Proceedings: Symposium on Swine Housing and Well-being

June 5, 2002
Des Moines, Iowa

United States Department of Agriculture

Cooperative State Research, Education, and Extension Service

Agricultural Research Service

National Agricultural Library

Animal Welfare Information Center

Purdue University

Proceedings: Symposium on Swine Housing and Well-being

1. Stockmanship and Training
2. Practical Sow Housing System Design
3. Consumer Perspectives

P.O.R.K. Academy 2002
Kent Feeds
Co-Sponsored by Pork Checkoff and the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service, Plant and Animal Systems, Animal Well-Being Project funds administered by Purdue University

Edited by

Richard Reynnells, Ph.D
U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Plant and Animal Systems

Published by:

U. S. Department of Agriculture
Agricultural Research Service
National Agricultural Library
Animal Welfare Information Center
Beltsville, Maryland 20705
E-mail: awic@nal.usda.gov
Web site: www.nal.usda.gov/awic

May 2003

Cover Photo courtesy of the United States Department of Agriculture, Agricultural Research Service, Photo Library

Table of Contents

Preface

Richard Reynnells
National Program Leader, Animal Production Systems
U. S. Department of Agriculture (USDA)
Cooperative State Research, Education and Extension Service (CSREES)

Funds have been made available for the USDA/CSREES and the Agricultural Research Service (ARS) to provide assistance to the animal industries in the area of animal well-being. Congressional directive S. RPT. 107-33 defines the supplemental appropriations for these research, education, and training programs.

The USDA/ARS funded research in FY2002 on sow housing at their Livestock Issues Unit, Lubbock Texas in collaboration with Texas Tech University, the University of Minnesota, and the University of Illinois. Objectives of this research are to measure sow stress in current (crate) and alternative housing systems, and to conduct an economic evaluation to determine the cost of conversion from crates or tether systems to one of several alternative systems. A societal concern is the individual confinement of sows, which the pork system (industry, university, government) is attempting to address, in part through this research and educational programs.

CSREES-led training and educational efforts complement ARS research activities, so the symposium and other programs are to be developed around swine housing and management issues. The symposium organizing committee is composed of about twenty representatives from animal welfare organizations, industry and USDA. The committee attempted to create a balanced program when defining topics and speakers for this symposium, which was held at the P.O.R.K. Academy, in conjunction with the Pork Expo in Des Moines on June 5, 2002. Access to the presentations via audio- and video-tapes is available to farmers and others not able to participate directly. Future educational and training programs will utilize these proceedings, and concepts discussed during the symposium. Future educational programs will likewise strive for a scientific and balanced approach and will complement existing material, including results from the ARS research projects. A one hour video and companion CDROM/DVD program will be developed. Training programs will be in cooperation with organizations such as the National Pork Board, agricultural universities, and non-government organizations from the professional, protection and industry communities.

Major issues in swine production are gestation stalls, and farrowing crates used in intensive production facilities. While transportation and “downer” animal concerns exist, the training modules will provide the majority of information on these and other aspects of management.

A broad advisory committee has provided input for the symposium and training material. A speaker from the European Union was invited to participate in order to gain a better understanding of their perspective of these management issues, including training programs and alternatives to intensive confinement. The symposium was open to the public, with topics that included: intensive and extensive confinement management

practices and training programs, and their effect on animal well-being; niche market development; certification programs; consumer perspectives; and identification of additional researchable items. The proceedings are being provided after the meeting to allow inclusion of research recommendations and other information. The proceedings and other material will also be used in follow-up and other intensive training opportunities. The training material will be able to stand alone as educational programs, or as part of other training or educational programs.

Welcome and Introduction

Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES

On behalf of the organizing committee, sponsors, and Purdue University as the lead university, I welcome you to the Swine Housing and Well-Being Symposium, Stockmanship and Training Session. Our other two sessions will take place this afternoon. We are indebted to the Pork Academy and Kent Feeds for agreeing to include our symposium in the Academy agenda for 2002.

This symposium was made possible by the allocation of funds from Congress through the USDA Secretary's office to the Research, Education and Economics Under Secretary to address animal well-being issues. Part of this allocation was made available to CSREES to provide leadership in the development of this symposium and other educational programs for the swine system, and outreach support to complement related USDA Agricultural Research Service programs.

You were provided an evaluation form as part of your registration packet. It is important to know your opinion of the topics and speakers for all sections of the symposium. It is also very important to have your opinion of the types of well-being educational and training programs that the swine industry would find helpful. These comments will help provide direction for the balance of our work on this very important project.

The organizing committee is composed of representatives from farm, commodity, university, and professional organizations that have a commitment to serving the swine industry, and by well-being advocates serving niche sectors of the industry through hands-on well-being programs, and animal protection group representatives. These same people will cooperate to coordinate development of the educational and training programs that build on this symposium. You will be sent a copy of the proceedings after the symposium. Videotapes and audiotapes of the symposium will be available through Purdue University and commodity and other organizations for only a handling fee.

Questions will be written on index cards or other paper. Questions will be taken to the Moderator, who will read the question and ask speakers to respond. Audience member interactions with speakers will take place after the Question and Answer period. If there is time after a presentation, the Moderator may or may not chose to allow a question using this same procedure. Speakers are reminded to stay on time because this is a tight schedule.

We have an outstanding panel of speakers, who have many years of experience in their field of expertise. They have been instructed to challenge you and to provide you a chance to see well-being issues in a realistic and perhaps different light. An emphasis on maintaining and expanding farmer's current stewardship roles, and exploring the well-being of animals offers positive opportunities for both the swine and the owner. Speakers will discuss background information, ethical considerations, resources available to you for training, retraining and orientation of employees, and stockmanship considerations. We hope you find the symposium beneficial.

Introduction
An A and Five E's:
Training Stockpeople to Be
Maximizers of Pig State-of-Being

Dr. Stanley E. Curtis
Department of Animal Sciences
University of Illinois, Urbana

It is my pleasure in the next few minutes to kick off this morning's session on Stockmanship and Training. As the pork industry moves into a new posture vis a vis the animal-welfare issue, even more attention needs to be paid to the nature of responsible stockmanship and the training of pig keepers to be responsible stockpeople.

The panel of speakers assembled by the program committee --- Ray Stricklin, Jean Larson (Cindi Smith), Peter English --- are highly qualified to their assigned tasks today. It is a privilege to say I have known each of the three for at least two decades. They are highly respected by their peers around the world for not only what they promise but also for what they deliver. I am as anxious as you must be to hear what they have to say to us here now.

What I have to say at the outset falls into three categories:

- An A
- Four E's
- A Fifth E

The A: Attitude

Attitude. The stockperson must be endowed with a proper attitude of just what a pig is; must respect the pig; must protect the pig; must support the pig; must be kind to the pig.

Attitude. The stockperson must be curious about what the pig needs, and anxious to fulfill those needs. The primary needs are for adequate and accessible feed and water, shelter, health care. The secondary needs are for protection from predators, injurious equipment and facilities, accidents. The tertiary needs that support acceptable pig emotional states.

Attitude. As mentioned earlier, the stockperson must at all times treat the pig with kindness and respect. Use the brain 99 percent of the time, brawn 1 percent. Apply necessary goading pressure dispassionately. Appropriately design and wisely use handling facilities and aids.

Attitude. Results from studies of pigs in The Netherlands, Australia, the United Kingdom, and the USA; with cows in the United Kingdom, Australia, and the USA; with chickens in the USA and elsewhere all lead to the conclusion that not only is kind treatment of animals at the hands of humans the humane way, it also is the healthy, biologically efficient, financially profitable way.

Attitude. Some people make good stockpeople, some do not. Some are exceedingly

trainable, others are not. Management should exercise zero tolerance for abusive handling and neglectful keeping of pigs. If, due to inadequate state labor laws, an employee may not be terminated for her first lapse, at least she should be transferred to a position involved in no way with direct or indirect animal contact.

The Four Es: Economics, Ethics, Emotions, Esthetics

Economics. Face it: the pork industry can no longer afford to let economics be by far the major determinant of management decisions related to pig state-of-being.

Ethics. Even philosophers gravely disagree with one another as to the ethics of animal care and use. If someone today says, "The ethics of the situation is thus and so," the speaker is either naive or engaging in calumny. There is no single monolithic ethical judgement as to where to draw the lines with respect to pig state-of-being. Moreover, what are actually emotional and esthetic issues are sometimes --- advertently or inadvertently --- mistaken as being ethical in nature when they clearly are not.

Emotions. Emotional attitudes about pork production systems mostly have as their basis uneasiness, anxiety, even fear of the unknown or unfamiliar. They have to do with the nature of the human observer, not necessarily the state-of-being of the pig.

Esthetics. Many people do not fancy visiting a pork-production unit. Just as they shudderingly shun popping their head into the mortuary operatory or hospital surgery suite, or as they would not enjoy even a quick peek over the top edge of a sewage-treatment-plant collection tank.

A Fifth E: Expectations

As a pluralistic society wrestling with a difficult, multifaceted issue, we must be sure that expectations regarding pig state-of-being are realistic. It is unrealistic to expect or set a goal that any pig on earth should experience well-being all the time. We humans --- with all of our intelligence, preventatives, nostrums --- do not achieve that. Instead, we should expect and hope that a pig on a contemporary pork production farm will experience well-being most of the time, fair-being some of the time, ill-being infrequently. It will be futile to set perfection as a goal along this line if we sincerely expect to achieve that goal.

Incidentally, a realistic goal in this matter should be based on performance criteria, not design criteria. Design specifications tell us at what temperature the thermostat should be set, whereas performance specifications tell us what constitutes a thermally comfortable pig. A thermally comfortable pig should be the goal, regardless of what thermostat setting is required in a particular (unique) pork-production setting to achieve that thermal comfort. Myriad factors determine thermal comfort, and sometimes the pigs will be comfortable at a thermostat setting 10 or more degrees above or below what some book or table or regulation calls for. In fact, in a practical setting, I am cool to the idea of design-specification tables and the like. They cause as much or more trouble in terms of pig comfort than they resolve. In fact, I go so far as saying it would not bother me to see the thermostats in pig houses with the numbers erased from the dials. Simply watch the pigs.

By the way they behave, they will tell you whether or not they are comfortable.

Recapitulation

1. Stockpeople must exercise a proper attitude toward the pigs.
2. Ethics in this matter is still mostly an exercise for ethicist philosophers, not for activists and politicians.
3. Thinking based on emotions and esthetics should not be confused with thinking based on ethical analyses.
4. Neither can economics any longer be the sole or even main criterion upon which management decisions bearing on pig state-of-being are made.
5. All engaged in the discussion of pig state-of-being must have realistic expectations of the goal. This simply is in the best interests of the pig. And the goal should be based on performance standards, not design standards.

Ethical Considerations of Pork Production

W. Ray Stricklin
Department of Animal and Avian Sciences
University of Maryland
College Park, MD 20742

Overview

Pork production has a major impact on the lives of many humans and involves the lives of millions of pigs. The impact on individual beings ranges from negative to positive, from suffering to pleasure. This range applies to both humans and other animals. Traditionally, swine producers have worked to minimize the cost of pork and have given relatively little direct attention to issues such as animal welfare. Today, meat has been made readily available and at cheap prices, but now questions are being raised as to whether some aspects of animal production *ought to be* modified and many of the concerns are related to issues such as animal welfare. Ethics is the discipline that deals with questions about what *ought to be.* While many of the questions involve animal welfare, other questions are related to human well-being (changes in rural life, farm and food processor labor issues, etc.) and also to the impact of pork production on the environment. In this discussion, it is argued that ethics is a necessary part of planning and development for sustainable pork production systems to be attained. Survey information indicates strong public support for the position that food-producing animals ought to be treated such that they experience an appropriate quality of life. Specifically, the public expresses greatest concern for issues that are related to intensive confinement such as gestation stalls. Additionally, the public has a highly favorable view of the term “rights” in relation to animals. However, true vegetarians make up only 2% of the American population and there has been no trend toward increased vegetarianism over the past 50 years.

It is the primary contention of this presentation that the public does not wish to stop eating meat but strongly believes that animals should receive appropriate treatment during their lives. Therefore, it is proposed that the establishment of pork production practices that are viewed as ethically defensible is not only the right thing to do but is also a pragmatic action to be taken as a marketing tool.

Introduction

Ethics is about treating others fairly. Historically, others have typically included only other humans. Today, there is a growing tendency in discussions about applied ethics to include animals and the environment. Accordingly, the term bioethics is sometimes used in this regard especially in reference to biotechnology and genetically modified organisms. The title of this presentation at first appearance may sound as if the following discussion will address honesty and fairness in the business dealings among swine producers. However, I will attempt to address ethical issues inclusive of both humans and other animals and the environment. Thus, the current discussion may be considered to be one about bioethics.

Ethics has to do with attempting to be objective in determining appropriate moral behavior on the part of humans. A basic premise of moral philosophy is that humans --- unlike the other animals --- have the ability to consider what constitutes right and wrong behavior and

also to act accordingly. Additionally, it can be argued that because we have this ability, we have an obligation to use it. In this paper I will not address all ethical issues associated with pork production --- to do so would take a much more detailed effort. For the sake of brevity in this presentation, I will not address specifically the very important ethical topic of molecular gene manipulation. Neither is this paper an attempt to build complete moral arguments either in support or criticism of the swine industry, as a philosopher would possibly do. Instead, in this presentation, I will attempt to raise some questions that have moral implications and offer some observations on each.

Can't science settle all disputes --- about everything?

We live in a time when science is making enormous strides in adding to our understanding of the natural world and resultant technology is providing us with new products and treatment that add to our longevity, comfort and pleasure in living style. Science tells us much about the universe, how we came to be, what is needed to feed ourselves, and many other details about our natural system that are of major importance in our daily lives. Science tells answers to *what is* types of questions, but science cannot tell us *what ought to be.* Accordingly, it is contended that the pork industry should not attempt to use science alone as the basis for contending positions relative to pork production.

It is not uncommon to hear persons in agriculture contend that someone or some group is not being scientific in their thoughts and behavior. Animal rights persons are often accused of being radicals acting emotionally and not scientific in their thinking. The Europeans are sometimes accused of not being scientific because they refuse to accept genetically modified food products and have legislated animal welfare codes of practice based on emotion and not objective facts from science. I have heard European animal scientists accuse American animal scientists of not being very scientific about animal welfare. The American public is sometimes accused of not being scientific when they do not readily accept irradiated food products.

In the above statements about others not being scientific, the contention is basically that science is synonymous with objective thinking and anyone who does not accept the viewpoint of the advocate is not being objective. It is also common to hear statements to the effect that only science should be employed in resolving disputes in today's world because ethics and philosophy are simply subjective opinions of individuals and that consensus is thus difficult if not impossible in ethics. But in fact the same can be said about science as was indicated in the accusations above where one group accuses another of not being scientific.

I think that it is also important that many of the statements listed have to do with food. Food habits are historically not based on objective reasoning, and there may be no reason that one should be asked to be scientific in selecting their food or how their food is produced. People do not eat what science considers the most healthful and never have done so. Dietary habits are based on religious traditions, individual preferences, etc. To argue that one should eat a given food --- or food produced in a given manner --- because of science is going against a long history of tradition. The freedom to eat what one chooses is a strongly held value. Granted, science-based information should be available, but arguing that a given food should be accepted on the basis of science can sound quite patronizing to consumers.

Regarding the lack of consensus about ethics, in fact there is much more agreement among humans regarding ethics than there is disagreement. For example, we humans almost universally agree that it is wrong to cause unnecessary pain and suffering to others. This is a value that is basically common to all people. There is strong agreement on this issue across international borders, languages, cultures, religions, races, sexes, etc. True, we may disagree about what is meant by "unnecessary" pain and suffering. Some groups may contend that it is sometimes "necessary" to cause suffering to others in order to bring about what is considered to be a greater good. Justification of warfare is frequently attempted with such an argument. We may even disagree as to whom should be included when we talk about harming "others." Animal rights activists typically contend that "others" should include all beings capable of feeling pain and suffering. Whereas, there are still many persons in the world who contend that "others" do not include persons of other ethic groups, religions, races, etc. Fetuses are also not believed to be persons by some and therefore feel it is not wrong to terminate them; whereas, others disagree. But regardless, the disagreement is not about values. The disagreement is about beliefs. All agree on the values involved --- *it is wrong to cause undue pain or harm to others.* The disagreement is about what is meant by unnecessary and who is deserving of consideration. Too often the emphasis in discussions about ethics becomes focused on topics where there is disagreement and the high level of agreement among humans is not recognized (Rachels, 1993).

We all need ethics. In fact, we all employ ethics in our daily lives and our professional activities --- even we scientists. To conduct science involves value judgement. The simple act of deciding which topic to research involves a value judgement and therefore has to do with ethics. When persons advocate that only science should be employed in addressing contemporary issues they give up the moral high ground to the groups they view as their opponents. The advocates for the environment, food safety, moral vegetarianism, etc. readily accept both moral and scientific grounds for their position. They quite readily accept that "doing the right thing" is important. I would suggest that having pork producers --- and animal scientists --- simply state that they as individuals care about the quality of life that animals have is a step in the right direction toward building a pork industry that is ethically based. Additionally, if they can state they hold such a position because they feel it is the right thing to do, then I believe an even greater step will have been made. And from a pragmatic viewpoint, such statements would do much to gain even greater public support for the pork industry.

Ultimately, science cannot answer all questions. Science can continue to add new knowledge about nature, and how we treat others should be consistent with what scientific knowledge we have. But science cannot tell us how to answer questions about how we ought to treat others. Ethics, not science, is the basis for determining how we ought to treat others. And others should include humans, other animals and the environment.

Can the swine industry afford to continue to produce cheap pork?

Pork production is typically measured in pounds of meat produced and dollars earned or lost. Both of these end-points are important. The first, meat, is a product that adds to the lives of many persons both nutritionally and in quality of life experienced from eating food that is pleasing in taste. Profit is necessary of course in a capitalist economy or else the production system is unsustainable. And when considered in total and the current system

has many pluses --- a major one being that hunger is not typically a problem. The Nobel laureate Amartya Sen wrote, “No democratic society --- with a reasonably free press --- has ever experienced famine.” However, when one thinks of our current pork production in total, then the impact of pork production is much greater than the bottom line on the accounting sheet or even the relative lack of hunger.
The continuing drive toward greater efficiency in production has led to fewer producers (Figure 1) and larger production units (Figure 2). While we often look to the greater

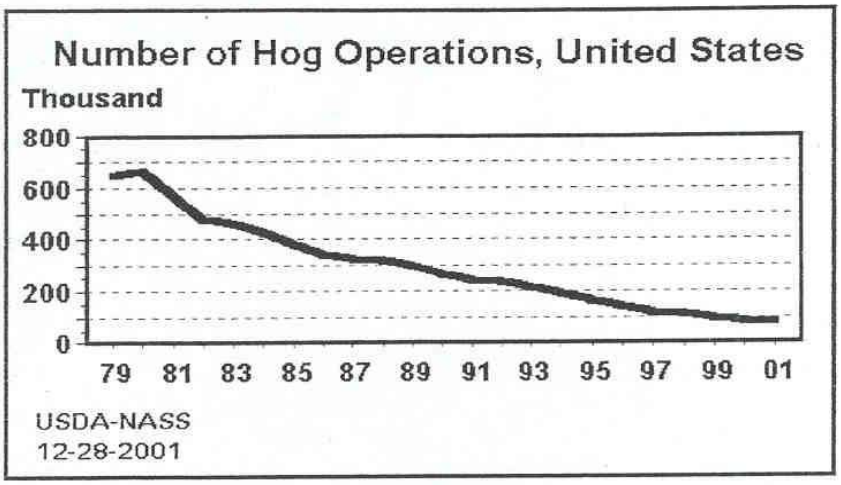


Figure 1. The decline in number of swine producers.

efficiency of production that comes with this change, we may at the same time overlook the considerable negative impact on the swine producers who are no longer in business, some having been forced out through bankruptcy. In total, these changes in the scale of production have had dramatic changes in pork production. Hodges (1999) wrote:

> *“During the 50 years since the end of World War II, farming in the West has changed from a way of life to a business. Animal producers now make decisions as business people husbanding their profit, return on investment and costs. As the benefits of scale are captured, livestock production has intensified. Science serves the farmer less directly. Today, research impacts the farmer mainly through upstream and downstream businesses, especially the chemical, food-processing and pharmaceutical companies. Many of these businesses merged in the 1990’s, so that at the end of the 20th century a few multinational companies are enormously powerful players on the world scene.”*

The changes in the size of scale of production systems have additionally had an impact well beyond the dramatic decline in the number of farmers and farm suppliers. The changes in the number of farmers have dramatically affected the rural economies and rural demographics of America. Today, many small towns have essentially disappeared and greater numbers of persons have moved into the cities and their expanding suburban sprawl. The changes in scale of pork production units have had a major impact on large segments of society far beyond the persons who own hogs.

