in terms of brains, skills, and talent of the farmer. Because you can’t do these system unless you know what a pig is, nor can you use these systems without being interested in your pigs and wanting to spend your working hours on the farm with them rather than anywhere else. It is high-tech, and I don’t recommend it to just anyone: only to the high tech farmers.

To conclude, I think that what I have learned is that having worked with behaviors of pigs for 21 years, and having had the pleasure of being friends with many of them, following them in the woods, and seeing what characters they are, what individuals and how elaborate they are in their behaviors, I agree with Francis Bacon, the English philosopher, who said, “Nature must be obeyed to be controlled.”

It is only through knowing how nature works, how it functions, that we can understand and design housing systems that will be good for the animals. And by that I mean so that we don’t have to remove parts of the animals, we don’t have to use chemicals in any way, and we have animals that are healthy and thriving.

Thank you very much for your attention.

Questions
Have you noted any change in performance going from free-range pigs to these systems?
Yes, they do much better, because pigs, on their own, will suffer from seasonal variations. They were not designed to farrow in the middle of winter, but in the spring. They’ll also suffer from heavy rainfall, which is a disaster to a natural nest that isn’t so protected.

In adding gilts into the system, do you find that gilts learn from older sows, or do you keep them away from the better sows? I’ve seen them lie down and not even build a nest. Is that hereditary or environmental?
First of all, ask yourself what sort of gilt you have. How was she brought up? In this system, or in a crate? You should have an animal with some experience in deep straw if you choose a deep-straw system. Also, gilts are very nervous when they’re about to nest.
Moreover, they make each other nervous, and if you have a bunch of nervous pigs around, that’s not good for a system like that. They’ll be visiting each other’s nest sites and things like that. And they shouldn’t, really. So introduce only those proportion of those gilts you need, rather than have a bunch that all farrow at one time. The Swedish farmers using this system cull sows that aren’t doing well after the second parity. On the other hand, a sow who does well may be kept on for seven, eight, even nine parities.

**What about profitability?**

You should ask the producers, but we know the results are perhaps better than in our conventional systems, around 20 piglets per sow a year, and some much better than that. The investment in these buildings is 60% lower than for our conventional buildings, and the time they’re in there is shorter. There’s a study of a few farms by Barbro Matsson (see p. 88) that shows that if a farmer puts in 27 hours in ordinary pens, he puts in 18 hours in the deep-bedded systems. So that tells you something about economic efficiency. We shouldn’t really compare dollars between Sweden and the United States, because we have so many factors that affect price that the comparison wouldn’t be relevant.