

HOG PRODUCTION ALTERNATIVES

LIVESTOCK PRODUCTION GUIDE

Abstract: This publication addresses the two different directions in which hog production is currently moving: 1) contracting with large-scale vertical integrators (producers/packers/processors linked from farrowing to packing to the retail counter), and 2) sustainable production of a smaller number of hogs sold through alternative markets. The aspects of sustainable hog production discussed in this publication include alternative niche marketing, breed selection, alternative feeds, waste management, odor control, health concerns, and humane treatment. Basic production practices are not covered in this publication, but they are readily available in many books and through state Cooperative Extension Services.

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Introduction

Today's independent hog producers have to choose between production systems that lead in different directions. One is toward confinement feeding of hogs and contracting with vertical integrators, where the motto is "get big or get out." The other direction is toward more sustainable production of a smaller number of hogs and marketing them, through various methods, as part of a whole-farm operation.

Kelly Klober, author of *Storey's Guide to Raising Pigs* and himself a farmer and value-added marketer, notes the large difference between the two types of production.

Scaled-down agribiz will not work on the small farm. When returns are figured in pennies per unit of production, whether that production is in pounds or bushels, they will not produce a sustainable and becoming

Related ATTRA Publications

- Pork: Marketing Alternatives
- Considerations in Organic Hog Production
- Hooped Shelters for Hogs
- An Organic & Sustainable Practices Workbook and Resource Guide for Livestock Systems
- Profitable Pork: Strategies for Hog Producers (SAN Publication)
- Holistic Management—A Whole-Farm Decision Making Framework
- Manures for Organic Crop Production
- Nutrient Cycling in Pastures
- Protecting Water Quality on Organic Farms
- Protecting Riparian Areas: Farmland Management Strategies
- Sustainable Soil Management

return to the small producer. The small farmer will have to work from within those perimeter fences, creating a farming mix geared not on volume, but premium product production. To succeed with growing less, one must have to sell it for more, and that means direct marketing, exotic production, value added marketing, or just about anything but the wholesale marketing of farm commodities by the truckload or pen-full (Klober, 2003).

Klober stresses that producers should not identify themselves as hog finishers or grain specialists, but should view their farm enterprises as being “like fine watches; the good ones are small, well put together, and everything works together in a precise fashion.” He goes on to say:

With careful planning, even the smallest farm can support a number of diverse enterprises. As long as they do not directly compete for such limited small farm assets as space, available labor, facilities, or capital, any number of ventures can be fitted together to form a distinct small farm. If they are keeping with the producer’s skill and desires, and good local market outlets exist for their outputs, any number of enterprises can be considered for the small farm mix. The answer to what is a good enterprise mix is as varied as the descriptions of individual snowflakes. They can be stacked on the small farm to create a structured cash flow and to fully utilize the labor available (Klober, 2003).

Understanding Pricing, Concentration, and Vertical Integration

Some large, independent hog operations, seeing the wide price fluctuations for finished hogs in the past few years, have started to move into contracting. As Jane Feagans, of Oasis Farms in Oakford, Illinois, says, “Our strategy right now is to survive. I don’t see the pork business as a particularly good business to be in right now.... We went into the contract arrangements as a risk-management tool. But it’s like insurance. Risk management comes at a cost, because it limits the upside of the market.” (Hillyer and Phillips, 2002) Producers who want to raise a large number of hogs will most likely need to contract with someone. As Chris Hart, Purdue University Extension marketing specialist explains, “The financial risks of not being aligned in some way in the pork marketing chain are just too extreme. Many of these independents are saying enough is enough.” (Hillyer and Phillips, 2002)

However, before producers decide to sign a contract to produce hogs for a vertical integrator, it is best to understand all aspects of the contract. Farmers’ Legal Action Group, Inc. (FLAG), located in Minnesota (**Further Resources:** Web sites), has several publications and articles on livestock production contracts. Some key questions to be addressed in contracts are listed in FLAG’s publication *Livestock Production Contracts: Risks for Family Farmers*:

- How is the grower’s compensation calculated?
- What are the grower’s expenses under the contract?
- Who has management control under the contract?
- Does the grower carry the responsibility for compliance with environmental and other regulations?
- Can the Integrator require the Grower to replace equipment in barns?
- What happens if the production contract is terminated by the Integrator? (Moeller, 2003)

In addition, many state departments of agriculture and Cooperative Extension Services have publications available to help producers better understand contracts. It is very important for all parties to READ AND UNDERSTAND EVERYTHING BEFORE THEY SIGN.