Americans now spend less than 10 cents of each dollar on food and much of the cost goes toward convenience-types of food. The argument that production practices that are questionable because of welfare, environment, etc. must continue in order to keep prices cheap loses its validity at some point, especially when Americans are paying much less than most persons in the world. Food prices must be reasonable to the consumer and profitable to the pork producer. But a policy that is based almost exclusively on cheap food prices can be argued to contribute in a considerable negative manner to the well-being of producers (bankruptcy), lowered rural standards of living, lessened animal welfare, and erosion of the environment. I believe that at some point, these costs could become so great that one could state that the pork industry --- and other animal food producing industries --- will not be able to afford to continue to produce "cheap" food.

Is bigger better?

Modern pork and other intensive systems solved a major problem---shortage of inexpensive meat and other animal products. Meat is now readily available to most all members of American society in abundance and at a cheap price. Technology played a major role in bringing about this change. But with cheap and readily available food, there have now emerged issues of animal welfare, environmental impact, labor disputes and worker safety, decline in the rural society and economy, etc. Science provided the knowledge for change. Technology facilitated the application of the knowledge. A democratic society and a capitalist economy allowed the implementation of change and distribution of the product to the consumers. But I believe when one considers the trends indicated in Figures 1 and 2, a critical question can be asked, "Where does the pork

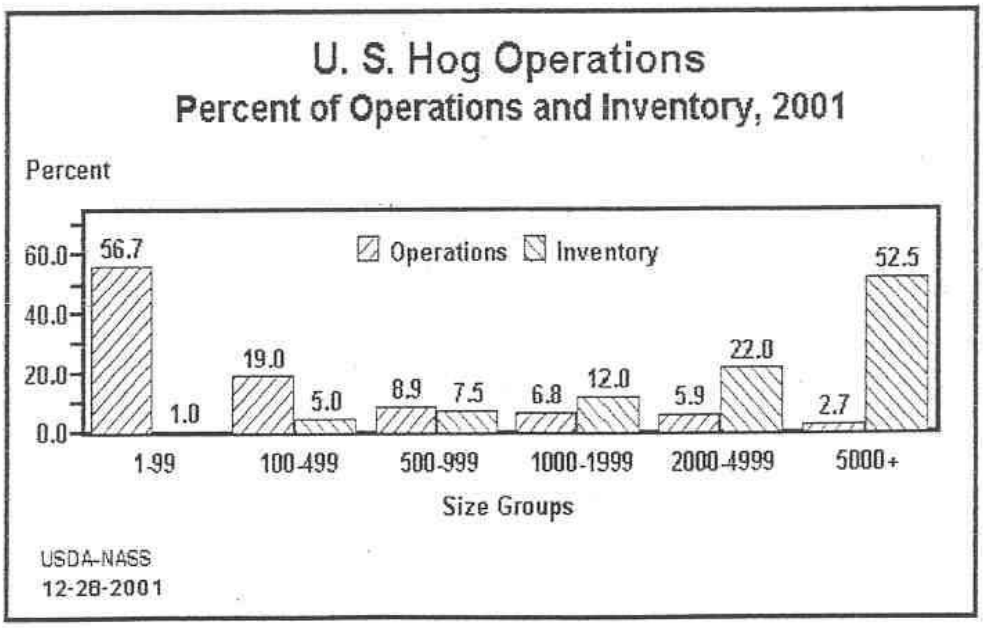


Figure 2. Distribution of the percent of hog operations by inventory.

industry --- the current pork producers --- expect the trend to stop?" According to the data from Figure 2, just over 2% of the producers (~2,000 units) own approximately 50% of the hogs. Are we to continue to argue for bigger and bigger units? Fewer and fewer

producers? More pigs per litter? Heavier body weights in younger market hogs? Even cheaper food for American consumers? What is the end point that is being sought by animal agriculture? Is there not some goal that can be set for these different features of pork production?

Can "unethical" pork be sustainable?

There is considerable evidence from survey data that intensive confinement of animals is considered to be unacceptable by the public (Herzog et at., 2001). One could even say that systems that do not allow the animal to turn around for most of their lives, as does the gestation stall, is considered by most persons as being unethical. If one defines sustainable systems as being those "that last," then one can ask whether or not systems that are deemed unethical can be sustainable.

Sustainability is a topical issue in general. Sustainable agriculture specifically has received considerable attention in recent years. The term sustainable has a number of definitions. Frequently the term sustainable agriculture is used to mean or imply some alternative to the current practice. And there is typically some implication that sustainable agriculture has to do in some manner with what is viewed as natural or environmentally sound. Sustainable agriculture then becomes systems that are small scale or even organic farming --- often with the emphasis solely on plant agriculture. However, if one views the term sustainable as meaning literally "activities that last or continue to exist," then there very well may be parts of current intensive animal agriculture that will prove to be sustainable for decades if not centuries. For example the environmental impact of a properly managed intensive animal unit is typically much less than is the impact of the same animals housed outside. Therefore, continuing to house animals in confinement units may likely continue for some time.

However, what about some of the specific practices commonly employed today to house animals intensively? For example will gestation stalls prove to be sustainable? The public clearly believes that animals should not be confined for long periods such that they cannot turn around. Can gestation stalls be sustainable when a majority of persons come to consider it unethical to house animals in such a manner? Stated more generally, can a system that is judged to be unethical in its treatment of animals be sustainable? I believe that ultimately the answer to this question is "No!"

Systems and production practices associated with pork that are not bio-ethically defensible (or consistent with public opinion) will ultimately prove to be unsustainable. It can be argued that this pertains not only to issues related to animal welfare as was just discussed relative to gestation stalls, but also issues of the environment. Animal production systems that are judged to be detrimental or threatening to wildlife, natural resources, or the ecosystem as a whole will not be sustainable when viewed by future generations as systems that have lasted.

Additionally, animal production systems that impose disproportionate burdens on groups of humans will not be sustainable. Agricultural workers and food processors are too frequently paid less or experience work conditions that pose considerable risk to their health and well-being. The increasing problem of employment of illegal aliens in some segments of agriculture causes all segments to be viewed negatively in its treatment of

workers. Workers in slaughter plants are now processing animals at strikingly rapid rates and have one of the highest rates of injury of all laborers. When hog market prices dropped dramatically a few years back, there was an apparent increase in suicide rates among swine producers in some regions. The continuing decline in hog producers has had a dramatic impact on the demographics and sociology of our society. There has been a continuing migration of persons from rural areas to cities, from the central farmland states to the coastal states. Rural communities and small towns in many farming regions of the United States have become shells of what they once were. All these changes are related to the increased scale and employment of technology in agriculture. Many people today are free from the drudgery of stoop labor but the industrialization of agriculture has also created or revealed these new problems. There are ethical costs to humans associated with increasing scale in agricultural systems, and at some point the costs may become such that citizens act out causing the current trend to be unsustainable.

What does the public want from pork producers --- what is the bottom line?

A review of survey data of the past 50 years about public attitudes toward animals was recently published by the Humane Society of the United States (Herzog et al., 2001). The conclusion reached in this publication was that there currently is no society-wide consensus regarding the moral status of animals. However, it was determined that public opinion has:

I. Shifted toward providing greater protection to animals.
2. Dramatically increased its membership in animal protection organizations.
3. Agrees (~65%) that, “An animal’s right to live free of suffering should be equally important to that of a human.”
4. Has a favorable view (~65%) of the animal rights movement.

These above stated findings may sound quite negative toward animal agriculture. However, according to Herzog et al. (2001) the survey data of the past 35 to 50 years also indicated that:

1. Only ~2% of Americans are “true” vegetarians.
2. The majority of persons state that health concerns are the basis for choosing to avoid certain animal products.
3. ***There is no detectable trend toward increasing vegetarianism*** (emphasis mine).

Regarding animal agriculture specifically, the authors in the HSUS review article concluded that members of the public:

1. Believe that the majority of farmers treat their animals humanely.
2. Express greater concerns about intensive confinement (gestation stalls, etc.).
3. Say they will pay more for products from humane systems.
4. Generally believe that meat industries can be relied upon to regulate themselves.
5. Overwhelmingly believe that groups such as USDA should be involved in protection of farm animals.
6. ***Wish to continue animal products in their diets*** (emphasis mine).

The results of this survey review says that people, as consumers, wish to continue to eat meat, but it also says that people, as citizens, wish to ensure that the animals experience a reasonable quality of life. The public as a whole seems to be saying that they accept eating products from animals as morally acceptable --- and they trust the producers as acting in good faith. However, the public appears to also be saying that they want some outside party to provide assurance that animals experience some quality of life. The public views USDA as having a role in animal oversight at the farm.

I believe that the Bottom Line is that the public is asking that the life of the pig be separated from the food product --- pork. Generally, in the public's attitude toward meat, it seems that there is a trend toward uncoupling the ownership of the animal's life from ownership of the animal food product. If this speculation is correct, then the public is saying that ownership of the animal as a food product does not extend to giving the animal's owner total control over the life experiences of the animal. At first this may sound completely impossible, and it is difficult --- but maybe not impossible. I say this because this is essentially what the research community has done during the past 20 years. Today, the researcher "owns" the animal from the viewpoint of the animal serving as a research subject. However, the care and treatment of the animal are determined by an Institutional Animal Care and Use Committee. Additionally, the recent actions of the fast food industries on animal welfare standards and oversight are patterned considerably on the model of how research animals are governed. The fast food groups could be said to be moving toward a policy that requires that a third party has input into determining how animals are treated. In other words they are moving toward uncoupling the ownership of the animal as a food product from ownership --- or at least control --- over all of the animal's life experiences.

The pork industry still has a chance to take a pro-active stance on ethical issues and act before changes are forced upon them, and I believe there are many good reasons for doing so. First of all, I would argue that it is the right thing to do for the animals. Next, taking a pro-active stance gives the industry the opportunity to determine the time frame for change. One of the big disadvantages to having change occur through actions such as that of that recently enacted by the fast-food industry --- or most of the proposed legislation bills for that matter --- is that they call for immediate changes.

In Europe when housing systems are declared illegal, the existing systems are grand-fathered in and then no new systems can be built. The veal crates of Britain were phased out over a 30-year period. Additionally, I would argue that if the pork producers as a whole through their own initiative took the position that they wished to eliminate certain practices, such as gestation stalls, that they would be a very strong position to demand tax-credit or other financial support to make the changes. In short I believe that a defensive strategy in dealing with ethical issues is a losing one when the long-term view is considered.

The American public wishes to continue to eat meat and other animal products. However, the public also strongly believes that there should be efforts taken to ensure that the animals involved experience a reasonable quality of life. The animal food industries and production systems that make adjustments in consideration of the public's concerns will have a financially healthy future. Acting to do the right thing for animals, the environment and all persons associated with pork production is also the right thing to do. Ethics in its most simple form can be said to be a matter of "doing the right thing." Socrates said

something to the effect, “The right thing to do is the thing that has the best reasons for doing.”

References

Herzog, H., A. Rowan and D. Kossow. 2001. Social Attitudes and Animals. In: The State of Animals: 2001. Ed: D.J. Salem and A.N. Rowan. Humane Society Press, Washington, DC. pp. 55-69.

Hodges, John. 1999. Why Livestock, Ethics and Quality of Life? In: Livestock, Ethics and Quality of Life. Ed: J. Hodges and I.K. Han. CABI Publishing, New York, pp. 1-26.

Rachels, James. 1993. The Elements of Moral Philosophy. McGraw Hill, Inc., New York. p. 216.

Sen, A., 1993. The Economics of Life and Death, Scientific American, May, 18-25.

Availability of Resources, Models, and Training Programs

Cynthia P. Smith, M.S., Technical Information Specialist
United States Department of Agriculture, Agricultural Research Service, National Agricultural Library, Animal Welfare Information Center
10301 Baltimore Avenue Beltsville, MD 20705

Abstract: Information regarding the well-being of swine is often presented to producers as a “hot topic”. Developing legislative issues will continue to keep swine housing and well-being at the forefront. However, interest in swine housing and well-being is not new. In the United States studies have been conducted on sow housing, problems associated with weaning, mixing pigs, handling, and environmental enrichment, for over twenty years. As with all scientific research as information is gained more questions remain to be answered. Therefore the task of providing the producer with information to make farm management decisions is not easy but a baseline of data does exist. During the following presentation information resources related to swine well-being, care, and housing, that are accessible using a personal computer, the internet, and the services of a local public library will be explored.

Overview of the Evaluation of Stockmanship

Professor Peter English,
University of Aberdeen, MacRobert Building, 581 King Street,
Aberdeen, AB24 5UA, UK

Swine 'Well-Being' is a focal point of this Symposium. The well-being of the pig is dependent on the soundness of its own genetic constitution and the quality of the 'environment' or system provided. Management and stockmanship are very important components of the overall production system. My brief in this paper is to deal with the stockmanship component.

The production system and the stockmanship component.

The system in its simplest form comprises the physical and human components as shown in Figure 1.

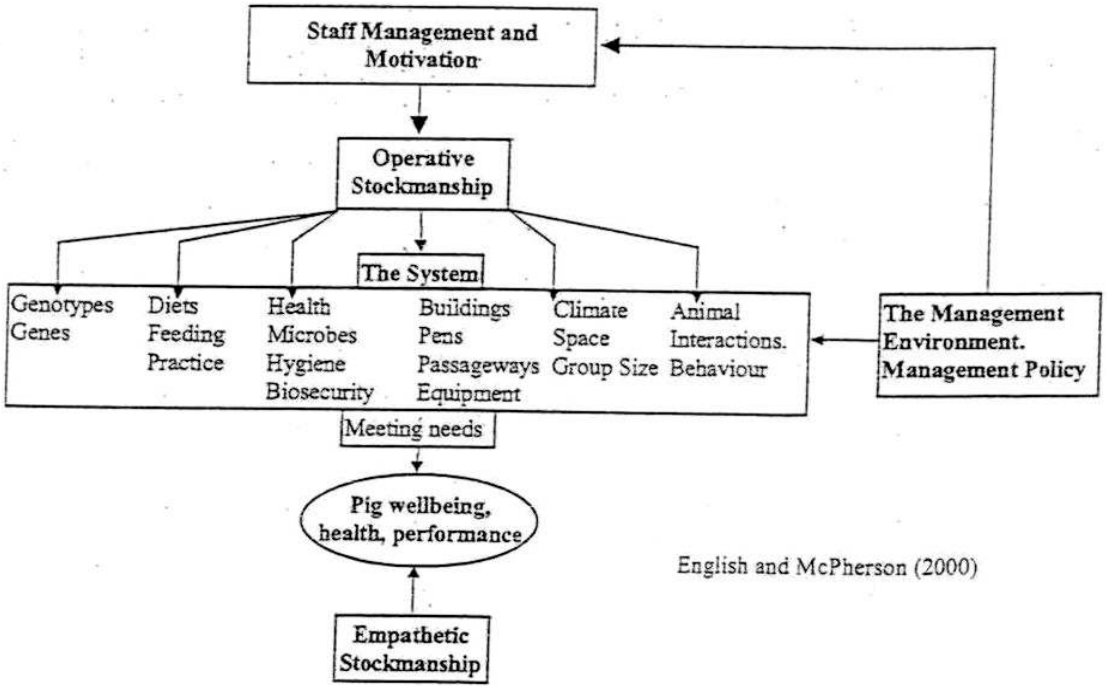


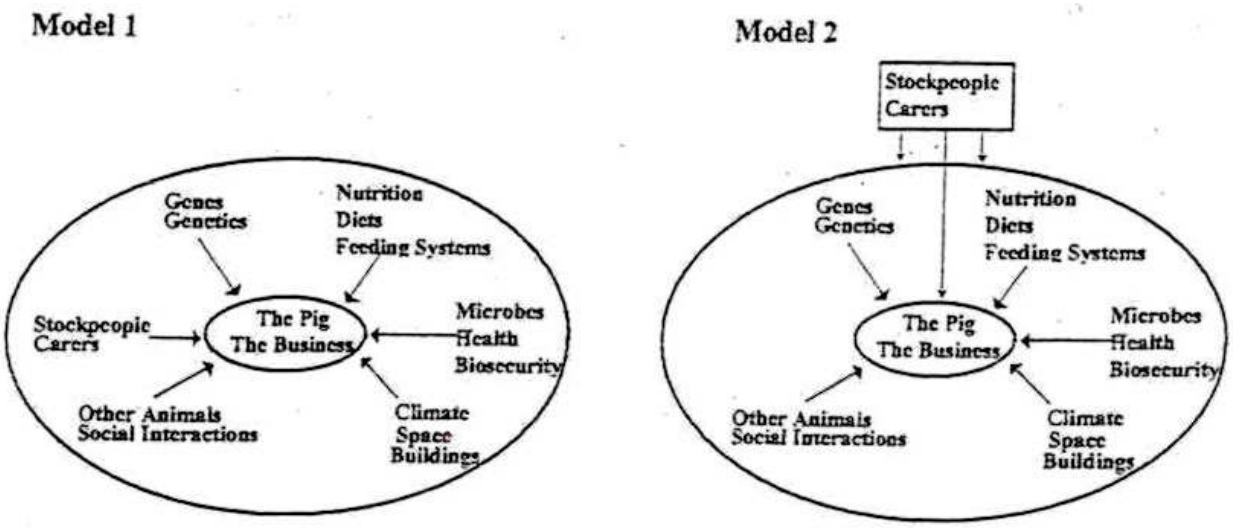
Figure 1. The basis of the production system and the roles of the manager and stockpeople.

Thus, the human components include the Management along with the Operative and Empathetic components of stockmanship as proposed by Seabrook (1984). 'Management' is responsible for synthesising and maintaining the 'husbandry' or production system and for hiring and managing staff. Thereafter, the stockpeople, through their operative and empathetic influences, are responsible, through the specified management guidelines, and their own initiatives, for providing for the needs and ensuring the well-being of the pigs in their care. When farms were small, the manager and stockperson was one and the same individual.

Opinions on the importance of the stockmanship component

When evaluating the impact of stockmanship on many of the desirable objectives in commercial pig production, the alternative models in Figure 2 of a pig production system created by management can be compared. Decisions can then be made, on the basis of personal experience, which is the more appropriate model.

Figure 2. Major controlling influences within the pig system on pig health, well-being, performance, product quality, efficiency and profitability



The author favours Model 2 because the stockpeople, as well as their direct influence on the pig through their man-animal empathy, handling and general care (English and Edwards, 1999), also have a very influential role on how effectively the pigs of varying genotype are provided with their specific needs in terms of feed, disease control measures, climate, housing, general care and the opportunity to socialise appropriately with their fellows.

Other opinions on the importance of stockmanship include the following:

The UK Farm Animal Welfare Council (1983). Good stockmanship is the key to animal welfare. Stockmanship is the key factor because, no matter how otherwise acceptable a system may be in principle, without competent, diligent stockmanship, the welfare of the animals cannot be adequately catered for.

'A good stockman is worth his weight in gold'. An oft quoted statement by experienced livestock farmers.

Professor H. W. Mumford, Professor of Animal Husbandry, University of Illinois (1917). A Tribute to the Stockperson. He may be polished, or a diamond in the rough - but always a gem.

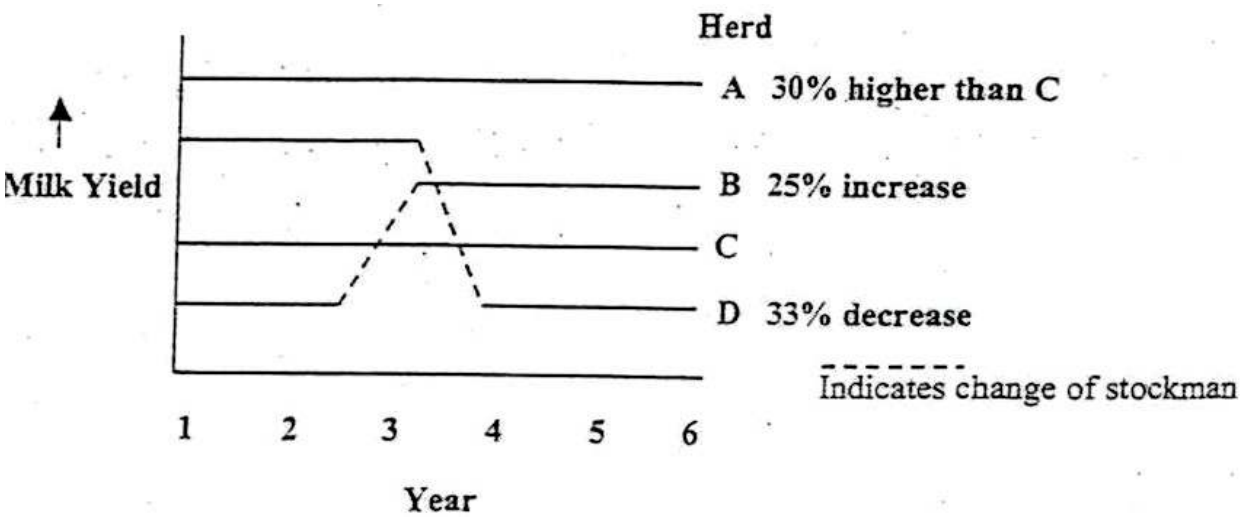
Professor Stan Curtis. Excellent animal husbandry is the *sine qua non* of successful animal production.

Scientific evidence on the importance of stockmanship

The studies of Seabrook (1974, 1984) with dairy cows, Hemsworth et al. (1981, 1986) and Ravel et al. (1996, 1998) with pigs have demonstrated significant influences of the stockperson and stockmanship characteristics on animal performance and indices of welfare.

Seabrook compared many single man dairy herds under the same management, where genotypes, buildings, nutrition and all other inputs were the same in the various herds, apart from that of the individual stockman, and found major differences in milk production per cow which was entirely attributable to the stockman (See Figure 3).

Figure 3. Milk production in Rex Patterson's single-man dairy herds (Seabrook, 1984).



Article continues on next page.

Hemsworth and his associates simulated caring and uncaring stockmanship by applying pleasant (positive) and unpleasant (negative) treatments and found major differences in growth and reproductive performance of pigs as well as indices of animal welfare (See Table 1).

Table 1. Effects of handling treatments on the level of fear of humans and performance of pigs.

	Handling treatment	
	Pleasant	Unpleasant
1. Hemsworth *et al* (1981)		
Time to react with experimenter (sec)[a]	119	157
Growth rate from 11-22 weeks (g/d)	709	669
Free corticostroid concentrations (ng/ml)[b]	2.1	3.1
2. Gonyou *et al* (1986)		
Time to react with experimenter[a]	73	147
Growth rate from 8-18 weeks (g/day)	897	837
3. Hemsworth *et al* (1987)		
Time to react with experimenter (sec)[a]	10	147
Growth rate from 7-13 weeks (g/d)	455	404
Free corticostroid concentrations (ng/ml)[b]	1.6	2.5
4. Hemsworth *et al* (1986)		
Time to react with experimenter (sec)[a]	48	120
Pregnancy rate of gilts (%)	88	33
Age of a fully co-ordinated mating response by boars (days)	161	193
Free corticostroid concentrations (ng/ml)[b]	1.7	2.4

[a]Standard test to assess level of fear of humans by pigs
[b]Blood samples remotely collected at hourly intervals from 0800 to 1700h
Source: Hemsworth (1988)

The quality of stockmanship currently and recruitment challenges

With the improved understanding of the overall needs of our pigs it should be easier to meet these needs through ensuring appropriate systems and standards of stockmanship. What are the trends in availability and quality of stockpeople in the USA? Are pig stockmanship jobs in demand so that objective selection procedures can ensure recruitment of competent or potentially competent employees from a large number of applicants? What about job turnover? Reports indicate that job turn-over is high, which suggests instability in the workforce and a lack of job satisfaction. In many European countries it is becoming increasingly more difficult to recruit good stockpeople. In UK the traditional production line of new stockpeople (sons/daughters of stockpeople and family farmers) is disintegrating as these traditional sources seek and gain employment outwith the farm livestock industries. In addition, as pig enterprises previously serviced entirely by family labour, now increase in size, the challenge has to be addressed of how to manage and motivate teams of employees, an increasing number now coming from non-farm backgrounds with no previous experience of working with pigs. A paper which I presented at an Iowa State University Conference on Swine Breeding Herd Management in 1995 was

entitled ‘Stockmanship: The ‘Achilles Heel’ of the Swine Industry’. There appeared then to be some agreement with this assertion and perhaps the situation has not improved a great deal since.

The comparative lack of relevant research and development studies on stockmanship.

Relative to the vast amount of research carried out over many decades on all other components (e.g. nutrition, genetics, health care, climatic factors) which affect the well-being, health and performance of the pig, very little research has been carried out on stockmanship with a view to increasing understanding on how to improve this most important aspect. The most probable reason for this serious anomaly is that stockmanship has had no champion to promote its importance and to sponsor relevant R and D work. The Feed Companies, Breeding Companies and Drug Companies have championed and sponsored research work on nutrition, genetics and disease control respectively while stockmanship understanding and enhancement has lacked such a champion and sponsor. Thus, an ‘evaluation of stockmanship’ and ideas on how to improve it has had to come from practical experience combined with the relatively small amount of relevant research data available. In addition, relevant information from other industries is helpful in relation to staff management and their motivation.

The qualities of good stockpeople.

Attempts have been made to list the desirable qualities of good stockpeople based largely on practical experience, for example, English et al. (1992):

1. A sound basic knowledge of the animals and their requirements.
2. A basic attachment for, and patience with, the stock.
3. The ability and willingness to communicate and develop a good relationship with the stock (empathy).
4. Careful and effective animal handling ability.
5. Ability to recognise all individual animals and to remember their particular eccentricities.
6. An understanding of normal behavioural characteristics of the stock and a keen sensitivity for recognising the slightest departure from normal behaviour of individual animals (perceptual skills).
7. An ability to organise the working time well and having sufficient time to pay attention to detail.
8. Having a keen appreciation of priorities with a ready willingness to be side-tracked from routine duties as pressing needs arise to attend to individual animals in most need of attention.
9. Dedication to the task of caring.

The basic desire is to make each animal as comfortable and contented as possible.

Good stockmanship is always enhanced further by additional experience. These qualities can be summarised as follows:

1. Interested in animals
2. A liking for animals
3. Knowledgeable about requirements
4. Highly skilled (technical skills)
5. Good Perceptual skills (observation)
6. Patience
7. Good attitude — behaviour towards animals
8. Judgement
9. Good work ethic
10. Adequate time to pay attention to detail
11. Experience.

While some will have different opinions on the specific qualities of good stockpeople, there is probably broad agreement that the characteristics listed above are fairly close to the overall credentials of excellent stockpeople.

Such general agreement helps to confirm what we already know --- that good stockpeople are very special people in terms of the extensive knowledge which they require and the wide range of skills and personal qualities which they must possess because the nature of their job is complex and their responsibilities are considerable.

The complex job and responsibilities of stockpeople.

People who have been brought up with livestock have experienced a very long 'apprenticeship' from their early childhood years. They tend to take their knowledge, skills and dedication to animal care for granted. As a result, they tend to underestimate the challenge facing new recruits to the stockmanship 'profession'. Our aspirations are that new recruits become well endowed quickly with the following abilities, skills and dedication:

1. Understanding the wide range of needs of their animals
2. Providing for these needs
3. Technical, handling and caring skills (wide range)
4. Perceptual skills (sight, hearing, smell, touch)
5. Caring
    A. Early detection of problems
    B. Diagnosis of cause
    C. Working out a remedy
    D. Applying remedy
    E. Monitoring the outcome
6. Supervision and Care responsibilities
    A. 24 hours per day
    B. 7 days per week
    C. 365 days per year.

When we analyse the job of the stockperson we come to realise the complex and demanding nature of their 'profession'. Good stockpeople are very special people — they are 'professionals'.

Any job which is complex and demanding needs recruits with good potential combined with relevant regular and progressive educational, training and motivational initiatives to convert the 'potential' into the desired end product of high quality stockmanship.

Improving stockmanship

At the outset of our studies on stockmanship at the University of Aberdeen we established the Mill Wheel Hypothesis (English et al.,1992), see Figure 4.

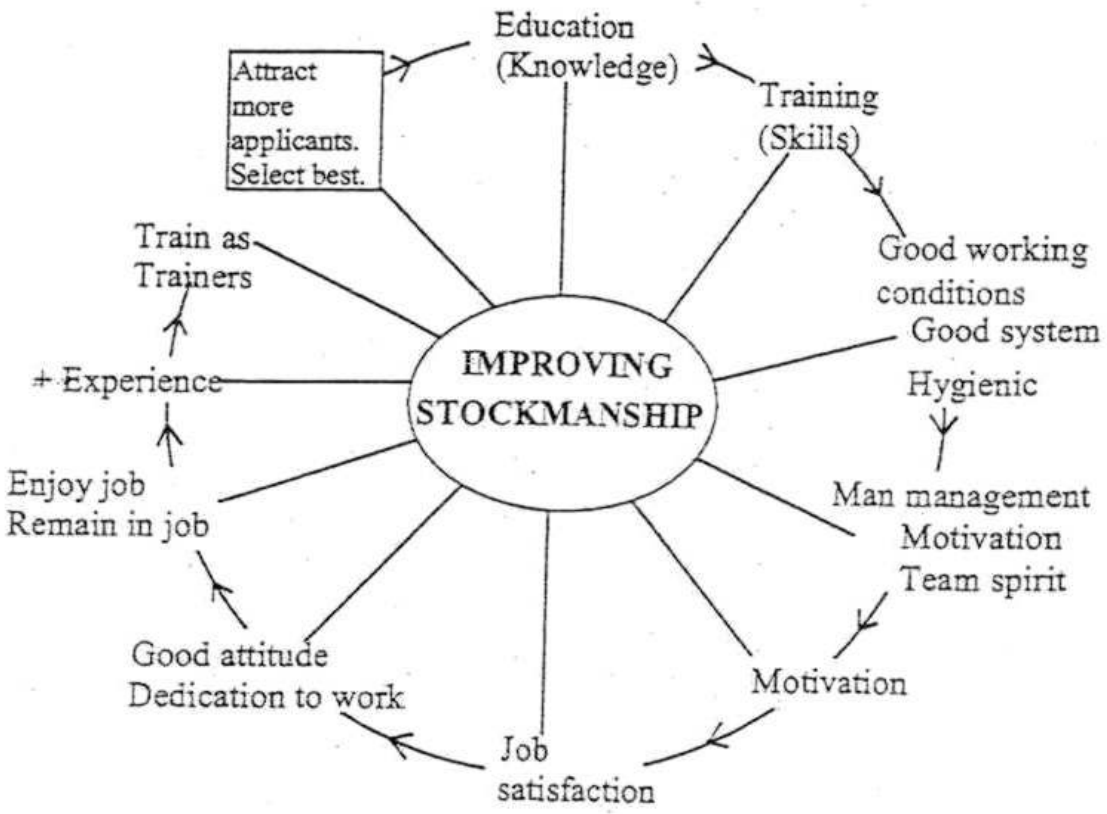


Figure 4. Improving the quality of stockmanship --- the 'Mill Wheel' hypothesis (English & McPherson, 1995)

The initial concept was that by improving our understanding of each of the Mill Wheel components, this would provide awareness or the 'fuel' to increase the efficiency of the operation of the mill wheel (i.e., the process of enhancing the quality of stockmanship). As well as monitoring the outcomes of the studies of other researchers, our own initiatives have included the development of improved training packages, educational/training approaches and motivational methods. While there is a need for research to improve our understanding of training and stockmanship, we feel that we now have sufficient awareness and experience to provide the basis of a sound educational/training/motivational package to enhance the quality of stockmanship. Large companies operating their own staff development schemes have probably reached the same conclusion.

On-farm Training --- Purpose-built to needs

An on-farm training approach was adopted from the outset in our work so that the training could be purpose-built to the specific needs of the farm and the staff (English et al., 1998a; 1998b). It involved the entire working team --- owner, managers and stockpeople. The number of staff attending each course varied from 4 to 20. The timing of the training was selected to suit the farm staff, the least busy day and time of the week being selected. Before a series of Training Courses, the pig enterprise was inspected by the trainers along with the owner and/or the manager, to see the stockpeople at their work and to assess the strengths and weaknesses of the system and the specific problem areas and challenges which should be a particular focus for education, training and discussion within the training group.

The emphasis in the training was on husbandry principles and practices (using slides and video training materials) and covered the needs of the pigs and how best to meet these needs. Slides and video training materials were supplemented with relevant exercises (e. g., on piglet fostering strategies) and simple knowledge/awareness tests. There was also emphasis on increasing understanding of pig behaviour and using behaviour as indices of well-being so that problems are detected and resolved earlier. Duration of the Training Courses on (1) Farrowing and Piglet Rearing (2) Breeding and Pregnancy (including gilt management), (3) Weaner Management and (4) Management of finishing pigs and improving carcass/meat quality, each lasted approximately 2 hours.

The stockpeople proved to be very dedicated and interested students. They accorded high scores to the training materials and training approaches and achieved significant improvements in knowledge in the post-course relative to the pre-course tests. They valued these tests and sought such training on a regular, progressive basis. They found the training motivational and it enhanced their job satisfaction. It could be said that they had a thirst for learning, for understanding their animals better and how to meet their needs more effectively. The training materials and approach appeared to meet the needs of all members of the training group --- from managers to experienced stockpeople to new recruits.

Impacts of the Training

The training was evaluated by the stockpeople and managers in various ways including a comparison of pre-course *versus* post-course test results and via Course Evaluations. However, the main ‘proof of the pudding’ was the impact, if any, on pig herd performance. To this end, herd performance records were compared in the year before and the year after the training and a summary of such comparisons are presented in Table 2. Farms selected for this comparison were those with no staff or system changes over the period so that any changes in pig performance were most likely to be attributable to the enhancement of the competence/motivation of the staff.

Table 2. Comparison of herd results in Year 1 (before) relative to Year 2 (after the training).

Herd	Number of sows	Additional pigs weaned per year in Year 2 relative to Year 1.	
		Number	Per Cent Increase
1	520	629	6.7
2	120	307	12.6
3	850	1020	5.0
4	350	726	13.4
5	760	608	3.8
6	210	231	5.5
7	400	640	6.5
8	640	704	5.1

In Herd 1, in addition to the increase in weaner output, reductions were also achieved in Rearing Herd (40%) and Finishing Herd (20%) mortality as well as improvements in growth rate in the Rearing (+13%) and Finishing Herds (+25%). The major improvements achieved in Herd 1 during the rearing and finishing stages are indicative of the existence of serious problems before the training which the training did much to alleviate.

Herd 3	Year Before	Year After	
Livebirths per litter	11.2	11.2	
Mortality of Livebirths (%)	12.2	8.0	
Piglets weaned per litter	9.8	10.3	
Litters per year	2.44	2.44	
Piglets weaned /sow/year	23.9	25.1	+5.0%
Herd 7	**Year Before**	**Year After**	
Farrowing Rate (%)	82.8	86.3	
Litters/sow/year	2.42	2.46	
Born Alive	11.8	12.2	
Born dead	1.0	0.7	
Piglets weaned per litter	10.2	10.7	
Piglets weaned /sow/year	24.7	26.3	+6.5%

Table 3. Details of Year Before *versus* Year After comparisons for Herds 3 and 7

More specific details of Year Before *versus* Year After comparisons for Herds 3 and 7 are summarised in Table 3. The training emphasis in Herd 3 was on reducing piglet mortality,

no training being provided on breeding management and the growing --- finishing stages. What about the relative likelihood of achieving improvements through relevant training in herds with either high or low productivity before the training? The key factor in terms of likelihood of a good response to training appeared to be the belief of the manager that relevant training could have a useful impact as well as the receptivity of the staff to training. It is likely that given the opportunity and challenge, a high proportion of staff will respond to efficient training. Most have a basic desire to succeed in their job and the better the understanding they have of their pigs and their needs, the more interesting their job becomes and the more motivated and determined they are to achieve both Company and self imposed objectives. It is interesting that Hemsworth et al., (1994) in Australia set out to improve the attitude and behaviour of pig stockpeople towards their pigs through training and related initiatives. Responses obtained included reduced levels of fear in the pigs as well as enhanced reproductive performance (+7.2% in births per sow per year). This level of improvement was within the range obtained in our own work (See Table 2). The Training initiatives used in the Australian work also appeared to enhance job satisfaction and to reduce job turnover rate.

Enhancement of pig well-being through improving stockmanship.

It can be claimed that the attainment of the pig performance improvements summarised in Tables 2 and 3 were achieved because of improvements in pig well-being. An obvious index of improved pig well-being or welfare is enhancement of survival of piglets and older pigs, achieved through meeting the pigs needs more effectively, including the earlier diagnosis and remedying of problems. The basis of the educational and training initiatives was in enhancing awareness of the basic needs of the pigs, on how best to provide for these needs, on behavioural indices of well-being, on the ability to detect problems earlier and rectify them more promptly and effectively, and the importance of stockperson-animal relationships to the animal, its well-being and performance. Further emphasis was on enhancing motivation and job satisfaction, and the stimulation to improve pig care through better understanding, attention to detail and good husbandry in general.

Are current staff in pig enterprises stockpeople or labourers? Is the staff complement classified as the 'Labour Force' or the 'Pig Care Team'?

One must be concerned about a situation in which there is a high turnover of staff in pig production enterprises. This indicates a lack of job satisfaction which is likely to have adverse effects on both the well-being of the pigs and the business. The adequacy of staff recruitment, educational, training and motivational initiatives must be examined with a view to their improvement. Are the mechanisms in place to convert new recruits with good potential into good stockpeople?

An alternative strategy is to make the production system so fail-safe and foolproof that only basic labourers are required who merely have to adhere to prescribed 'recipes' or clearly written procedures to do their job. What proportion of employees are happy to work in this way? Do they contribute significantly to the high labour turnover rate on some pig enterprises? Could some of these labourers be converted into better and more contented stockpeople by understanding the needs of their pigs better and being better able to provide for these needs? Would this help to reduce labour turnover and help to create more stable and effective teams of stockpeople within pig enterprises? We must

remember that high labour turnover can be a 'disruptive, costly business' in the pig enterprise. I would appreciate responses to some of the above questions from pig enterprise managers.

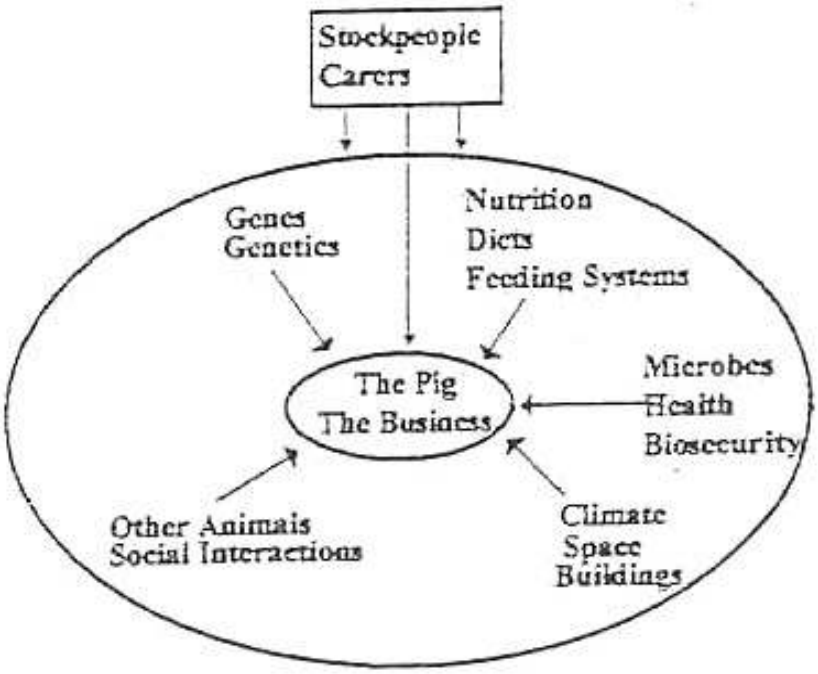
My own experiences in UK and other European countries with about 500 stockpeople of widely varying backgrounds and experience have been positive. In general terms, they have had a great thirst for learning, for understanding the needs of their pigs better and of how to meet their needs more effectively, and have responded well to our educational/training/motivational initiatives.

Improved stockmanship helps to make more efficient use of expensive resources.

In our own studies, our 'Year Before' *versus* 'Year After' comparisons have been confined to those enterprises where there have been no staff or system changes over the period and no increase in capital investments. The improvements achieved in Year 2 have been achieved by enabling the staff through enhanced understanding, application of skills, dedication to caring and fine tuning of priorities to make more efficient use of their basic resources---the genotypes, diets, feeding systems, disease control measures, buildings and climatic control facilities. The educational/training and motivational initiatives have helped the stockpeople to make more efficient use of these expensive resources (See Figure 5).

Figure 5. The pivotal role of enhanced stockmanship in making more efficient use of expensive resources by improving pig well-being, health and performance, efficiency and profitability indices.

Model 2



Evaluation and improvement of stockmanship to enhance the well-being of the pig and the business.

Relative to other influential factors in the pig enterprise, very little research has been carried out to provide a basis for determining the components of stockmanship, evaluating these and thereafter improving this very important component of pig production systems. However, through practical experience and the limited research and development work which has been carried out, we now have a sound basis for enhancing stockmanship through educational, training and motivational initiatives. The recent development of high quality comprehensive Training Packages (e. g., English et al., 2000) provide further support to educational/training initiatives in pig production enterprises. However, there is a continuing need to pursue appropriate research and development studies and the results of these will help to fine tune and improve existing training/motivational initiatives to further enhance stockmanship and, in turn, the well-being of both our pigs and the pig business.

References

English, P.R., Burgess 6, Segundo R and Dunne JH (1992). Stockmanship: improving the care of the pig and other livestock. Farming Press. Ipswich, Suffolk, England. 190 pages.