With vertical integration, the mainstream pork industry has consolidated in a way that many people consider unsustainable. The number of hog producers is rapidly decreasing every year. Between 1971 and 1992, the number of hog farms fell from 869,000 to 256,390 (Smith, 1998b), and between 1997 and 2002 the number of hog farms continued decreasing by about 39%, from 125,000 to just over 79,000. (Martin, 2004) While the number of hog producers is decreasing, the large operations are expanding or increasing in actual numbers. In 2000, hog producers marketing fewer than 1000 hogs per year – 68.2% of hog producers – marketed only 1.8% of all hogs produced, while hog producers marketing more than 50,000 head per year – two-tenths of one percent (.002) of hog producers – marketed 51.3% of hogs produced. (Lawrence and Grimes, 2000)

Large-scale vertical integration (producer/packer/processors linked from farrowing to packing to the retail counter) has put pork production in the same predicament as poultry production. Vertical integrators are direct-contracting more hogs today than in the past. According to a National Pork Board Analysis of USDA price data, 35.8% of all hogs were sold on the open market (negotiated price) in 1999, but that number fell to 11.6% in January 2004. (Anon., 2004a)

A large animal confinement operation in Wisconsin.

Photo by Bob Nichols, USDA NRCS



This shrinking of the open market is a problem for hog farmers. While some small cooperatives and processors, as well as small-scale direct hog marketers, are technically vertical integrators, they lack the concentration of power to affect the market. According to Fred Kirschenmann, director of the Leopold Center for Sustainable Agriculture in Ames, Iowa, the mid-size farms are finding it more difficult to find competitive markets for their hogs. The mid-size farms are “too big to sell directly to consumers and too small to interest corporate food producers, who often prefer dealing with a few large farms rather than with dozens of smaller farms.” (Martin, 2004)

What this reduced open-market pricing really means is that 11.6% of hogs – those sold on the open market – establish the price for many of the vertically-integrated hogs as well, because integrators tie their prices to the open market price. However, in the written testimony of the Organization for Competitive Markets (OCM) to the U.S. Senate Judiciary Subcommittee on Antitrust, Competitive Policy, and Consumer Rights, Micheal Stumo, OCM General Council, states:

The hog industry is approximately 87% vertical at the producer/packer interface. Vertical integration takes the form of packer owned hogs, and various types of contracted hogs. Ninety percent of the hog contracts pay the producer through a formula price based upon the open market price reported each day by the USDA’s Market News Service. All the pork packers have been aggressively going vertical and have stated as much.

In theory, the 13% of the non-vertical hogs set the price for the open market price reports. In practice, three to five percent of the hogs traded set the price. These are the hogs actually negotiated between packers and producers in the Iowa-Southern Minnesota market, the price setting market. The other non-vertical hogs either are committed to a packer through an oral formula arrangement, or are merely forced to take the “Posted Price” that the packer says it will pay based on the Iowa-Southern Minnesota market....

Packers always have an incentive to push hog prices down to save money. But when 90% of the contract hogs are pegged to the open market, the marginal cost of bidding for open market hogs is tremendously magnified.... In today’s concentrated packer environment, we have dominant firms interacting in a very thin market. This scenario exponentially increases their ability to drive prices lower as compared to a situation where

the dominant firm bought all their hogs from a high-volume open market. It is no surprise that the past 20 years have seen a steady downward trend in hog prices as packers consolidated horizontally and vertically even while the wholesale meat prices justify far more for live hogs (Stumo, 2003).