English, P.R. and McPherson, 0. (1995). Stockmanship: The 'Achilles Heel' of the pig industry and the role of training, education and motivational procedures in enhancing pig care and performance. Proceedings Iowa State University Conference on 'Swine Breeding Herd Management'. Des Moines, Iowa, USA. September 1995.

English, P.R., McPherson, 0., Deligeorgis, 5.6., Vidal, J.M., Tarocco, C., Bertaccini, F. and Sterten, H. (1998a). Evaluation of training, certification and career development strategies for livestock industry workers in Scotland, Greece, Spain, Italy and Norway. In: Farm Animal Welfare — Who writes the rules? Occasional Publication No. 23 — British Society of Animal Science 1999. (Eds. A.J.F. Russel, C.A. Morgan, C.J. Savory, M.C. Appelby and T.L.J. Lawrence) 144 - 149.

English, P.R., McPherson, 0., Deligeorgis, S.G., Vidal, J.M., Tarocco, C., Bertaccini, F. and Sterten, H. (1998b). Evaluation of the effects of training methodologies, motivational influences and staff and enterprise development initiatives for livestock industry workers in Scotland, Greece, Spain, Italy and Norway on livestock performance and indices of animal welfare. In: Farm Animal Welfare Who writes the rules? Occasional Publication No. 23 — British Society of Animal Science 1999. (Eds. A.J.F. Russel, C.A. Morgan, C.J. Savory, M.C. Appelby and T.L.J. Lawrence) 137 - 143.

English, P.R. and Edwards, S.A. (1999). Animal Welfare. Chapter 71 in Diseases of Swine. 8th Edition (Eds. Straw, BE, D'Allaire, S. Mengeling, WL and Taylor, DJ. Iowa State University Press. Ames, Iowa, USA. 1067-1076.

English, P.R. and McPherson, 0. (2000). Enhancing animal welfare through the education, training and motivation of stockpeople. Invited Paper presented to the Farm Quality Assurance Group, UK Farm Animal Welfare Council. Edinburgh. 19 Pages.

English, P.R., Carr, J., Gill, B.P., Sheldon, M., Brent, 6., Grant, S., McPherson, 0. and

Edwards, S.A. (2000). An Interactive Multi-Media Training Package for Pig Stockpeople. University of Aberdeen and Meat and Livestock Commission, UK.

Hemsworth, P.H., Bamett, J.L. and Hansen C. (1981). The influence of handling by humans on the behaviour, growth and corticosteroids in the juvenile female pig. Hormones and Behaviour 15, 396-403.

Hemsworth, P.H., Barnett, J.L. and Hansen, C. (1986). The influence of handling by humans on the behaviour, reproduction and corticosteroids of male and female pigs. Applied Animal Behavioural Science 15: 303-314.

Ravel A, D'Allaire S and Bigras-Poulin M (1996). Survey of management and housing in farrowing quarters among independent and integrated swine farms in Québec. Can. J. Vet Res. 60, 21-28.

Ravel A. D'Allaire S and Bigras-Poulin M (1998). Influence of management, housing and personality of the stockperson on independent and integrated swine farms in Quebec. Canadian Journal of Veterinary Research.

Seabrook, M. (1974). A study of some elements of the cowman's skills as influencing the milk yield of dairy cows. PhD Thesis, University of Reading, England.

Seabrook M.F. (1984). The psychological interaction between the stockman and his animals and its influence on performance of pigs and dairy cows. Veterinary Record 115: 84-87.

Practical Sow Housing System Design: Opportunities and Alternatives
Introduction

Larry R. Miller
National Program Leader, Animal Sciences
USDA/CSREES

I welcome you to the session that addresses various alternative swine housing systems in the United States. The speakers will cover stall systems, pen systems, extensive/pasture systems, and large group systems that may include comparisons among these systems. Presentations will emphasize the science that supports the animal well-being and practical aspects of each system including the economic efficiencies. The advantages and disadvantages of each system will be discussed to help producers compare options that are available and applicable to their production situation.

The Pork Academy provides a valuable format for producers and others interested in swine housing systems to objectively evaluate alternative housing systems. This symposium was made possible by the allocation of funds from Congress through the USDA Secretary's office to the Research, Education and Economics Under Secretary to address animal well-being issues. Part of this allocation was made available to CSREES to provide leadership in the development of this symposium and other educational programs for the swine system and outreach support to complement related USDA, Agricultural Research Service programs.

The organizing committee is composed of representatives from farm, commodity, university, and professional organizations that have a commitment to serving the swine industry, and from persons serving niche sectors of the industry as hands-on well-being advocates, and protection group representatives. These same people will cooperate to coordinate development of the educational and training programs that build on this symposium. You will be sent a copy of the proceedings after the symposium. Videotapes and audiotapes of the symposium will be available through Purdue University and commodity and other organizations for only a handling fee.

You were provided an evaluation form as part of your registration packet. It is important to know your opinion of the topics and speakers for all sections of the symposium. These comments will help provide direction for the balance of our work on this very important project.

Questions will be written on index cards or other paper. Questions will be taken to the Moderator, who will read the question and ask speakers to respond. Audience member interactions with speakers will take place after the Question and Answer period. If time allows, the Moderator may chose to allow a question using this same procedure. Speakers are reminded to stay on time due to the tight schedule.

We have an outstanding panel of speakers, who have many years of experience in their field of expertise. They have been instructed to challenge you and to provide you a chance to see well-being issues in a realistic and perhaps different light. We hope you find the symposium beneficial. Thank you for your participation and interest in practical sow housing and design.

The Crate

John McGlone
Pork Industry Institute
Texas Tech University
Lubbock, Texas 79409

The gestation crate (also called the stall) is the most common system for housing sows in the USA today. It is arguably the most common system around the world in developed countries. A typical gestation crate measures two feet wide and seven feet long. Sows can stand up, lie down, but sows can not turn around or completely socially interact with other sows while in a crate. The crate prevents inter-sow aggression and extreme submissive/thin sows and the crate allows for the individual control of feed intake (and therefore a good body condition can be maintained). Limited social interaction is possible with the crate between neighboring sows.

Gestation crate were first introduced in the USA in the 1960's and they first appeared in the popular agricultural press in 1969 but this system was probably on farms starting around 1964. Gestation crates or individual stalls were used in Europe for more than 200 years. Today, the majority of USA sows are kept in crates for all of gestation and lactation (apart from walks between gestation and lactation crates).

Sows in crates show stereotyped and non-stereotyped oral/nasal/facial (ONF) behaviors for a variable amount of their awake time. ONF behaviors are a cause for concern for some scientists and consumers. Sows in gestation crates do not show physiological signs of stress. Reproductive rates are very good for sows in crates. For studies that compared productivity of sows in crates and a variety of alternative systems (group pens indoors or outdoors), the majority of studies report no difference between sows in crates and other systems. In spite of the scientific evidence which does not report physiological or productive problems with the crate, some groups claim based on behavior data or ethical or other arguments that the crate is not an acceptable system. Alternative systems are available, but they typically require more floor space. Economic forces favor the gestation crate at this time. If market forces result in banning the gestation crate, then the space required to keep sows (and the cost) will rise.

Group housing of sows in small pens: Advantages, disadvantages and recent research

E. A. Pajor
Assistant Professor,
Animal Welfare and Behavior
Department of Animal Sciences, Purdue University
West Lafayette, IN

Introduction

Public perceptions, particularly misconceptions, of animal husbandry practices, can negatively impact the swine industry. Increased awareness of modern agricultural practices has raised concerns over their impact on food safety, the environment, and animal welfare. Recent activities by retailers, such as fast food restaurants and supermarket chains, as well as animal rights organizations, have increased pressure on various sectors of the agricultural industry to address controversial practices that may affect food safety, the environment, and animal welfare.

Presently, one of the most controversial issues of conventional pig production is the individual housing of gestating sows. In Europe, 70% of gestating sows are individually housed (Hendricks et al., 1998). In Australia and New Zealand, 63 and 50% of sows are housed individually (Patterson et al., 1997; Gregory and Devine, 1999). In the USA, Barnett et al. (2001) estimated that 60-70% of sows are housed in stalls throughout gestation.

Although conventional gestation stalls allow for easy management, and individual feeding, they are perceived by the public to negatively impact sow welfare. In gestation stalls, sows are prevented from performing many of the behavior patterns that pigs would perform in more natural or less restricted conditions resulting in a negative impact on sow welfare.

The issue of sow housing and other welfare issues have been investigated by animal welfare scientists for many years (see SVC 1997; and, Barnett et al., 2001 for excellent reviews). Concerns over animal welfare combined with European based scientific data have led to gestation stalls being phased out in several European countries, and from 2013 the use of stalls will be restricted throughout the European Union. This action has increased pressure on the US swine industry and animal scientists to consider the advantages and disadvantages of the alternatives to gestation stalls.

Advantages of group housing

There are clear advantages for animal welfare when sows are housed in groups (SVC, 1997). Housing sows in groups provides sows with:

1. more room to move and exercise
2. more control over their environment
3. more opportunity for normal social interactions.

Sows in groups are reported to have improved cardiovascular fitness (Marchant et al., 1997), improved muscle weight and bone strength (Marchant and Broom, 1996), decreased morbidity (Tillon and Madec, 1984) and less abnormal behavior (Broom 1983)

Disadvantages of group housing

Although there are clear animal welfare benefits to group housing, disadvantages also exist (SVC, 1997). These include:

1. Fighting
2. Injury
3. Embryo loss in extreme cases of fighting or as a result of mixing during implantation
4. Detection of injuries and poor health may be more difficult
5. Better stockmanship required.

Characteristics of small pens for group housing

1. Typically 4-12 animals per pen
2. Individual feeding stalls are highly recommended
3. Provision of laying area with solid floor is desirable
4. Slatted floors should be provided for the dunging area
5. Ability to lock animals that are being bullied within feeding stall allows for easy management of a difficult situation
6. Feeding stalls which sows can close or open by entering and exiting, minimize the harassment, displacement, and vulva biting while providing the sow with the option of spending time in isolation or with the group

Advantages of small pens

1. Simultaneous individual feeding
2. Ease of conversion from existing gestation stall facilities
3. Ease of management compared to large groups
4. Groups are relatively stable compared to large dynamic groups which should minimize sow aggression

Sow Aggression

Group housing is not without animal welfare concerns and sow aggression leading to injury is particularly problematic. Although group housing permits freedom of movement and increased social contact, the initial group formation often results in aggression between sows (Edwards, 1982). Aggression is a natural behavior that is required to establish a dominance hierarchy, but may result in serious injuries (Lynch et al., 1984).

In addition to mixing, social stress leading to aggression can occur when stable groups are altered. This occurs commonly in the swine industry, when non-pregnant sows are removed from the group. The aggression that occurs during the initial mixing or when group composition is altered can result in decreased production, physical injury (which may lead to infection and food safety concerns), and a clear negative impact on an animal's welfare. Aggression can also impact the welfare of subordinate individuals within the group over the longer term, if system design is inadequate and animals are not able to isolate themselves.

The issue of sow aggression highlights one of the main advantages of small groups. In general, small groups can be relatively stable in comparison with larger groups composed

of sows at various stages of gestation. These large, dynamic, groups present producers with significant challenges with regards to sow aggression associated with the formation of stable social relationships.

Sow aggression is not limited to group housing. Sows kept in stalls often show aggressive behavior towards their neighbors (Barnett et al., 1987). In fact the aggression between stalled sows has been reported to escalate to a high level more often than in group-housed animals (Broom et at., 1995). Such aggressive interactions in confined sows will not normally result in injury but do involve fear and frustration which can impact sow productivity and welfare.

Behavior during farrowing

A significant amount of the discussion over gestation housing focuses on the welfare of the sow specifically during gestation. However, gestation housing can clearly effect the behavior and welfare of sows during farrowing and lactation. Improved bone strength and muscle tone as a result of group housing can be beneficial to sows during farrowing. However, gilts accustomed to freedom of movement during gestation, are reported to find farrowing crates to be more stressful than sows housed in stalls during gestation (Lawrence et al., 1994). Furthermore, gilts that experience close confinement for the first time when moved to farrowing crates are more stressed than gilts housed in crates during gestation (Beattie et al., 1995; Harris and Gonyou, 1998; Boyle et al, 2000). In contrast to Marchant and Broom (1993), Boyle (2002) reported that sows loose housed during gestation changed postures more during parturition and early lactation suggesting a negative effect on sow welfare in farrowing crates. Increased movement during parturition increases the probability of piglets being crushed (Thodberg et al., 1999) and has been associated with aggression towards piglets (Harris et al., 2001). In fact, increased savaging of piglets has been reported for sows housed in groups during gestation compared to stalls (Beattie et al., 1995).

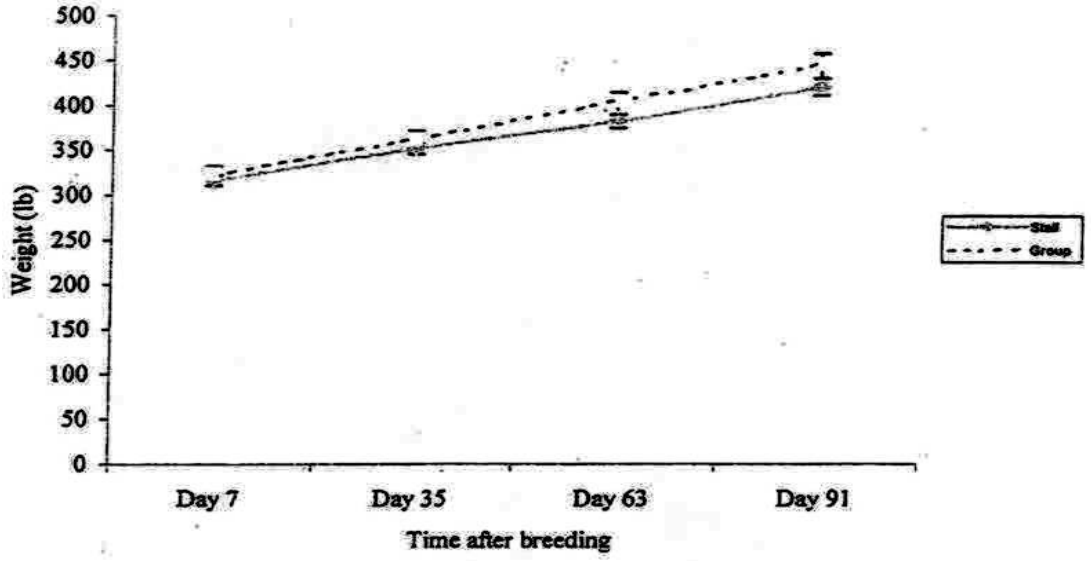
Recent Research

Few published North American studies on the effects of gestation housing exist, and evaluation is complicated by the lack of direct comparisons under controlled conditions.

Our recent research compared gilts housed for one parity in conventional stalls or small groups of four. All conditions, except for housing type, were identical for the two systems.

Article continued on next page

Figure 1. Weights on d 7 to d 91 after breeding for pregnant gilts housed in stalls and groups.



There was no overall effect of housing on the amount of weight that gilts gained during gestation, although sows in groups gained on average 20% more weight during pregnancy (Fig. 1). There were no differences in backfat measurement between gilts housed in stalls and those housed in groups on any of the four measurement days

There was no significant difference in skin health between gilts allocated to groups and stalls at the time of transfer to gestation. From d 21 after breeding (2 wk after entry to gestation housing) to d 91 after breeding, body skin health was consistently poorer in group-housed than stall-housed gifts. Fig. 2 shows differences between skin health scores for the six body regions on d 91.

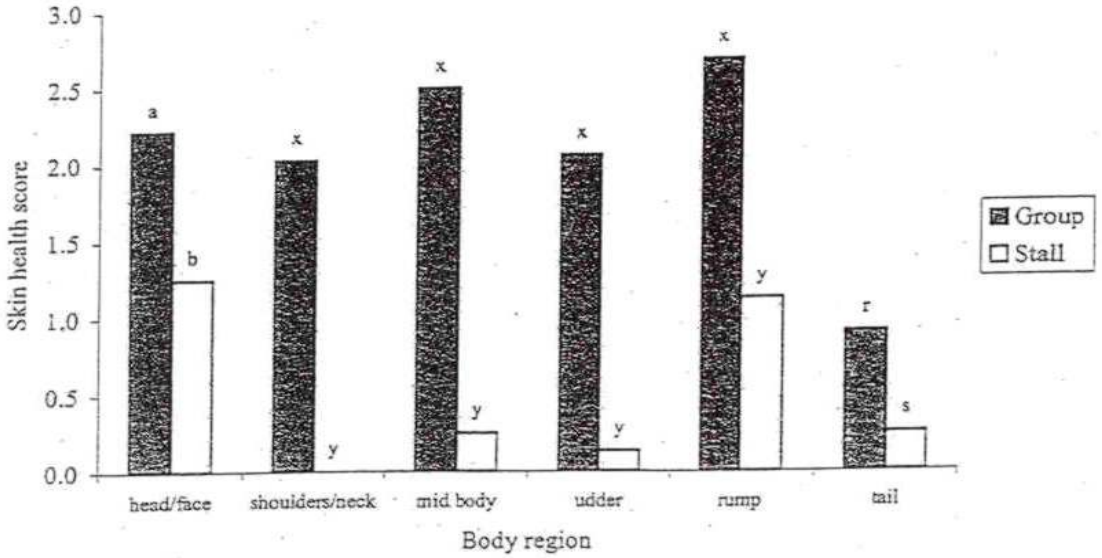


Figure 2. Skin health scores (head and body) for group and stall-housed guts on d 91 after breeding.

We also examined a number of physiological measures (Sorrells et al., 2001). There were no significant differences in hematocrit, lymphocyte, or AGP concentrations (Table 1).

		Stalls			Groups			Level
Variable		Time	n*	mean		n**	mean	of significance
Hematocrit	1	16	40.4		8	41.5		> .10
(%PCV)	2	13	40.3		8	40.9		> .10
	3	14	38.7		8	40.6		> .10
Granulocyte	1	16	9.29		8	9.20		> .10
($x10^9$/L)	2	13	8.80		8	8.79		> .10
	3	14	10.7		8	11.3		<. 003 Time
Lymphocytes	1	16	6.08		8	6.16		> .10
($x10^9$/L)	2	13	5.81		8	5.66		> .10
	3	14	5.70		8	5.19		> .10
Fibrinogen	1	16	0.32		8	0.32		> .10
(g/dL)	2	13	0.26		8	0.30		> .10
	3	14	0.38		8	0.40		<. 002 Time
$\forall_1$-acid Glycoprotein	1	16	467		8	379		> .10
(ug/ml)	2	13	406		8	435		> .10
	3	14	460		8	426		> .10
Haptoglobin	1	16	1433		8	1308		<. 06 Trt.
(ug/ml)	2	13	1617		8	1297		<. 06 Trt.
	3	14	1824		8	1724		<. 002 Time

* value indicates number of individuals tested
** value indicates number of groups of four tested

Table 1. Blood parameters for guts housed in groups of 4 or individual stalls (Sorrells et al., 2001).

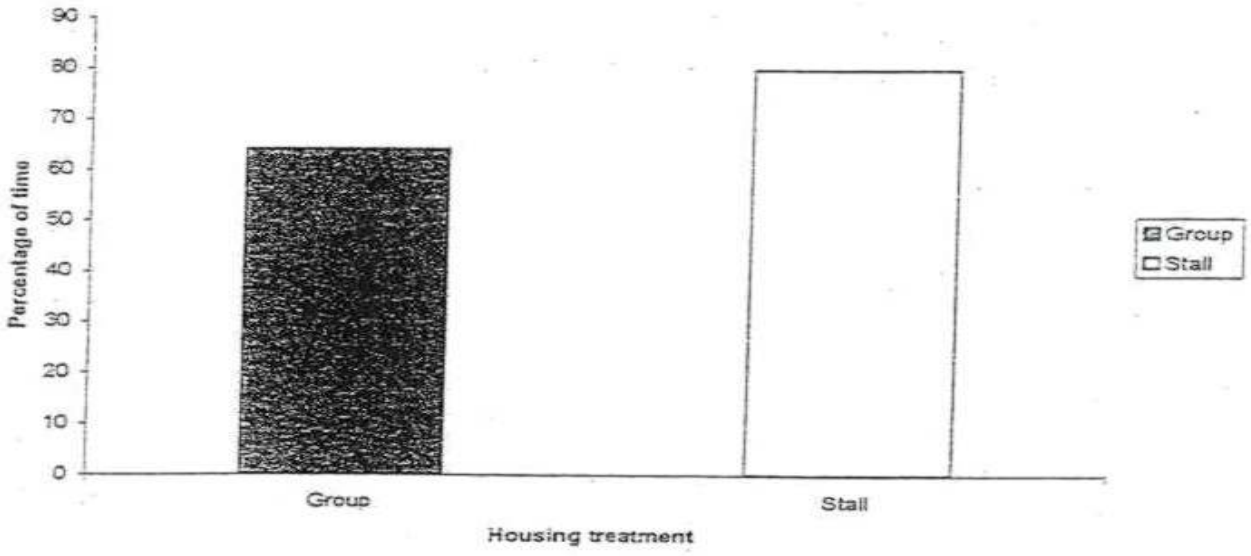


Figure 3. Percentage of time spent performing repetitive oral/nasal/facial behaviors (stereotypies) during a 2 hour period after consuming feed, by gilts housed in groups of four and gestation stalls.

Group housed and stall housed sows did differ significantly in the occurrence of stereotypic behavior, with sows in stalls performing more stereotypies than sows in groups (Figure 3).

These results indicate no difference in production between gilts housed during their first pregnancy in stalls or small groups. Group-housed females had more scratches, cuts and wounds on their head, face and body than did those housed in stalls. Although some of these lesions were a result of aggression between group members, injuries may also have been caused by individuals being stepped on, or contact with sharp pen fittings. These accidental wounds may also have contributed to the higher lesion scores for group-housed females' feet and legs. While higher feet and leg lesion scores did translate into higher average lameness scores for grouped females, this difference was not significant.

We found no differences in production, reproductive performance or behavioral time budget, although group-housed gilts had poorer skin health and higher lameness scores at the end of gestation but performed fewer stereotypies (Harris et al., 2002).

Future Research

Although substantial research on sow housing has been done, there are numerous issues that still need to be addressed. For example, it is clear that different genetic lines respond differently to various environments and stressors (Pajor et al., 2000; Torrey et al., 2000). It is probable that different genetic lines of swine will vary in their performance in different types of housing systems. Despite the importance of different genetic lines to the swine industry, research in this area is seriously lacking. Research on sow aggression, or social development is required. Initially, this needs to be done at a fundamental level followed by applied research. This will ensure that new management practices or housing systems are based on scientific evidence and a thorough understanding of the issue. Finally, research and education in the area of human-animal interaction and stockmanship is required. Interactions between stockpeople and their animals can limit the productivity and welfare of livestock (Hemsworth and Coleman, 1998). For example, studies in pigs indicate that high fear of humans through a chronic stress response, can limit growth and reproduction (Hemsworth and Coleman, 1994). Intervention studies in the pig industry have demonstrated that educational material targeting the attitude and behaviors of the stockpeople can have a direct effect on animal fear and productivity. Additional research development and implementation of these training programs is needed.

Much of the previous research has taken the form of comparing one housing system with another. Many studies comparing housing systems are difficult to interpret since they fail to use adequate scientific controls and/or a multi-disciplinary approach to investigating the impact on animal welfare. Although there is some value in continuing this approach, perhaps most notably in the area of economics, where comparative data or even the models to initiate comparative studies between housing systems seem absent, in general, the comparative approach is limited due to the lack of adequate controls. In lieu of comparative studies, there needs to be a shift in research priorities towards solving the management challenges of alternative housing for gestating sows, be they real or perceived.

References

Barnett, J.L., P.H. Hemsworth, C.G. Winfield, 1987. The effects of design of individual stalls on the social behaviour and physiological responses related to the welfare of pregnant pigs. Appl. Anim. Behav. Sci. 18, 133 - 142.

Barnett, J.L., P.H. Hemsworth, G.M. Cronin, E.C. Jongman, and G.D. Hutson, 2001. A review of the welfare issues for sows and piglets in relation to housing. Aust. J. Agric. Res., 52, 1 - 28.

Beattie, V.E., N. Walker, I.A. Sneddon, 1995. Effects of rearing environment and change of environment on the behavior of gilts. Appl. Anim. Behav. Sci. 46, 57-65.

Boyle, L.A., F.C. Leonard, P.B. Lynch, P. Brophy 2000. Influence of housing system during gestation on the behaviour and welfare of gilts in farrowing crates. Anim. Sci. 71, 561-570.

Boyle, L.A., F.C. Leonard, P.B. Lynch, P. Brophy 2002. Effect of gestation housing on behaviour and skin lesions of sows in farrowing crates. Appl. Anim. Behav. Sci. 76, 119-134.

Broom, D.M., 1983. Stereotypies as animal welfare indicators. In "Indicators relevant to farm animal welfare" (Ed. D. Smidt) pp. 81-87. (Matinus Nijhoff: the Haugue).

Broom, D.M., M.T. Mendl, and A.J. Zanella, 1995. A comparison of the welfare of sows in different housing conditions. Anim. Sci. 61:369 - 385.

Edwards, S.A., 1982. Scientific perspectives on loose housing systems for dry sows. Pig. Vet. J. 28, 40-51.

Gregory, N.G., C.D. Devine, 1999. Survey of sow accommodation systems used in New Zealand. New Zealand Journal of Agricultural Research 42, 187-194.

Harris, M.J., H.W. Gonyou 1998. Increasing available space in a farrowing crate does not facilitate postural changes or maternal responses in gilts. Appl. Anim. Behav. Sci. 59, 285-296.

Harris, M.J., A.D. Sorrells, S.D. Eicher, B.T. Richert and E.A. Pajor, 2001. Effects of Production and Health of Two Types of Housing for Pregnant Gilts. Purdue Swine Day Publication.

Harris, M.J., A.D. Sorrells, S.D. Eicher, B.T. Richert and E.A. Pajor, 2002. Effects on Production, Health and Behavior of Two Types of Housing for Gestating Gilts. American Society of Animal Science, July 21 - 25, 2002.

Hendricks, H.B.M., B.K. Pedersen, H.M. Vemeer, M. Whitmann, 1998. Pig housing systems in Europe: current distributions and trends. Pig News and Information 19, 97N-104N.

Hemsworth, P.H., G.J., Coleman, 1998. Human-Livestock Interactions: The Stock person and the Productivity and Welfare of Intensively-Farmed Animals. CAB International, Oxon, UK.

Hemsworth, P.H., G.J., Coleman, J.L. Barnett. 1994. Improving the attitude and behaviour of stockpersons towards pigs and the consequences on the behaviour and reproductive performance of commercial pigs. Appl. Anim. Behav. Sci., 39, 349-362.

Lawrence, A.B., J.C. Petherick, K.A. McLean, L.A. Deans, J. Chirnside, A. Vaughn, E.M.C. Terlouw, 1994. The effect of environment on behaviour, plasma cortisol and prolactin in parturient sows. Appl. Anim. Behav. Sci. 39, 3 13-330.

Lynch, P.B., J.F. O'Grady. P.A. Keamey, 1984. Effect of housing system on sow productivity. Annals of Veterinary Research 15, 181-184.

Marchant, J.N. and D.M. Broom. 1993. The effects of dry sow housing conditions on responses to farrowing. Anim. Prod. 56, 475-476.

Marchant, J.N., and D.M. Broom. 1996. Effects of dry sow housing conditions on muscle weight and bone strength. Anim. Sci. 62: 105-113.

Marchant, J.N., A.R. Rudd and D.M. Broom. 1997. The effects of housing on heart rate of gestating sows during specific behaviours. Appl. Anim. Behav. Sci. 55: 67-78.

Pajor, E.A., C. Busse, S. Torrey, M. Shea-Moore, and T. Stewart, 2000. The effect of selection for lean growth on swine behavior and welfare. Purdue Swine Day Publication pp1 -3.

Patterson, R., A. Pointon, C. Cargill, 1997. Sow wastage in the Australian pig herd-degree, cost and prevention. Report to the Pig Research and development Corporation, Canberra.

SVC, Scientific Veterinary Committee, Animal Welfare Section, 1997. The Welfare of Intensively Kept Pigs. European Commission; Report # XXIV/B3/ScVC/0005/1997, 190 p.

Sorrells, A.D., S.D. Eicher, M.J. Harris, E.A. Pajor, B.T. Richert, 2001. Evaluation housing stress in gestating gilts using immunological measures. Purdue Swine Day Publication.

Thodberg, K. K.fI. Jensen, M.S. Herskin, E. Jorgensen, E. 1999. Influence of environmental stimuli on nest building and farrowing behaviour in domestic sows. Appl. Anim. Behav. Sci. 63, 13 1-144.

Tillon, J.P., F. Madec. 1984. Diseases affecting confined sows. Data from epidemiological observations. Ann. Rech. Vet. *15: 195-199.*

Torrey, S., S. Weaver, E.A. Pajor, D. Kuhlers, and T. Stewart, 2000. Evaluating differences in stress levels in lean growth versus control landrace pigs. Swine Day Publication pp. 4-5.

Sow Well-Being in Extensive Gestating Sow Housing: Outdoor and Hoop Barn Systems

M.S. Honeyman
Associate Professor, Department of Animal Science
Coordinator, ISU Research and Demonstration Farms
Iowa State University, Ames, Iowa

Extensive gestating sow housing is an area of increased interest. Forces related to animal welfare, environmental protection, farm size and structure, and increasing building and energy costs have fueled the interest. The development of niche or special markets for pork that require production systems with certain attributes (outdoors, bedding, etc.) are also encouraging interest.

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 sow housing is characterized by plenty of space for the sows, low capital investment, and the ability to be readily expanded.

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

Outdoor swine production is defined as a system that allows the pigs outside access including contact with soil and growing plants (Honeyman et al., 200l c). Outdoor swine 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 aggressive in developing and refining intensively managed outdoor swine production systems (Thornton, 1990). Estimates are that one fourth to one third of all pigs produced in England are born in outdoor, floorless huts. 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 pipe, and improved farrowing huts have allowed modern outdoor pig production to be competitive and more easily managed. In this paper housing gestating sows outdoors in concrete lots or dirt lots will not be addressed.

Hoop barns are large, simple, tent-like shelters that can be used for pigs. The low-cost structures have been rapidly adopted in Iowa. Over 2,000 hoop barns have been built since 1996 by about 800 farmers (Honeyman et al., 200l b). Hoop barns, or hoops, 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 to 2 m (4 to 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., 2001a). When hoops are used for gestating sows, the high traffic areas for feeding and watering are covered with concrete. Sometimes individual feeding stalls are used to insure that each sow receives their daily feed allotment (Brumm et al., 1999).

Sow Well-Being

Animal well-being is defined by Ewing et al., (1999) as "the state that encompasses factors such as good health, a sense of safety and comfort, protection from damaging environments, ...and capability to engage in normal behaviors." Also, well-being is described as a "concept of a harmonic relationship between the animal and its environment" (Ewing et al., 1999). Therefore positive sow well-being is characterized by healthy, comfortable, productive animals that are protected from harmful environments and able to perform normal or natural behavior.

Ewing et al., (1999) continued that to "ensure well-being, the animal's environment must be adequate in terms of physical, dietary, and social characteristics." Physical environment consists of the area that the animal lives in and consists primarily of the thermal and spatial needs. Dietary environment consists of the interaction between the animal, its environment, and nutrients or feedstuffs. Social environment deals with animal-to-animal and animal-to-human interactions. In extensive systems, sows are maintained in groups, thus the animal-to-animal interaction is a fundamental part of managing these systems.

A comparison of sow gestation housing systems is shown in Table 1. The table is adapted from Hoop Structures for Gestating Swine (Brumm et al., 1999). Outdoor pasture and hoop barn systems are compared to indoor confinement gestation stalls for physical, dietary, and social environments. A trade-off is evident in Table 1. Although outdoor pasture systems allow for maximal expression of natural sow behaviors and have a very low housing investment, control of thermal comfort, feed, and individual sows is difficult. The individual stall in confinement presents the converse situation --- minimal natural sow behavior and high housing investment with very good and easy control of the thermal comfort, feed, and individual sows. The bedded hoop with feeding stalls represents an intermediate system in all categories.

Table 1. Comparison of sow gestation areas.*

Environment	Physical		Dietary	Social	
Gestation Area	Thermal Comfort Control	Housing Investment	Feed Management	Individual Sow Management	Natural Sow Behaviors
Outdoor Pasture	Poor	Very Low	Difficult	Difficult	Maximal
Bedded Hoop w/Feeding Stalls	Good	Medium	Moderate	Moderate	Moderate
Confinement Stalls	Very Good	High	Easy	Easy	Minimal

*adapted from Brumm et al., 1999.

Physical Environment

Extensively housed sows live in a physical environment with a wide thermal range and large spatial areas. The thermal neutral zone for gestating sows is from 50^0F to 85^0F ambient temperatures (Holden et al., 1996). When temperatures drop below this zone, or effectively drop below this zone due to wind or dampness, the effect on the sow is lessened by simple floor-less shelters, bedding, and the sows huddling together. Bedding is a primary tool in lessening the effects of cold. In hoop barns, the effective temperature that pigs feel is modified by the natural composting of the bedded pack. During February in central Iowa, temperatures exceeding 40^0C (104^0F) were found at a 15 cm (5.9 in.) depth in the bedded pack (Honeyman et al., 2001a).

In hot settings, the effects are lessened by shades and wallows and positioning shelters to catch prevailing wind for outdoor systems. For hoop barns, drippers over the feeding stalls or concrete areas can be used. Hot temperatures coupled with high humidity and little wind are the most problematic of any thermal condition. In extensive systems these extreme hot conditions pose a major management challenge.

The spatial needs of gestating sows housed outdoors is usually more than adequately met. A guideline for stocking density is 15 to 37 sows per acre. Stocking density is highly variable depending on season, climate, soil type, topography, and vegetation type (Honeyman et al., 2001 c).

Hoop barns are more spatially restrictive. Guidelines for gestating sows in bedded hoop barns are a minimum of 24 square feet of bedded area per sow (Brumm et al., 1999). Pens should be at least 15 feet wide to reduce control by aggressive or boss sows. Overall layout in the hoop is usually a function of hoop width, group size, and feeding systems.

Dietary Environment

Gestating sows, because of low energy needs relative to voluntary feed intake and satiety, present a rather unique swine feeding situation. Using conventional grain and soy-based diets, the gestating sow is limit fed more extremely and for a longer duration than any other phase of pig production. Feed is often the most limiting resource for the gestating sow. Special care with group-housed settings must be given to insure that each sow receives their daily feed allotment without major competition and stress from more aggressive sows.

Individual lockable feeding stalls provide an effective way to feed sows individually and minimize sow aggression at feeding. Additionally, the stalls provide a setting to manage the sows individually for purposes of artificial insemination, estrus checks, vaccination, etc. (Honeyman and Kent, 2001).

Because of seasonal changes in climate, gestating sows housed outdoors or in hoop barns may need more energy. Feed allotments are commonly increased (5 to 25%) during cold conditions to allow the sows the extra energy for maintaining their body temperature (Holden et al., 1996).

Pond (1981) suggested that feeding fibrous feeds to gestating sows could be greatly increased. Outdoor gestating sows on pasture will spend time grazing and foraging.

Consuming fibrous plant material can provide nutrients to the sow, as well as satisfy hunger and behavioral needs.

Reproductive performance has been maintained or improved by feeding gestating sows large amounts of alfalfa (Danielson and Noonan, 1975; Hagen et al., 1987; Pollman et al., 1981).

Work in Iowa with gestating gilts that were rotationally grazed on alfalfa for 42 days during mid-gestation calculated daily alfalfa intakes of 11.5 kg (25.3 lb) as fed, or 3.2 kg DM (7.0 lb DM). Daily feed allotment was reduced to 720 g (1.6 lb) of corn plus salt and a mineral phosphorous source. These gestating gilts maintained similar weight gain and back fat change as control gilts fed 1.8 kg (4.0 lb) of corn-soy diet daily (Honeyman and Roush, 1999). Although restricted to the growing season, outdoor gestating sows can meet a portion of their nutritional needs by grazing. Grazing of sows has the additional advantages of no manure to haul, reduced purchased feed inputs, less feed to handle, sows nearer satiety, and inclusion of a forage crop in the crop rotation (Honeyman and Roush, 1999).

Grazing is not possible for sows confined to hoop barns. However pigs in bedded hoop barns consume some bedding (Huenke and Honeyman, 2001). The dietary role of this consumed bedding is viewed as positive for gestating sows, but there is no quantitative or comprehensive information available.

Social Environment

Managing groups of gestating sows requires a slightly different approach than managing sows in individual stalls. Managing sows in extensive systems also requires a slightly different approach than managing sows in an environmentally controlled confinement barn. The manager of extensive group systems must be more aware of weather changes and extremes. Sow aggression within the group, particularly related to scarce resources --- usually feed, is always a concern. Introducing new sows to the group often creates fighting that must be addressed.

Management Experiences

Experience with managing groups of sows in deep-bedded hoop barns at Iowa State University for the past six years has led us to these conclusions:

1. Groups of sows, all of the same parity, are the easiest to manage. However, even within these groups of the same parity, there are larger and aggressive individuals that need to be considered.
2. Feeding stalls are an excellent way to manage the sows individually within the group and to minimize fighting over feed. The stalls also provide a safe place for sows that are the target of aggression during non-feeding times.
3. Sows randomly access feeding stalls, so extra feed for thin sows requires extra labor.
4. Introducing replacement gilts to the group is a challenge. First parity gilts are best kept separate through their first gestation, if possible. They can then be commingled after weaning of their first litter. This allows the pregnant gilts to be developed separately from older sows.

5. Weaning is a good time to introduce new sows to the group.
6. Keeping a static group as much as possible is preferable. Static means managing the group as a batch, i.e., the group is bred, farrowed, and weaned at the same time. Dynamic groups, or groups of sows where sows are added and removed frequently, must continually reestablish their social order.
7. Planning the breeding of sows housed in hoops requires special consideration. Either breeding occurs in a central breeding barn with the sows later moved to a hoop, or breeding occurs in the hoop.
8. By housing a boar adjacent to the sow pens, detection of recycling sows has been easy in hoop barns.
9. Soundness problems have been fewer for sows housed in bedded hoop structures than for sows housed on concrete slats.
10. Positioning feeding stalls on an elevated platform (about 46 cm or 18 in. high) prevents bedding from building up in the stalls.
11. The hoop barn requires cleanout 2 to 4 times per year.
12. Position feeding stalls and alley along the west wall to keep the cooler east part of the hoop available for sows.
13. Construct the watering area to drain outside the hoops.
14. Although expensive, an electronic feeder worked very well to feed and manage gestating sows in the hoop.

Pros and Cons of Extensive Gestating Sow Systems

The characteristics of outdoor housing of sows and deep-bedded hoop barn systems are shown in Tables 2 and 3, respectively. An attempt to classify the characteristics as an advantage (Pro) or disadvantage (Con) was made with an "X" in the appropriate column. Advantages and disadvantages are usually based on an individual situation or perspective. When the characteristic could have both advantages and disadvantages, both Pro and Con are noted.

Table 2. Characteristics of outdoor pasture systems.

	Pro	Con		
Portable housing, fence, feeders, waterers			X	X
Outdoor working conditions			X	X
Seasonal in many areas			X	
Minimal energy requirements			X	
Low capital needs		X		
Adverse conditions (mud, wind, heat, cold, rain)				X
Ample bedding needed			X	
Extensive land needs				X
Uses low quality land			X	
Can be integrated into crop rotation			X	
Thermal control difficult			X	
Feed needs (more in winter)				X
Predators				X
Produces pigs in large groups of similar age			X	
Parasites can be soil borne				X
Sow management can be challenging			X	

Flexible system-easily expanded	X		
Feeding management more difficult			X
Grazing potential	X		
No manure to spread		X	
Perceived as humane		X	
Eligible for some niche markets	X		
Extensive access and logistic issues			X

Table 3. Characteristics of deep-bedded hoop systems.

	Pro	Con	
Improved thermal control	X		
Ample bedding needed		X	
Solid manure generated	X	X	
Improved feed control management		X	
Moderate capital investment		X	
Relatively new approach		X	
Individual sow management with feeding stalls	X		
Feed needs (more in winter)			X
Versatile structure	X		
Feeding can be automated		X	
Adding gilts and new sows to group			X
Extremely hot, humid, windless days			X
Detecting sows that return to estrus			X
Perceived as humane		X	
Eligible for some niche markets	X		
Air quality		X	

Conclusion

The well-being of the gestating sow can be achieved and maintained in group-housed and extensive systems. Outdoor pasture systems have become more viable with the advent of portable technologies (fencing, ATVs, etc.). Outdoor sows can graze to meet some of their nutrient needs. Access and logistics are more challenging with extensive outdoor systems. The biggest challenge for outdoor sows relates to seasonality, labor, and individual sow management.

A newer style of extensive housing is keeping sows in bedded hoop barns. These tent-like structures allow an outdoor-like system to be replicated in a smaller, more controlled setting while maintaining the advantage of low fixed costs for group-housed sows. Bedded hoop barns may prove to be a viable intermediate or compromise system that provides the advantages of outdoors without the disadvantages of large land needs, seasonality, and little control over the sows thermal comfort. However, the bedded hoop systems need more research, experience, and development.

References

Brumm, M.C., J.D. Harmon, M.S. Honeyman, J.B. Kliebenstein, and J.M. Zulovich, 1999. Hoop structures for gestating swine. AED44. Mid-West Plan Service. Iowa State Univ., Ames, IA. 16 pp.