The Missouri Rural Crisis Center in Columbia, Missouri, has found that since 1994 more than 70% of Missouri hog farmers (7,400 out of 10,500) have left hog production. The Center adds that the Missouri hog farmer's share of the pork retail dollar has gone from 46¢ in 1986 to 30¢ in 2003, while the consumer prices of pork have increased more than 40%. (Oates and Perry, 2003)

Hog Prices Received by Missouri Farmers	
(average annual prices per hundredweight)	
1985-1987	\$49.34
1988-1990	\$48.03
1991-1993	\$46.63
1994-1996	\$46.27
1997-1999	\$41.04
2000-2002	\$37.60

**** If you adjust hog prices for inflation, independent pork producers are getting paid about 51% less in real dollars for their hogs than what they received in 1985.**

Missouri Hog Prices (Oates and Perry, 2003)

The economic analyses of farm records by various state universities show that the size of the hog operation is not as important to making a profit as how well the hog operation is managed. (Ikerd, 2001) In a presentation to the Biodynamic Farming Conference, Fred Kirschenmann of the Leopold Center stated, "Studies in Iowa have shown that the most efficiencies are gained on farms that market 800 to 1000 pigs annually." (Maulsby, 2003a)

But vertical integrators do not want independent producers; they want producers tied to them with contracts that offer the producers minimal rewards for their labor. Vertical integrators have their own operations in every phase of pork production. From the farrowing-to-finishing factory farm to the packinghouse to the fresh and frozen meat cases, vertical integrators need no help from anyone.

University of Missouri rural sociologist William Heffernan has found that the profits from an independent producer have a multiplier effect of three to four in a local community, but profits from a corporate or private company-owned farm leave the local community almost immediately. (DiGiacomo, 1995) Another study in Minnesota found that for livestock-intensive operations, the percentage spent locally (within 20 miles of the farm) declined dramatically with the growth of the operation. So, rural communities and even states need to consider what is more important to them—having a large number of hogs produced or having a large number of hog producers. (Thompson, 1997)

Sustainable Systems: The Other Option

There are many things to consider in sustainable hog production and marketing. This publication focuses on only some of these issues. Basic hog production information—housing, breeding, farrowing, care of baby pigs, weaning, etc.—is not covered in this publication, but it is available from state Extension Service offices and in books available at libraries, bookstores, and on-line stores (see **Further Resources: Books**). Other aspects of sustainable production are discussed in the ATTRA publications mentioned throughout this publication and in the **Further Resources** section. The main issues addressed in this publication are:

- Niche marketing
- Breed selection
- Alternative feeds, including forages and alternative energy and protein sources
- Waste management
- Odor control
- Health concerns for hogs and producers
- Humane treatment

In the past, hogs were a dependable source of cash income for diversified family farms, sometimes called the "mortgage lifter," and contemporary sustainable hog production should be an integral part of the whole farm. Whole-farm planning or holistic management is a decision-making management system that can assist in establishing a long-term goal, help to create a detailed financial plan, a biological plan for the landscape, and a

monitoring program to assess progress toward the planned goal. For additional information about holistic management, see ATTRA's *Holistic Management – A Whole-Farm Decision Making Framework*.

On a diverse, integrated farm, livestock recycle nutrients in manure that is used to grow the livestock feed, forages, legumes, and food crops typical of healthy, diversified cropping systems, and hogs will readily eat weather-damaged crops, crop residues, alternative grains, and forages.

Dan and Colin Wilson, brothers farming near Paullina, Iowa, raise hogs in hoop houses, in a greenhouse used for winter farrowing, and on pasture. They decided that confinement pens didn't fit their philosophy of animal welfare.

Budgeting

Budgets help evaluate the probable costs and income of an enterprise. To do this, however, budgets need to include all projected costs and receipts, even if they are difficult to estimate. Sample budgets can help you better understand what needs to be included in your budget, but yours will be unique for your operation, because the costs and receipts are different for every farm enterprise. Costs can also change, sometimes quickly, as can market opportunities, making the final budget quite different from what was planned. Many state Extension Services have budget information available for various enterprises. Several sample budgets are available in the Pennsylvania State University publications *Swine Production and Enterprise Budget Analysis* at

<http://agalternatives.aers.psu.edu/livestock/swine/swine.pdf>

and

http://agalternatives.aers.psu.edu/farm-management/enterprise/enterprise_budget_analysis.pdf.