Danielson, D.M.,, and J.J. Noonan, 1975. Roughage in swine gestation diets. J. Animal Sci. 41:94-99.

Ewing, S.A., D.C. Lay, Jr., and E. von Borell, 1999. Farm Animal Well-Being. Prentice Hall, Upper Saddle River, N.J.

Hagen, C.D., R.L. Moser, S.G. Cornelius, and J.E. Pettigrew, 1987. Alfalfa haylage for gestating swine. J. Animal Sci. 65 (Suppl. l):l38 (Abstr.).

Holden, P., R. Ewan, M. Jurgens, T. Stably, and D. Zimmerman, 1996. Life Cycle Swine Nutrition PM-489 Iowa State Univ., Ames, IA. 17 pp.

Honeyman, M.S., J.D. Harmon, J.B. Kliebenstein, and T.L. Richard, 2001a. Feasibility of hoop structures for market swine in Iowa: Pig Performance, Pig Environment, and Budget Analysis. Applied Engineering in Agriculture. 1 7(6):869-874.

Honeyman, M.S., and D. Kent, 2001. Performance of a Swedish deep-bedded feeder pig production system in Iowa. American Journal of Alternative Agriculture. 1 6(2):50-56.

Honeyman, M.S., J. Kliebenstein, and J. Harmon, 2001b. Iowa hoop structures used for swine: a survey. ASL-Rl 780. Swine Research Report AS-646. ISU Ext. Serv. Ames, IA.

Honeyman, M.S., J.J. McGlone, J.B. Kliebenstein, and B.E. Larson, 2001c. Outdoor Pig Production. PIH-145. Pork Industry Handbook. Purdue University, W. Lafayette, IN. 9 pp.

Honeyman, M.S., and W.B. Roush. 1999. Supplementation of mid-gestation swine grazing alfalfa. American Journal of Alternative Agriculture. 14(3): 103-108.

Huenke, L., and M.S. Honeyman, 2001. Fecal fiber content of finishing pigs in hoop structures and confinement. ASL-R1 779. Swine Research Report AS-646. ISU Ext. Serv. Ames, IA.

Pollman, D.S., D.M. Danielson, M.A. Crenshaw, and E.R. Peo, Jr., 1981. Long-term effects of dietary additions of alfalfa and tallow on sow reproductive performance. J. Animal Sci. 51:294-
299.

Pond, W.G., 1981. Limitations and opportunities in the use of fibrous and by-product feeds for swine. In: Proc. Distillers Feed Conference 36 (April 2): Cincinnati, Ohio.

Thornton, K., 1990. Outdoor pig production. Farming Press, Ipswich, U.K.

Large Group Systems for Gestating Sows

Rebecca Morrison Ph.D.
University of Minnesota, West Central Research and Outreach Center,
Morris, Minnesota

The welfare of gestating sows in confinement systems, in particular gestation stalls, is generating considerable interest from all realms of the pork industry. Deep-litter, group housing systems have been developed as an alternative to confinement stalls for gestating sows. Deep-litter, group housing systems allow sows to be housed in groups of 15 to 200 sows on a base of deep litter. These systems provide approximately $2m^2$ floor space per sow, and systems are usually naturally ventilated

The advantages of deep-litter, group housing systems are as follows:
1. Reduced capital cost
2. Lower energy costs
3. Perceived animal welfare benefits (sows are able to conduct locomotory behaviors, have social and physical interactions with other sows and the bedding, and may have reduced farrowing time due to improved muscle tone and reduced lameness)
4. Anecdotal evidence that sows have increased feed intake during lactation as straw consumption increases gut fill capacity.

Group housing systems for gestating sows have traditionally resulted in increased aggression and embryo loss (resulting in poor reproductive performance) in sows. Factors such as inadequate feeding systems, poor breeding management and insufficient pen space allowance may have contributed to poor performance and welfare of sows in group housing systems in the past. Currently, the management of sows in group housing systems is being reviewed, and there appears to be success in using group housing systems. The key components to success in deep-litter group housing systems are breeding management, feeding systems and bedding management.

Breeding management If possible sows should remain in static social groups from the time of weaning. New sows and gilts should be introduced at this time. Thereafter, sows should not be mixed until after the 40^{th} day of gestation, until embryo implantation has occurred (Brumm et al., 1999). There is currently insufficient data in the scientific literature to determine which is the best group size for sow management.

Feeding systems

Individual feeding stalls Individual feeding stalls are widely used in deep-litter group housing systems. Stalls enable a sow to feed without being disturbed by other sows, and receive her individualized feed requirements. Individual stalls may require more labor then other feeding systems (especially if sows are hand fed), however they enable the producer to lock the sows in for management procedures such as artificial insemination and vaccinations. Each stall should have a lockable back gate to ensure that more dominant sows do not disturb sows feeding in their stall (Brumm et al., 1999).

Electronic feeding systems Electronic sow feeders (ESF) in group housing system will ensure individual feeding of a large number of sows within a pen and avoid feed wastage.

Although group housing with ESF may improve sow welfare as compared with confinement with regard to freedom of movement and space availability, it allows only one sow to eat at a time, resulting in a highly competitive environment and possibly in injuries. There are reports indicating higher levels of aggression and injuries in pigs housed in groups with ESF (Gonyou, 2002; Broom , et al., 1995; Van Putten, et al., 1990).

Floor feeding Floor feeding allows sows to eat within a group situation in a free-for-all manner. This feeding system requires low labor input, however can result in aggression between sows, especially if there is restricted feeding space available for the sows. Furthermore the producer does not have control over individuals feed intake between sows (Brumm et al., 1999).

Bedding management

Bedding management is critical to the success of deep-litter group housing systems. Sows will create areas within their pen for sleeping, dunging and feeding. It is essential that these areas are maintained, and that the bedding does not become sloppy, which may result in leg injuries. Furthermore, sufficient bedding must be added during the winter months to ensure that sows are protected from the elements. Sows must have enough bedding to bury down into the deep litter.

References

Broom D.M., Mendl M.T., Zanella A.J., 1995. A comparison of the welfare of sows in different housing conditions. Anim Sci 61: 369-385.

Brumm, M.C., Harmon, J.D., Honeyman, M.S., Kliebenstein, J.B. and Zulovich, J.M., 1999. Hoop structures for gestating swine. Midwest Plan Service, Ames, Iowa.

Gonyou, H.W., 2002. Selection of a Sow Group Housing System for Prairie Swine Centre at Elstow. Western Hog Journal.

Van Putten G, Van de Burgwal J.A., 1990. Vulva bitings in group-housed sows: preliminary report. Appl Anim Behav Sci 1990; 26: 181-186.

Consumer Perspectives: Introduction

Lew Smith
National Program Leader, Animal Nutrition
USDA/ARS

This session addresses consumer perspectives of swine housing and well-being in the United States. The speakers will cover consumer attitudes and legislation, overview successful marketing programs, and the impact of consumers' perspectives on international markets. Consumers make decisions to buy or not to buy. Consumers were acknowledged an important force in the research/education agenda of FAIR '95 (Food Animal Integrated Research). Goal one was "Enhance industry-wide responsiveness to consumer and societal concerns". The other four of five goals were about supporting scientific gaps of the specific societal concerns with more research. The importance of consumer perspectives were re-acknowledged in FAIR 2002.

Fair 2002 is the outcome of the second national conclave to establish consensus on animal agriculture research and education priorities for the 21st century. More than 250 leading animal scientists, farmers, ranchers, environmentalists, animal welfare proponents, commodity group representatives, government staff, rural advocates, and agribusiness and food service representatives gathered to determine the most pressing research and education needs of the animal industry.

The science behind animal agriculture affects America's international trade balance, our environment, our neighbors, local economies, and us as individuals. Competitive farmers and ranchers with the right knowledge and tools can ensure that livestock, dairy, and poultry enterprises thrive; consumers get safe and nutritious food; and wildlife benefit from improved animal health and enhanced environmental stewardship. Food animals fare better in the care of knowledgeable producers and processors, and communities reap financial rewards from food-processing industries.

Gains such as these require public investments in research and education that, in turn, fuel the creation of industries and export profits that sustain communities and rural economies across the country. Keeping that edge will require a clear vision for the future and a strategic plan for research investments to attain the next generation of innovations.

Six goals became the foundation for FAIR 2002's research priorities and objectives. These are the necessary steps to ensure that we raise the best quality animal products in the ways that are "economically competitive, environmentally friendly, and socially acceptable".

Goal six was, "Promote Animal Well-Being: Enhance Animal Well-Being throughout the Food Production Cycle". This session of the Symposium on Swine Housing and Well-Being brings together the newest scientific information on consumer perspectives of this issue. Quotes are from: FAIR'95 and FAIR 2002, Federation of Animal Science Societies.

Consumer Attitudes and Legislation

Terri Dort, President
National Council of Chain Restaurants
Washington, DC

Presentation not available.

USDA Process Verified Program

James L Riva, Chief,
Audit, Review and Compliance Branch
USDA, Agricultural Marketing Service
Washington, DC

The Agricultural Marketing Program's Process Verified Program provides the agricultural industry with independent verification of their quality management systems, and a method to add value to and market their products using specific value added claims that were all but impossible to verify using normal certification methods.

By using the Process Verified Program, farmers, producers, feeders, suppliers, and processors have a method to assure their customers that their procedures and processes which are designed to meet specific quality standards, are verified by the USDA, and will provide consistent quality on a continual basis. Customers gain confidence in the quality system due to the independent, third party audits that review, confirm, and verify a company's documented quality management system. In this process AMS verifies quality management systems and upon approval allows companies to advertise and market their products as "USDA Process Verified."

To evaluate quality systems AMS uses internationally recognized standards for quality management systems. This ensures consistent auditing practices and promotes international recognition of audit results.

Process Verification is a cost efficient alternative to traditional certification and product inspection; it is a third party verification of any organization's quality management system, large or small, regardless of product, process or marketing goal.

AMS currently conducts quality systems audits for a number of Quality System Verification Programs. These programs are posted on the AMS website at: http://www.ams.usda.gov/process.

<u>USDA Process Verified Approval Process</u>

1. Document
   A. The Applicant documents their program quality system and processes

2. Program Operate & Test
   A. The Applicant operates and tests their systems with an internal audit

3. Adequacy Audit
   A. AMS Conducts a review of the documentation

4. Compliance Audit
   A. AMS conducts an onsite audit on all aspects of the applicants system

5. Program Approval
   A. Upon a successful audit AMS issues a one year approval

6. Begin Marketing
   A. The Applicant is posted on the AMS website and begins marketing

7. USDA Monitoring
   A. AMS conducts ongoing audits as outline in program requirements

Upon successfully completing the audit process the applicant will be allow to represent their program as USDA Process Verified. The USDA Process Verified Shield may be use in conjunction with the companies verified marketing claims in all point of sale information.

USDA, AMS, LS
Audit, Review, and Compliance Branch
1400 Independence Avenue, S. W.
Room 2625 STOP 0250
Washington, DC 20250-0250
Telephone: (202) 720-1124

Adequacy Audit

The Approved USDA Process Verified Programs listed below have successfully passed a document review and onsite audit conducted by the Livestock and Seed Program, Audit, Review, and Compliance Branch as outlined in ARC Instruction 1000 and 1001; and have been found in compliance with all criteria of their approved quality management systems.

Approved USDA Process Verified Programs

Example Companies
1. Premium Standard Farms
2. Farmland Industries
3. America's Best Pork
4. PM Beef Group LLC
5. Pederson's Natural Farms
6. Red Angus Association of America
7. Red Angus Feeder Calf Certification Program

The USDA Process Verified Program is user-fee funded. Applicants are charged an hourly fee for documentation review, onsite audits, and for travel costs at the Government approved reimbursement rate. The exact cost would vary depending on the scope of the program being audited, the number of locations, and other factors. In the initial audit year of the program, applicants should expect to have a document review, a major system wide audit, and at least one surveillance audit. AMS lead auditors will provide cost estimates prior to providing service based on the scope and location of the program.

Applicants must submit a letter requesting services and a complete copy of the applicant's program documentation along with:

1. Examples of all labels, tags, or other instruments used to identify animals or products.
2. Completed examples of all forms used in the program. These examples should be taken from actual records.

3. Copies of letters from consulting veterinarians, feed manufacturers, tag manufacturers, etc., as specified in the appropriate general requirement documents.
4. A copy of the most recent satisfactory internal audit report.

The Livestock and Seed Program, Audit, Review and Compliance (ARC) Branch currently conducts Quality Systems audits for a number of Quality System Verification Programs. These programs are posted on the ARC Branch website at:: http://www.ams.usda.gov/lsg/arc/process.htm.

Through this verification, USDA Process Verified suppliers are able to have Process Verified Points" such as breed, feeding practices, or other raising and processing claims verified by the USDA and market as "USDA Process Verified."

The USDA Process Verified Program applies to livestock, meat, and agricultural products marketing programs submitted to the AMS Program for verification and monitoring. It is limited to programs or portions of programs where process verified points are supported by a documented quality management system. The extent of controls included in these programs may include all phases of production and marketing from genetic development through retail distribution, or any portion as described in the scope of the submitted program. Programs submitted in writing to AMS will be approved when it is determined that they meet the AMS criteria and the program has successfully passed on onsite audit.

AMS quality auditors are fully trained on program requirements for each specific commodity group by experienced lead auditors. Additionally, all lead auditors have passed an American National Standards Institute (ANSI) Registrar Accreditation Board (RAB) accredited lead auditors training class and are working toward certified quality auditors status. Lead auditors must maintain this status with continuing education and practical experience in the quality system auditing field. AMS auditors conduct audits according to ISO 10011-1:1990 Guidelines for auditing quality systems, allowing international recognition of results documented during the assessments.

Impact of International Markets

Mark Ritchie, President
Institute for Agriculture and Trade Policy

Presentation not available.

Appendix A

Speaker Biographies

edited by Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES

Richard Reynnells
Dr. Reynnells earned the Ph.D., M.S., and B.S. in Poultry Science at Michigan State University. He has worked in all phases of broiler, commercial layer and game bird production while on the family farm or as an Extension Poultry Scientist at the University of Georgia. As a National Program Leader for Animal Production Systems for CSREES/PAS he serves as a liaison with the animal industries and related university departments, having multiple administrative or other duties, including: facilitate the definition of problem areas with diverse stakeholders, and provide leadership in program or policy development to solve or ameliorate these situations; coordinator for several national, animal well-being, waste management, or food safety symposia; liaison for multi-state research committees; and, professional organization roles. Current activities focus on water quality and quantity, and animal well-being issues.

Stan Curtis
Dr. Stan Curtis grew up on an Indiana farm and took his degrees in animal sciences at Purdue University. Since 1970 --- except for an 8-year stint as an administrator at Penn State University --- he has been a professor of animal sciences at the University of Illinois. He specializes in the environmental physiology, behavior, and husbandry of livestock and other kept animals. He is considered an authority on pigs. He has received state, regional, national, and international awards recognizing his scientific and public service contributions regarding the farm-animal welfare issue. These include the 1989 CAST Charles A. Black Award, the 1998 AAALAC International Bennett J. Cohen Award, and the 2001 NPPC Distinguished Service Award. He is former president of American Society of Animal Science and Federation of Animal Science Societies and Chair, of the Association for Assessment and Accreditation of Laboratory Animal Science International.

Ray Stricklin
Ray is currently an associate professor at the University of Maryland. His responsibilities at the university include coordinating of Undergraduate Programs in Animal Science which include Applied Animal Behavior, Animal Welfare and Introductory Animal Science. His primary research interests are using his knowledge of animal social and spacing behavior to develop computer simulations in the design of housing for animals. Ray received his BS and MS from the University of Tennessee and his PhD from Pennsylvania State University. His is a past board member of the American Society of Animal Science, Scientists Center for Animal Welfare, and International Society of Applied Ethology.

Cynthia Smith
Since 1990 Cynthia has worked for the United States Department of Agriculture and National Agricultural Library. Cynthia received her BS in Animal Science with a minor in Psychology, Animal Behavior Emphasis from Virginia Tech. She received her MS from the University of Illinois in Animal Science, Farm Animal Ethology.

Peter R. English
Professor English, BSc, NDA, PhD, recently retired as Professor of Animal Science and Husbandry at the University of Aberdeen. Served the University as a Professor, Lecturer, Researcher, Extension Specialist and Administrator. Lectured in Animal Science and Animal Systems, animal behaviour/welfare and the education, training and motivation of livestock farmers and stockpeople. His role as Director of two internationally respected one year Masters Courses (Animal and Pig Production) involved him in research on the full spectrum of animal systems which serve man throughout the world. He is the senior author of three text books on swine: 'The Sow: Improving her efficiency', 'The Growing and Finishing Pig' and 'Stockmanship'. His pig research has focused on the causes and prevention of piglet mortality and on the wide spectrum of factors influencing reproduction, lactation, growth and product quality in relation to improving pig husbandry and efficiency of production. He is the author of over 400 scientific and advisory publications related to Pig/Animal Care and Production systems. He has been actively involved in translating research into practice through his papers, books, lecturing and extension activities. His youthful experience as a shepherd and cattleman on small family farms in the Scottish Highlands, combined with his early University responsibilities for the management of the University's experimental pig herd, has been influential in his current focus of addressing the challenge of incorporating 'stockmanship' into the scientific spectrum of factors which impinge on the health, welfare, productivity and efficiency of swine and other farm livestock enterprises. He was the winner of the prestigious David Black Award in 1984 for his services through his research and extension activities to the British Pig Industry. In 1998 he received the British Society of Animal Science/RSPCA Award for his pioneering research in Animal Welfare and the education, training and motivation of stockpeople. He is a member of the UK's Farm Animal Welfare Council.

Larry R. Miller
Dr. Miller’s education includes a B.S. degree from Western Illinois University, an M.S. degree from Kansas State University, and a Ph.D. from Purdue University. Graduate work emphasized Animal Breeding, Growth & Muscle Biology, and Statistics. He has been an employee of USDA since 1969 with a career traversing the Agricultural Research Service, the Joint Council on Food and Agricultural Sciences, CSRS, and CSREES. Research program areas of emphasis encompass animal and veterinary sciences including responsibilities for animal well-being, minor use animal drugs, animal germplasm preservation, small ruminants, and numerous other animal species.

Ed Pajor
Ed was born in Simcoe, Ontario, Canada, where he spent his early years on his family's tobacco farm. He received his Hons. B.S. Co-op degree in biology from the University of Waterloo. Ed completed his M.S. and Ph.D. degrees in biology from McGill University, specializing in animal behavior. Ed's graduate research focused on swine behavior and welfare, specifically the piglet's adaptation to weaning, parent-offspring interactions, and the development of alternative housing systems for sows and piglets. Ed's research was

carried out at Agriculture and Agri-Food Canada in Ottawa, Ontario. After completing his Ph.D., Ed worked for two years at Agriculture and Agri-Food Canada's Dairy and Swine Research and Development Centre located in Lennoxville, Quebec as a Post-doctoral research fellow. Ed's research focused on the effect of aversive handling on the development of fear in dairy cattle. Ed joined the faculty of the Animal Sciences Department at Purdue University in July of 1999. Ed's responsibilities include teaching, research, and extension. Ed's research in animal behavior and welfare focuses on sow housing and dairy cattle management. Ed also serves on several boards and committees.

Mark Honeyman
Mark is an associate professor of animal science at Iowa State University where he teaches swine management and animal nutrition. He also coordinates the ISU Research and Demonstration Farm system, a state-wide network of sixteen farms. Honeyman conducts research in swine nutrition and production. His work has focused on extensive alternative swine production including outdoor, deep-bedded, and hoop barn systems. He is keenly interested in the role of livestock, particularly swine, in sustainable agriculture. Previously he was a partner in his family's farming operation in southwest Iowa. He earned his B.S., M.S., and Ph.D. degrees in animal science and nutrition from Iowa State University.

Rebecca Morrison
Rebecca received her PhD in 2001 from University of Melbourne, Australia in Swine Behavior and Welfare. Her thesis title was "The behavior, welfare and performance of growing pigs in deep litter group housing systems." Rebecca is currently at the University of Minnesota, West Central Research & Outreach Center, Sustainable Swine Production Systems Scientist (Alternative Swine Housing Systems).

Lewis W. Smith
Lewis was born in York, Pennsylvania, grew up in Northern Baltimore County, Maryland, on a dairy-poultry farm, and was active in the Future Farmers of America in High School. He completed requirements for B.S. in 1959, M.S. in 1961, and Ph.D. in 1968, all at the University of Maryland, College Park, with emphasis in dairy science, animal science, and chemistry. Dr. Smith started his career with the United States Department of Agriculture-Agricultural Research Service, in Beltsville, Maryland, in 1961 with the Dairy Cattle Research Branch. His research focused on waste and forage utilization, forage chemistry, biochemistry, and ruminant digestive physiology. He has held positions in the Agency, as Scientist, Research Leader, Institute Director, National Program Leader for Animal Nutrition, and since January, 2002 National Program Leader for Aquaculture and Animal Well-Being. As National Program Leader, Dr. Smith has lead responsibility for the ARS National Programs, Aquaculture and Animal Well-Being and Stress Control Systems. In addition, he is a member of the management teams of several other National Research Programs including Food Animal Production; Rangelands, Pastures and Forages; and Manure and Byproduct Utilization. Dr. Smith holds membership in the American Dairy Science Association, American Society of Animal Science, and American Registry of Professional Animal Scientists. He has served in various advisory or consulting roles for national and international organizations or governments, most recently on a scientific orientation to the Azores. Dr. Smith has authored or co-authored over 125 scientific reports. He and his wife, Kay have a son, Scott and daughter, Paige.

Terrie M. Dort
Terrie has been the President of the National Council of Chain Restaurants (NCCR) for the last ten years. In this role she had led the industry, including such giants as McDonald's and Burger King, in their successful opposition to many onerous legislative initiatives. NCCR has also taken a leadership role in public policy issues of interest to the industry such as smoking in restaurants and violence in the workplace. Ms. Dort was formerly a Vice President at Rowland and Sellery, a government relations consulting firm, where she directed and managed all aspects of legislative strategy programs. Prior to her position at Rowland and Sellery, she was a Government Affairs Representative in the Washington, DC office of Deere and Company. For eight years she represented this Fortune 100 Company on the Hill and before trade associations and coalitions. From 1991 - 1993, Ms. Dort served on the Board of Directors of Women in Government Relations. She received her Masters in International Business from George Washington University in 1985.

James Riva
James has been with the USDA for 30 years. He started his career with FSIS in 1972 working for 10 years as a first line inspector. In 1982 he moved to AMS Meat Grading and Certification Branch where he spent 15 years as a USDA Meat Grader. In 1996 he was reassigned to work in the AMS Livestock and Seed Program Audit program know as the Quality Systems Certification Program working as a Lead Auditor. He then accepted a job with the Farm Service Agency, Commodity Operations as the Director of their Total Quality Systems Audit Program. James returned to AMS, and is currently the Branch Chief of the Livestock and Seed Program, Audit, Review and Compliance Branch working in the Washington, DC office.

Mark Ritchie
Mark is President of the Institute for Agriculture and Trade Policy in Minneapolis, MN. He received his Masters in International Public Law in 1994 from the University of Amsterdam. In 1971 he received his BSc from Iowa State University in the Honors Program. Ritchie's professional activities and affiliations include Co-Organizer and Faculty for the Salzburg Seminar on Global Food Systems in the 21st Century, American Agricultural Economic Association, The Academic Council on the United Nations System, International Forum on Food and Agriculture as well as many others. Mark has many publications and presented on a variety of programs.

Appendix B

Speaker and Contributor Contact Information

edited by Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES

Michael Appleby, Vice President
Farm Animals and Sustainable Agriculture
The Humane Society of the United States
2100 L Street, NW
Washington, DC 20037
T#: 301.258.3111
F#: 301.258.3081
email: mappleby@hsus.org

Stan Curtis, Emeritus
Department of Animal Sciences
Animal Sciences Laboratory
1207 W. Gregory Drive
University of Illinois
Urbana, IL 61801
T#: 217.333.6489
F#: 217.244.2871
email: securtis@uiuc.edu

Terri Dort, President
National Council of Chain Restaurants
325 7th Street, NW, Suite 1100
Washington, DC 20004
T#: 202.626.8183
F#: 202.626.8185
email: dortt@nrf.com

Peter English, Emeritus
Department of Agriculture & Forestry
University of Aberdeen
581 King Street,
Aberdeen, UK AB24 5UA
T#: (011) 44 (0).1224.274201; 431.9306
F#: (011) 44 (0).1224.273731
email: p.english@abdn.ac.uk

Mark Honeyman
20 Curtiss Hall
Iowa State University
Ames, IA 50011
T#: 515.294.4621
F#: 515.294.6210
email: honeyman@iastate.edu

Anna Johnson, Director
Animal Welfare
National Pork Board
PO Box 9114
Des Moines, IA 50306
T#: 515.223.3533
F#: 515.223.2646
email: Anna.Johnson@porkboard.org
Internet: www.porkboard.org
Office Location: 1776 NW 114th Street
Clive, IA 50325

John McGlone
Department of Animal Science
Texas Tech University
Lubbock, TX 79409
T#: 806.742.2533
F#: 806.742.2335
email: anjjm@attacs.ttu.edu

Larry Miller, National Program Leader, Animal Production Systems
United States Department of Agriculture (USDA)
Cooperative State Research, Education and Extension Service (CSREES)
800 9th Street SW, Room 3130 Waterfront Centre
Washington, Dc 20250-2220
T#: 202.401.6848
F#: 202.401.1602
email: lmiller@reeusda.gov

Rebecca Morrison, Alternative Swine Housing Scientist
West Central Research and Outreach Center
University of Minnesota
State Highway 329
P.O. Box 471
Morris, MN 56267
T#: 320.589.1711
F#: 320.589.4870
email: morrisrs@mrs.umn.edu

Ed Pajor
Department of Animal Sciences
1026 Poultry Building, Room 207
Purdue University
West Lafayette, IN 47907-1026
T#: 765.496.6665
F#: 765.494.9347
email: pajor@purdue.edu

Richard Reynnells, National Program Leader, Animal Production Systems
United States Department of Agriculture (USDA)
Cooperative State Research, Education and Extension Service (CSREES)
800 9th Street SW, Room 3130 Waterfront Centre
Washington, Dc 20250-2220
T#: 202.401.5352
F#: 202.401.6156
email: rreynnells@reeusda.gov

Mark Ritchie, President
Institute for Agriculture and Trade Policy
2105 First Avenue South
Minneapolis, MN 55404
T#: 612.870.3400
F#: 612.870.4846
email: mritchie@iatp.org
Internet: http://www.iatp.org

James Riva, Agricultural Marketing Specialist
USDA, Agricultural Marketing Service, Audit, Review and Compliance
Room 2634 South Building
1400 Independence Avenue, SW
Washington, DC 20250
T#: 202.720.1124
F#: 202.690.4119
email: James.Riva@usda.gov

Cynthia Smith
USDA, Agricultural Research Service (ARS), National Agricultural Library (NAL),
Animal Welfare Information Center (AWIC)
10301 Baltimore Blvd.
Beltsville, MD 20705-2351
T/F#: 518.383.8146
email: csmith35@nycap.rr.com

Lew Smith, National Program Leader, Animal Nutrition
USDA/ARS, National Program Staff
5601 Sunnyside Avenue
Building 4, Room 2168
Beltsville, MD 20705-5138
T#: 301.504.5925
F#: 301.504.5467
email: lws@ars.usda.gov

Ray Stricklin
Animal and Avian Sciences Department
1413A AnSc/AgEn Building
University of Maryland
College Park, MD 20742-2311
T#: 301.405.1374/1373
F#: 301.314.9059
email: ws31@umail.umd.edu

Appendix C

Future Research Needs Highlighted by the Speakers

Anna Johnson
Director, Animal Welfare
National Pork Board

1. Detailed research conducted on the role and skills of the stockperson. There is a need for detailed on farm training programs. In today's society where more workers come from an increasingly urbanized background, skills that producers take for granted are lacking in the majority of new personnel and we may often under estimate the challenges imposed. These challenges could then result in unmotivated staff that eventually will leave the profession (Peter English).

2. Pre-weaning mortality is often comprised of primary and secondary factors. One area that must be addressed in detail is the role of hypothermia in baby piglets. This may often be the starting point, which leads onto crushing or starvation of piglets (Peter English).

3. A survey should be conducted to directly compare producers and consumer's ideas on what welfare is, the components of welfare, and what it means to both parties. Limited surveys have been conducted and even less have directly compared these diverse groups. One issue that should be addressed is biosecurity. From a producer's point of view of protecting his animals from outside disease versus the consumer who thinks that producers keep them off their property because they have "something" to hide.

4. Pork producers need to have some educational material that can be taught at a variety of levels (school, college, universities and outside adult groups). Animals rights groups employ personnel specifically to travel the country and invest money in such material. Educators currently can only show and teach one side of the argument. Often commodity groups fare poorly against such material and with consumers having little understanding of farms, transport and slaughter facilities they often believe heavily in such material and concern over the accuracy of facts is often raised (General discussion).

5. Address the issue of having one size of gestation stall on a farm, when gilts/sows ranges in size as they increase through parities (Edmond Pajor).

6. Previous research work, which has compared different gestating sow housing systems, may have flaws because "noise" has been included into this research. For example housing systems are compared on different sites, which can introduce different management, feeding, and occasionally genetics. Conclusions are then difficult to compare. Future work must ensure that comparisons are made on the same site preferably within the same barn (Edmond Pajor).

7. Feeding management possibilities for the sow must be considered. If the USA follows the EU in dictating that all sows must be able to eat simultaneously then would the

Electronic Sow Feeding System (ESF) research work become redundant? (General discussion).

8. Mixing of gestating sows, management and the issue of aggression in group housing must be researched more thoroughly to understand what the stockperson can do to minimize and/or eliminate these problems. If alternative systems are to work, aggression must be managed (Edmond Pajor).

9. There is a huge gap in information for the producer in regards to retrofitting and economic cost. If producers want to change from a stall to pen they need to have a resource to be able to guide them (General discussion).

10. Research on housing gestating sows in large groups must be researched more thoroughly. Little work has focused on groups of 60 or more sows and how behavior, hierarchy, performance and physiology are affected. Do they maintain social sub-groups within one large group or does this get abandoned? (Rebecca Morrison).

11. Work must be conducted in regards to housing for the gestating sow and how this impacts on the farrowing phase. It has been proposed that sows that have access to straw and/or a fibrous material throughout gestation can increase their gut capacity and later the physiology of the stomach. Therefore when sows are placed into farrowing stalls and do not have access to substrate is her welfare then compromised? (Rebecca Morrison).

12. Role of genetics is crucial when implementing different systems for the gestating sow. Over the past two decades the breeding companies have been selecting for production-oriented traits and meat quality. This has resulted in sows, which may be suited to a stall but may lack the structural soundness and body conformation for pens or pasture living (Edmond Pajor).

13. Space (dynamic and static) needs for gestating sows kept in all systems must to be researched and for these dimensions to be backed with science (John McGlone).

14. Swine (all phases of production) that has access to some form of substrate will eat this bedding. Research needs to address how much they eat, and how it affects their physiology and gut structure. In addition if the provided substrate provided to the animals has been treated with insecticides and or pesticide does this result in residues within meat that could be harmful to the consumer? (Rebecca Morrison).

15. Research on the floor structure should also be considered. Will the USA follow the EU, who is currently implementing totally solid floor and substrate use? Once the gestation stall has been decided upon what other issues will then become debatable? (General discussion)

Appendix D

Speaker Responses to Questions

Michael Appleby
Vice President, Farm Animals and Sustainable Agriculture
Humane Society of the United States

Swine Housing and Well-Being: Questions and Answers

Session 1

Question	*What is involved with a well-being index?*
Peter English	Piglet well-being is all to do with understanding and meeting the needs of the animal. For example, if immunity is boosted, the animal can cope better with its environment.
Question	*As an independent producer, what types of information are appropriate for me to use with high-school students, full-time workers and so on?*
Cynthia Smith	For high school, we have information available on animal welfare for teachers, on videos and so on, for example on the difference between animal welfare and animal rights. Some companies let you preview videos before buying. One example of a useful video would be on daily procedures such as needle teeth clipping.
Peter English	There was a question about our interactive CDs for stockpeople and managers: these are now available.
Question	*If you have to appoint one person, good with either staff or pigs, which would you choose?*
Peter English	The former is important with a large staff. For a small staff, an all-rounder is important.
Question	*How do you instill a good attitude: do you have to be born with 'ethics' or can the attitude be taught?*
Ray Stricklin	There is already much caring, but we can help improve this.
Stan Curtis	There are some people more interested and more trainable. Others can be helped, but something very useful would be a probation period --- if someone doesn't 'belong' on an animal farm they should be 'let go'.
Cynthia Smith	Temple Grandin has said that staff attitude follows that of management.
Peter English	I do not believe the common idea that 'Good stock people are

born not made' --- it is 10% 'genetic' and 90% 'environmental'. Training is possible, but I agree that a period of probation would be good.

Question — *Where are the best trainers found --- off or on-site?*

Peter English — It is best to find them on the farm, then the farm can be independent --- can tackle tasks when they arise, when time is available and so on. Interactive packages (CDs, etc) help with this. Outside help is good, but big companies can develop in-house schemes.

Cynthia Smith — The New Zealand program is good and much of it is available in package form.

Question — *Is the general public's view of animal welfare the same as producers'?*

Ray Stricklin — What do we mean by welfare? There is a lack of communication on these issues between industry and public, worsened by increasing intensiveness, confinement and biosecurity. There is a lot of agreement on ethics --- for example, that it is wrong to cause unnecessary pain --- but more disagreement on what is appropriate or necessary.

Peter English — The consuming public is a varied group. There have been demands for better welfare, but the public is not always willing to pay extra, for example for getting rid of stalls.

Stan Curtis — The general public does have its own concepts of welfare, but over the last 25 years values and concerns of the general public have changed, which makes it difficult for the industry to satisfy those concerns. Restaurants are less concerned about welfare as such, more about satisfying the general public's concerns. The latter are often whims, and these should not form guidelines for industry, which should be based on science. And science is reaching a consensus on what actually constitutes well-being: this should be what we base practice on. Some demands on how we raise animals don't make sense scientifically and the industry reasonably says that they cannot meet such demands. They tend to respond by saying 'Go and find someone else who can keep pigs like that and buy your pork from them.'

Session 2

Question — *Has it been shown that sows in crates with a common trough receive the same amount of feed?*

John McGlone — This cannot be referring to crates, in which feeding is separate, but to stalls. No, there is variation in feeding unless stalls have systems to lock sows in during feeding or trickle feeding if possible. This is one of the major problems of group housing.

Question	*Is there information on variation in aggression between genetic lines?*
Ed Pajor	Not much, although such variation is apparent. Most selection has been for production traits. We should incorporate behavior into breeding programs in the future.
Question	*As a producer, I understand that public perception is a real factor, but I am concerned that PETA and other groups influence USDA and policy decisions. Is this unscientific?*
Rebecca Morrison	PETA and other animal rights groups have sparked interest in these issues but are not driving policy. Groups like the National Pork Board do take science into account.
Ed Pajor	Animal rights groups are good at taking credit for change, but a more potent driving force is concern for food safety. People are discovering the reality of farming as a result and that old images, such as a farm with two cows, are out of date.
Question	*How many square feet are needed per sow?*
John McGlone	Recommendations are for 16 sq ft per sow in groups and 14 in crates. In fact some sharing is possible, so less than 16 might be possible in groups. For 'normal postural adjustment', an area 35" wide and 7.5' long is needed.
Question	*Are there effects of social rank or dominance hierarchy on performance?*
John McGlone	In groups, these affect reproduction. Low ranking animals lose pregnancy more often, but the average in groups is still the same as that in crates.
Question	*Are pesticide residues found when sows are kept on bedding?*
Mark Honeyman	This has not been studied to my knowledge.
Question	*Would the price of Electronic Sow Feeders come down if gestation crates were banned?*
Mark Honeyman	It might well, because of larger scale production.

Session 3

Question	*How do you deal with biosecurity issues, when making unannounced audits?*
Jim Riva	We arrive and explain why we're there, then comply with any of their regulations—clothing, etc.—but without notice.
Question	*Have you read "Fast Food Nation"? Do you have any observations on it?*
Terri Dort	Yes and yes. I bought it to debate Eric Schlosser on a TV program. It is interesting, but an exaggerated picture. He had an agenda and found worst examples of everything. It's an awful book.
Lew Smith	That may be so, but one of my concerns is the extent of marketing to children in food stores and so on.
Question	*You said that the NCCR guidelines will be announced in late June, but what will be the date and method for full publication?*
Terri Dort	Different groups (e.g., poultry producers) have different procedures for member-approval, so although the first phase release will be late June, full release will be intermittent. It should be complete by late summer. There will then be a press conference and so on.
Question	*Changes in rural structure are often blamed on consolidation of agriculture. What about consolidation of other industries— what impact does this have?*
Jim Riva	There is mandatory livestock reporting in AMS procedures. I have seen industry go from many small packers to a few large ones—there are advantages and disadvantages of this including improved hygiene. We are monitoring such changes.

Appendix E

Summary of Questions to Specific Speakers

Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES

These questions reflect areas of interest that could be addressed in educational and research programs in the future. Questions represent audience requests that were not addressed due to time constraints.

To: Anyone

A. Advice on retrofitting group housed barns (i.e., 12 sows in pen with 14 sq. Ft./sow). Should we open up....3 pens into one? Use feeding stations? Skip feeding? How to AI? How to feed thin sows?
B. Average sow's weight? Determine crate postural adjustments. (Session 2)
C. Genetic lines...what factors determine agro-economics?
D. Should a gestation housing system provide for the sow to build a nest, an innate behavior expressed at farrowing? (Session 2)

To: Terri Dort

A. Changes in the structure of rural communities is blamed on the consolidation of animal agriculture. What effect does the consolidation of restaurants (e.g., McDonalds; Bennigans), hardware stores (e.g., Wal-Mart), clothing stores (e.g., K-Mart), groceries (e.g., Safeway, Giant) and other chain/franchises have on this structure? Why is this situation not discussed? What is the impact on the producer?
B. What can the pork industry do to help your members when they are attacked by PETA?
C. Could you further explain the research that your association or members have done on consumer's perceptions of animal welfare guidelines?
D. Are there NCCR standards for beef and dairy...if not, why not? Issues with beef can be addressed through the packers.

To: Ed Pajor

A. Every time the swine industry fights off proposed legislation related to animal welfare, is there not a net loss in consumer confidence in pork as a product?

Appendix F

Availability of Resources, Models, and Training Programs: A Summary

Cynthia P. Smith, M.S., Technical Information Specialist
United States Department of Agriculture, Agricultural Research Service,
National Agricultural Library, Animal Welfare Information Center

Abstract: Information regarding the well-being of swine is often presented to producers as a "hot topic." Developing legislative issues will continue to keep swine housing and well-being at the forefront. However interest in swine housing and well-being is not new. In the United States, studies have been conducted for over twenty years on sow housing, problems associated with weaning, mixing pigs, handling, and environmental enrichment. As with all scientific research as information is gained more questions remain to be answered. Therefore, the task of providing the producer with information to make farm management decisions is not easy but a baseline of data does exist.

Currently, a collaborative project between government, academia, and several non-profit organizations is underway to develop a resource guide to assist producers and swine educators (extension swine specialists, animal scientists, and veterinarians) with information related to swine well-being, care, housing, and stockmanship. The majority of the resources listed will be accessible using a personal computer, the internet, and the services of a local public library.

Over two thousand citations from the past several years have already been selected from agricultural, medical sciences, and biological sciences literature databases for inclusion in the resource guide. These citations cover swine production systems from all over the world and include both intensive and extensive production systems operating under a variety of climatic conditions. Citations have been included from peer reviewed journals, proceedings, textbooks, handbooks, guidebooks, video cassettes, and training kits. Citations cover a broad range of subject areas including: behavior, feeding, health, housing, husbandry, legislation, reproduction, slaughter, and transport. In addition to bibliographic information the guide will also contain a section listing annotated web links to full text materials, audiovisual clips, specialized databases, and other resources available on the World Wide Web.

During the development of this project there was discussion on the need for training materials to be made available to US swine educators and producers at a reasonable cost and in user friendly formats. With this goal in mind a number of training materials in the form of videocassettes, training kits, and CD-ROMs are currently being purchased for inclusion in the USDA National Agricultural Library's collection. These useful materials will then be made available through interlibrary loan to smaller academic and public libraries. Please visit the National Agricultural Library Document Delivery Service at http://www.nal.usda.gov/ddsb/ for information on lending policies and restrictions.

A tremendous amount of effort has been made to improve the quality and availability of decision making tools available for today's producer and other swine related professionals.

These tools will only be effective if they can be integrated into the regular training and educational programs offered at each facility whether it be small or large.

The following is a selected listing of recent publications covering the care and welfare of swine that will be included in the final resource guide.

Behavior

Beattie, V.E.; Sneddon, I.A.; Walker, N.; Weatherup, R.N. (2001). **Environmental enrichment of intensive pig housing using spent mushroom compost.** *Animal Science: an International Journal of Fundamental and Applied Research* 72(1): 35-42.

Boyle, L.A.; Leonard, F.C.; Lynch, P.B.; Brophy, P. (2000). **Influence of housing system during gestation on the behaviour and welfare of gilts in farrowing crates.** *Animal Science: an International Journal of Fundamental and Applied Research* 71(3): 561-570.

Day, J.E.L.; Spoolder, H.A.M.; Burfoot, A.; Chamberlain, H.L.; Edwards, S.A. (2002). **The separate and interactive effects of handling and environmental enrichment on the behaviour and welfare of growing pigs.** *Applied Animal Behaviour Science* 75(3):177-192.