The Iowa State University publication *Cost of Organic Pork Production* also provides information that should be helpful in designing your budgets. It is available at www.ipic.iastate.edu/reports/01swinereports/asl-1784B.pdf.

Colin Wilson explains:

"We like working with livestock, and didn't want to get into a high-volume, low margin business that turns animals into production units. Our system provides a nicer environment for the hogs than a confinement barn, where pigs just eat, drink, sleep, and get bored. We've learned to work with our animals rather than conform them to our system.... We are trying to run an operation that is good for people and for livestock. We want to create a farming operation that can be passed on to the next generation" (Maulsby, 2003b).

Alternative Niche Marketing

As mentioned earlier in *Understanding Pricing, Concentration, and Vertical Integration*, one reason small and mid-size hog farmers are considering niche marketing is the lack of open markets and the concentration of hogs under contract. Alternative marketing is not an easy task, but farmers are being left with fewer options.

Speaking at a "Pig Power" meeting in Minnesota, Mark Honeyman, Iowa State University animal scientist, commented that hog farmers are finding niche markets opening up for them.

As the market gets dominated by huge operations, it creates more niche markets on the back side. I call it the Wal-Mart effect.... Of course, if the niche gets big enough, then the big guys grab it. But one thing the big guys can't replicate is the story that goes with the food. People want to know what they're eating. They want to know where it comes from. Farmers like you can provide that story (Anon., 2003a).

Chuck Talbott, Adjunct Assistant Professor at North Carolina A&T State University, discussing his small-scale hog producers project states:

Small producers cannot and should not compete on the same level with corporate farms, but they may be able to produce a unique product that appeals to an upscale market. Therefore, emphasis should be placed on marketing the potential strengths and distinguishing features of the small farmer's product, such as taste differences due to diet and genetics, antibiotic-free status, and free-range, environmental, and animal welfare issues... Many people refer to pasture-raised pigs as "old timey" farming. I would rather call it profitable farming, especially if we can produce a unique product that stands out from the other nine million exceptionally lean hogs marketed annually in North Carolina (Talbott, 2003).

The 2001 report “Alternative Production Systems: Influence on Pig Growth Pork Quality,” from the Pork Industry Institute at Texas Tech University, summarizes a study on consumer preferences for pork from conventional and alternative production systems:

A majority of consumers say they are willing to pay more for products that are produced as “sustainable,” “natural” or with other assurances without mentioning any improvement in pork eating quality. We were surprised at first to see that consumers now put a value on some social features of the production system quite apart from the pork’s appearance or sensory qualities. A niche market is available for pork produced with certain socially-acceptable assurances even if no real difference in pork sensory qualities can be consistently demonstrated through objective research (Gentry et al., 2001).

For information on direct marketing, cooperatives, and niche markets, as well as legal considerations, labels, trademarks, processing regulations, and obstacles, see ATTRA’s *Pork: Marketing Alternatives*.

Breed Selection Criteria

Selection of breeding stock for a sustainable hog operation is very important. All breeds of pigs have certain traits that can be advantageous to sustainable hog production. So before purchasing breeding stock, try to find a seedstock producer raising pigs in conditions similar to those in your operation. Research at Texas A&M indicates that range-ability in sows (the ability to nest and farrow on their own) is a highly heritable trait and could be genetically selected for pasture operations. (Nation, 1988b)

The most common breeds of pigs in the United States are Yorkshire, Landrace, Hampshire, and Duroc. These breeds have been bred for characteristics that make them adaptable to confinement operations and the particular stresses and management conditions found in these systems. Pasture-raised hogs face different stresses and require different traits, such as hardiness in extreme climates, parasite resistance, foraging ability, and good mothering attributes—characteristics not developed for confinement hog production. (Kelsey, 2003)

Some traditional and heritage swine breeds still retain these characteristics. These breeds



Photo by Diane Halverson/AWI

Pasture-raised hogs require traits such as hardiness in extreme climates, parasite resistance, foraging ability, and good mothering attributes.

include the Berkshire, Chester White, Spotted, Tamworth, Poland China, Large Black, Hereford, and Gloucester Old Spot Pig. For information about breeding stock availability of these minor and heritage breeds, contact the American Livestock Breeds Conservancy at 919-542-5704, www.albc-usa.org/; or the New England Heritage Breeds Conservancy at 413-443-836, www.nehbc.org/. General descriptions of the many hog breeds can be found at www.ansi.okstate.edu/breeds/swine.