Gonyou, H.W. (2001). **The social behaviour of pigs.** In: *Social Behaviour in Farm Animals* Keeling, L.J.; Gonyou, H.W. (Eds.), CABI Publishing: Wallingford, UK, p.147-176.

Held, S.; Mendl, M. (2001). **Behaviour of the young weaner pig.** In: *The Weaner Pig: Nutrition and Management* Varley, M.A.; Wiseman, J. (Eds.), CABI Publishing: Wallingford, UK, p.273-297.

Johnson, A.K.; Morrow-Tesch, J.L.; McGlone, J.J. (2001). **Behavior and performance of lactating sows and piglets reared indoors or outdoors.** *Journal of Animal Science* 79(10): 2571-2579.

Marchant, J.N.; Broom, D.M.; Corning, S. (2001). **The influence of sow behaviour on piglet mortality due to crushing in an open farrowing system.** *Animal Science: an International Journal of Fundamental and Applied Research*. 72(1): 19-28.

Turner, S.P., Edwards, S.A.; Bland, V.C. (1999). **The influence of drinker allocation and group size on the drinking behaviour, welfare and production of growing pigs.** *Animal Science: an International Journal of Fundamental and Applied Research* 68(4): 617-624.

Whittemoore, C.T. (1998). **Pig behaviour and welfare**. In: *The Science and Practice of Pig Production,* Blackwell Science: Oxford; Malden, Mass, 2nd ed., p.131-166.

Breeding

Henryon, M.; Berg, P.; Jensen, J.; Andersen, S. (2001). **Genetic variation for resistance to clinical and subclinical diseases exists in growing pigs.** *Animal Science: an*

International Journal of Fundamental and Applied Research 73(3): 375-387.

Knol, E.F.; Ducro, B.J.; Van Arendonk, J.A.M.; Van der Lende, T. (2002). **Direct, maternal and nurse sow genetic effects on farrowing, pre-weaning and total piglet survival.** *Livestock Production Science* 73(2-3): 153-164.

Visscher, A.H.; Janss, L.L.G.; Niewold, T.A.; de Greef, K.H. (2002). **Disease incidence and immunological traits for the selection of healthy pigs. A review.** *Veterinary Quarterly (Netherlands)* 24(1): 29-34.

Feeding

Andersen, I.L.; Boe K.E.; Kristiansen, A.L. (1999). **The influence of different feeding arrangements and food type on competition at feeding in pregnant sows.** *Applied Animal Behaviour Science* 65(2): 91-104.

Aumaitre, A.L.; Fernandez, J.A.; Wiseman, J. (2001). **Special issue: The role of dietary fibre in pig production.** *Animal Feed Science and Technology* 90(½): 1-115.

Han, I.K.; Lee, J.H.; Piao, X.S.; Li, D. (2001). **Feeding and management system to reduce environmental pollution in swine production: Review.** *Asian Australasian Journal of Animal Sciences* 14(3): 432-444.

McGlone, J.J.; Fullwood, S.D. (2001). **Behavior, reproduction, and immunity of crated pregnant gilts: effects of high dietary fiber and rearing environment.** *Journal of Animal Science* 79(6): 1466-1474.

Ramonet, Y.; Meunier-Salaun M.C.; Dourmad J.Y. (1999). **High-fiber diets in pregnant sows: digestive utilization and effects on the behavior of the animals.** *Journal of Animal Science* 77(3): 591-599.

Spoolder, H.A.M.; Edwards, S.A.; Corning, S. (1999). **Effects of group size and feeder space allowance on welfare in finishing pigs.** *Animal Science: an International Journal of Fundamental and Applied Research* 69(3): 481-489.

Whittemore, C.T.; Green, D.M.; Knap, P.W. (2001). **Technical review of the energy and protein requirements of growing pigs: food intake.** *Animal Science: an International Journal of Fundamental and Applied Research* 73(Part 1): 3-17.

Health

Georgsson, L.; Svendsen, J. (2001). **One or two feeders for groups of 16 growing-finishing pigs: Effects on health and production.** *Acta Agriculturae Scandinavica Section A Animal Science* 51(4): 257-264.

Groot, J. de; Ruis, M.A.W.; Scholten, J.W.; Koolhaas, J.M.; Boersma, W.J.A. (2001). **Long-term effects of social stress on antiviral immunity in pigs.** *Physiology and*

Behavior 73(½): 145-158.

Henryon, M.; Berg, P.; Jensen, J.; Andersen, S. (2001). **Genetic variation for resistance to clinical and subclinical diseases exists in growing pigs.** *Animal Science: an International Journal of Fundamental and Applied Research* 73(3): 375-387.

Mouttotou, N.; Hatchell, F.M.; Green, L.E. (1999). **Foot lesions in finishing pigs and their associations with the type of floor.** *Veterinary Record: Journal of the British Veterinary Association* 144(23): 629-632.

Otake, S.; Dee, S.A.; Rossow, K.D.; Deen, J.; Joo, H.S.; Molitor, T.W.; Pijoan, C. (2002). **Transmission of porcine reproductive and respiratory syndrome virus by fomites (boots and coveralls).** *Journal of Swine Health and Production* 10(2): 59-65.

Thomsen, L.E.; Mejer, H.; Wendt, S.; Roepstorff, A.; Hindsbo, O. (2001). **The influence of stocking rate on transmission of helminth parasites in pigs on permanent pasture during two consecutive summers.** *Veterinary Parasitology* 99(2): 129-46, ISSN: 0304-4017 Keywords: Helminthiasis, transmission, growth and development, body weight, epidemiology, feces, parasitology, parasite egg count, Denmark.

Visscher, A.H.; Janss, L.L.G; Niewold, T.A.; de Greef, K.H. (2002). **Disease incidence and immunological traits for the selection of healthy pigs. A review.** *Veterinary Quarterly* 24(1): 29-34.

Housing

Barnett, J.L.; Hemsworth, P.H.; Cronin, G.M.; Jongman, E.C.; Hutson, G.D. (2001). **A review of the welfare issues for sows and piglets in relation to housing.** *Australian Journal of Agricultural Research* 52(1): 1-28.

Boyle, L.A.; Leonard, F.C.; Lynch, P.B.; Brophy, P. (2002). **Effect of gestation housing on behaviour and skin lesions of sows in farrowing crates.** *Applied Animal Behaviour Science* 76(2): 119-134.

Cox, L.N.; Cooper, J.J. (2001). **Observations on the pre-and post-weaning behaviour of piglets reared in commercial indoor and outdoor environments.** *Animal Science: an International Journal of Fundamental and Applied Research* 72(1): 75-86.

Gallmann, E.; Brose, G.; Hartung, E.; Jungbluth, T. (2001). **Influence of different pig housing systems on odor.** *Water Science and Technology: a Journal of the International Association on Water Pollution Research* 44(9): 237-244.

Honeyman, M.S.; Roush, W.B. (2002). **The effects of outdoor farrrowing hut type on prewean piglet mortality in Iowa.** *American Journal of Alternative Agriculture* 17(2): 92-95.

Kelly, H.R.C.; Bruce, J.M.; Edwards, S.A.; English, P.R.; Fowler, V.R. (2000). **Limb injuries, immune response and growth performance of early-weaned pigs in different housing systems.** *Animal Science: An International Journal of Fundamental and Applied*

Research 70(1):73-83.

Klont, R.E.; Hulsegge, B.; Hoving-Bolink, A.H.; Gerritzen, M.A.; Kurt, E.; Winkelman-Goedhart, H.A.; de Jong, I.C. (2001). **Relationships between behavioral and meat quality characteristics of pigs raised under barren and enriched housing conditions.** *Journal of Animal Science* 79(11): 2835-43.

Krieter, J. (2002). **Evaluation of different pig production systems including economic, welfare and environmental-aspects.** *Archiv fur Tierzucht* 45(3): 223-235.

McGlone, J.J.; Fullwood, S.D. (2001). **Behavior, reproduction, and immunity of crated pregnant gilts: effects of high dietary fiber and rearing environment.** *Journal of Animal Science* 79(6): 1466-1474.

Pajor, E.A.; Weary, D.M., Fraser, D., Kramer D.L. (1999). **Alternative housing for sows and litters. 1. Effects of sow-controlled housing on responses to weaning.** *Applied Animal Behaviour Science* 65(2):105-121.

Husbandry

Coleman, G.J.; Hemsworth, P.H.; Hay, M.; Cox, M. (2000). **Modifying stockperson attitudes and behaviour towards pigs at a large commercial farm.** *Applied Animal Behaviour Science* 66(1-2):11-20.

Hunter, E.J.; Jones, T.A.; Guise, H.J.; Penny, R.H.C.; Hoste, S. (2001). **The relationship between tail biting in pigs, docking procedure and other management practices.** *The Veterinary Journal* 161(1): 72-79.

Taylor, A.A.; Weary, D.M.; Lessard, M.; Braithwaite, L. (2001). **Behavioural responses of piglets to castration: the effect of piglet age.** *Applied Animal Behaviour Science* 73(1): 35-43.

Yu, I.T.; Lin, J.; Wu, J.F.; Yen, H.T.; Lee, S.L.; Yang, T.S. (2002). **Reevaluation of the necessity of iron injection to newborn piglets.** *Asian Australasian Journal of Animal Sciences* 15(1): 79-83.

Legislation

Bach Knudsen, K.E. (2001). **Development of antibiotic resistance and options to replace antimicrobials in animal diets.** *Proceedings of the Nutrition Society* 60(3): 291-299.

Pellini, T.; Morris, J. (2001). **A framework for assessing the impact of the IPPC directive on the performance of the pig industry.** *Journal of Environmental Management* 63(3): 325-333.

Wierup, M. (2001). **The Swedish experience of the 1986 year ban of antimicrobial**

growth promoters, with special reference to animal health, disease prevention, productivity, and usage of antimicrobials. *Microbial Drug Resistance* 7(2): 183-190.

Reproduction

Evans, A.C.; O' Doherty, J.V. (2001). **Endocrine changes and management factors affecting puberty in gilts.** *Livestock Production Science* 68(1): 1-12.

Singleton, W. L. (2001). **State of the art in artificial insemination of pigs in the United States.** *Theriogenology* 56(8):1305-1310.

Tummaruk, P.; Lundeheim, N.; Einarsson, S.; Dalin, A.M. (2001). **Repeat breeding and subsequent reproductive performance in Swedish Landrace and Swedish Yorkshire sows.** *Animal Reproduction Science* 67(3-4): 267-280.

Slaughter

Aaslyng, M.D.; Gade, P.B. (2001). **Low stress pre-slaughter handling: effect of lairage time on the meat quality of pork.** *Meat Science* 57(1): 87-92.

Chevillon, P. (2001). **Pig welfare during pre-slaughter and stunning.** In: *Proceedings of the 1st International Virtual Conference on Pork Quality: Welfare, Transport, Slaughter and Consumer, Concordia, Brazil, November 16- December 16, 2000*, EMBRAPA Suinos e Aves Documentos, 69, pp.178-202.
Available online at: http://www.cnpsa.embrapa.br/pork/indice.en.html

Faucitano, L. (2001). **Causes of skin damage to pig carcasses.** *Canadian Journal of Animal Science* 81(1): 39-45.

Grandin, T. (2001). **Solving return to sensibility problems after electrical stunning in commercial pork slaughter plants.** *Journal of the American Veterinary Medical Association* 219(5): 608-611.

Raj, A.B.M. (1999). **Behaviour of pigs exposed to mixtures of gases and the time required to stun and kill them: welfare implications.** *The Veterinary Record: Journal of the British Veterinary Association* 144(7):165-168.
Stoier, S.; Aaslyng, M.D.; Olsen, E.V.; Henckel, P. (2001). **The effect of stress during lairage and stunning on muscle metabolism and drip loss in Danish pork.** *Meat Science* 59(2): 127-131.

Swanenburg, M.; Urlings, H.A.P.; Keuzenkamp, D.A.; Snijders, J.M.A. (2001). **Salmonella in the lairage of pig slaughterhouses.** *Journal of Food Protection* 64(1): 12-16, ISSN: 0362-028X.

Transportation

Berry, R.J.; Lewis, N.J. (2001). **The effect of duration and temperature of simulated transport on the performance of early-weaned piglets.** *Canadian Journal of Animal Science* 81(2): 199-204.

Bradshaw, R.H.; Randall, J.M.; Forsling, M.L.; Rodway, R.; Goode, J.A.; Brown, S.N.; Broom, D.M.(1999). **Travel sickness and meat quality in pigs.** *Animal Welfare* 8(1):3-14.

Kettlewell, P.J.; Hoxey, R.P.; Hampson, C.J.; Green, N.R.; Veale, B.M.; Mitchell, M.A. (2001). **Design and operation of a prototype mechanical ventilation system for livestock transport vehicles.** *Journal of Agricultural Engineering Research* 79(4): 429-439.

Warriss, P.D. (1998). **Choosing appropriate space allowances for slaughter pigs transported by road: a review.** *The Veterinary Record: Journal of the British Veterinary Association* 142(17): 449-54.

Zanella, A.J.; Duran, O. (2001). **Pig welfare during loading and transportation: a North American perspective.** In: *Proceedings of the 1st International Virtual Conference on Pork Quality: Welfare, Transport, Slaughter and Consumer, Concordia, Brazil, November 16-December 16, 2000*, EMBRAPA Suinos e Aves Documentos, 69, p. 20-31.
Available online at: http://www.cnpsa.embrapa.br/pork/indice.en.html

Books and Proceedings

American Society of Agricultural Engineers (2000). ***Swine Housing: Proceedings of the First International Conference: October 9-11, 2000***, Des Moines, Iowa. American Society of Agricultural Engineers, St. Joseph, Michigan, ASAE publication 701P0001, 401 p.

Ault; D. (1999). ***Swine Source Book: Alternatives for Pork Producers***, Alternative Swine Production Systems Program, University of Minnesota Extension Service: St. Paul, Minn.

Cowart, R.P.; Casteel, S.W. (2001). ***An Outline of Swine Diseases: A Handbook***, 2nd ed., Iowa State University Press, Ames, Iowa, 191 p.

EMBRAPA (2001). ***Proceedings of the 1st International Virtual Conference on Pork Quality: Welfare, Transport, Slaughter and Consumer, November 16- December 16, 2000***, Concordia, Brazil, EMBRAPA Suinos e Aves, 251 p.
Available online at: http://www.cnpsa.embrapa.br/pork/indice.en.html

Harmon, J.(2001). ***Swine Breeding and Gestation Facilities Handbook*** MidWest Plan Service: Ames, Iowa, 103 p.

Straw, B.E. (1999). ***Diseases of Swine*** Iowa State University Press: Ames, Iowa, 8th ed., 1209 p.

University of Minnesota Extension Service (2001). ***Hogs Your Way: Choosing a Hog Production System in the Upper Midwest***, Minnesota Dept. of Agriculture: St. Paul, MN, 82 p.

Varley, M.A.; Wiseman, J. (2001). ***The Weaner Pig: Nutrition and Management*** CABI Publishing: Wallingford, UK; New York, 336 p.

Whittemoore, C.T. (1998). ***The Science and Practice of Pig Production*** Blackwell Science: Oxford; Malden, Mass, 2nd ed., 624 p.

Note: A resource guide "*Information Resources on Swine Housing, Care and Welfare*" contains these citations and hundreds more. It is available through the Animal Welfare Information Center at http://www.nal.usda.gov/awic/pubs/swinehousing/swinehousing2.htm. The guide contains a listing of training materials and useful web sites, as well as an extensive review of the literature.

Appendix G

Resource List of Farmers

Larry R. Miller
National Program Leader, Animal Sciences
USDA/CSREES

A list of field experts on swine housing and management systems is being developed to assist producers evaluate alternative production systems. The intent is to identify one or two producers from each hog producing state, and generic references for all states, where a farmer can go for advice regarding swine housing and retrofitting existing housing. In addition, generic sources would be available for each state, such as the Extension Service and American Farm Bureau Federation contacts. A disclaimer will be at the beginning of the list to indicate that farmers on the list have limited time and will only respond at their convenience, preferably through email but may also telephone. Telephone and other costs will be the responsibility of the person seeking advice. Each farmer contact should have as part of the information, a one or two sentence summary of their area of interest or expertise. Names included in this list does not imply endorsement by the USDA, and are provided strictly as examples for educational programs.

Appendix H

Summary of Evaluations

Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES

EVALUATION

Swine Housing and Well-Being Symposium
as part of the Kent Pork Academy
on the Eve of the World Pork Expo

June 5, 2002

Des Moines Marriot Hotel, Des Moines, Iowa

---

please circle your answer

1 *= POOR ----------**to**--------->>>> OUTSTANDING =* ***5***

Please take the time to fill out the evaluation. **Use the back of the form if necessary.**
WHAT WAS YOUR OPINION OF:

1.	**Overall Program?**	1	2	3	4	5
	Number			1	8	3
	Average			50/12 = 4.2		

Comments:
Very good---I learned a lot.
Excellent informative presentations by all speakers.
Need for this type of information is great. Would have been fair to invite an animal welfare organization to present their concerns instead of being subjected to speculation by speakers. They should have been represented on the program.

1.	**Facilities?**	1	2	3	4	5
	Number			1	4	6
	Average			49/11=		4.5

Comments:
Cold rooms

3.	**Food?**					
	Luncheon	1	2	3	4	5
	Number			1	5	5
	Average			48/11 = 4.4		

Coffee Breaks		1	2	3	45
Number	1		2	4	2
Average			33/9 =		3.7

Comments:
It would have been nice to have a larger break between the last two sessions

2. **SESSION ONE**
STOCKMANSHIP AND TRAINING

OVERALL SESSION (9:30 - 11:30)		1	2	3	45
Number		1	2	2	3
Average			31/8 =		3.9

E. **INTRODUCTION**

Stan Curtis	1	2	3	4	5
Number	1	2	1	4	3
Average			39/11 = 3.5		

F. **ETHICAL CONSIDERATIONS**

Ray Stricklin	1	2	3	4	5
Number		1	1	3	4
Average			37/9 =		4.1

G. **RESOURCE AVAILABILITY, MODELS AND TRAINING PROGRAMS**

Cindi Smith	1	2	3	4	5
Number		3	1	3	3
Average			36/10 = 3.6		

H. **OVERVIEW OF EVALUATION**
OF STOCKMANSHIP

Peter English		1	2	3	45
Number				7	3
Average			43/10 = 4.3		

Comments for the Session:

Very Informative.
The room was very cold.
Outdated combative attitude toward consumer concerns---no place for this anymore in agriculture of 21st century; it hasn't served producers well in the past and not now.

3. **SESSION TWO**
PRACTICAL SOW HOUSING SYSTEM DESIGN

OVERALL SESSION (1:00 - 3:00)		1	2	3	45
Number				5	7
Average			55/12 = 4.6		

A. **STALL SYSTEM**

John McGlone		1	2	3	45
Number			1	4	8
Average			59/13 = 4.5		

B. **PEN SYSTEM**

Ed Pajor	1	2	3	4	5
Number			2	4	7
Average			57/13 = 4.4		

C. **EXTENSIVE/PASTURE SYSTEM**

Mark Honeyman	1	2	3	4	5
Number		1	2	3	7
Average			55/13 = 4.2		

D. **LARGE GROUP SYSTEM**

Rebecca Morrison	1	2	3	4	5
Number			1	4	8
Average			59/13 = 4.5		

Comments for the Session:
Good objective presentations.
Good historical overview---somewhat cynical.
Question space needs in small pens systems for social recognition not adequately addressed.

3. **SESSION THREE**
CONSUMER PERSPECTIVES

OVERALL SESSION (3:00 - 5:00)	1	2	3	45
Number		1	1	5
Average		32/7 =		4.6

A. **CONSUMER ATTITUDES & LEGISLATION**

Terri Dort	1	2	3	4	5
Number		1		2	5
Average			35/8 =		4.4

B. **OVERVIEW OF NICHE MARKETS...PROCESS VERIFIED**

James Riva	1	2	3	4	5
Number			1	3	4
Average			35/8 =		4.4

C. **IMPACT OF INTERNATIONAL MARKETS**

Mark Ritchie	1	2	3	4	5
Number				4	5
Average			41/9 =		4.6

Comments for the Session:
Good speakers.
A lot of very small print (Dort)

Please provide us with your suggestions for TOPICS for training, retraining and educational programs (for example, videos, brochures, manuals, etc.). Also, what authors or universities would you like to see as part of the project?

Short printouts of the outlines for the talks.
Invite an actual animal welfare group to speak for itself on concerns.

If you choose to not complete the evaluation at the meeting, please return it to:
Richard D. Reynnells, NPL-Animal Production Systems, USDA/CSREES/PAS
800 9th Street SW, Room, 3130 Waterfront Centre
Washington, DC 20250-2220
T#: 202.401.5352
F#: 202.401.6156; 1706
e-mail: rreynnells@reeusda.gov