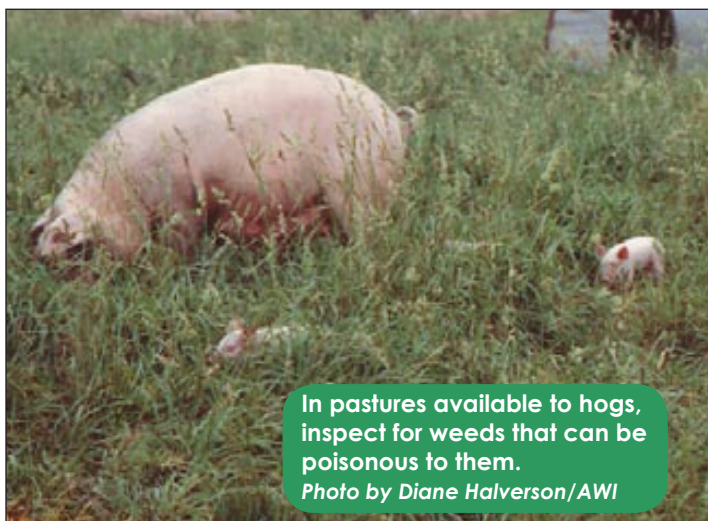
In the enclosed “The pastured pig” articles from *Graze*, Jim Van Der Pol talks about his ideas of what makes a perfect pasture sow. He discusses the selection for genetic traits in gilts and boars, various culling requirements for his sows and replacement gilts, and changing the sows’ behavior through genetics. The articles also describe his pasture gestation and farrowing operations. (Enclosures are not available on-line but are available by contacting ATTRA.)

Producers also need to consider what breeds their markets prefer. Organic Valley, the brand name of CROPP (Coulee Region Organic Produce Pool) Cooperative at LaFarge, Wisconsin, says that they have identified a market for a Berkshire cross-bred with a Chester White sow. So CROPP only accepts Berkshire-sired certified organic hogs from Chester White sows for their products. For information about the Organic Valley pork program, contact Allen Moody, Feed and Pork Pool Coordinator, at 888-444-6455, extension 240; or 608-625-2602; or e-mail allenm@organicvalley.com.

Niman Ranch Pork Company, the nation's leading marketer of natural pork, doesn't specify what type of hog their producers need to raise. Niman wants producers to follow the Animal Welfare Institute's Humane On-Farm Husbandry Criteria for Pigs standards – available at www.awionline.org/farm/standards/pigs.htm – and produce hogs that are good tasting and have enough back fat to produce a marbled meat. Paul Willis, manager of Niman Ranch Pork Company, says, "We're not interested in a super lean pig. Our animals live outdoors, and they need that body fat to handle the heat in the summer and the cold in the winter." (Anon., 2003b) Niman Ranch Pork Company is working with farmers in the Midwest and Southeast. For information about Niman Ranch Pork Company, call 641-998-2683 or e-mail philk@frontiernet.net.

Alternative Feeds

Conventional swine rations consist primarily of corn and soybean meal – corn for energy and soybean meal for protein. However, diversified farmers may have other types of grains, crop residues, and forages that lack a ready market or are considered waste products. Pigs – being versatile omnivores – can eat a wide range of feeds, such as pasture grasses and other fibrous materials, as well as alternative energy and protein sources. The pig's ability to digest fibrous materials increases as it matures. Since they do not have rumens, pigs digest fiber primarily in their large intestine through fermentation. (Johnson et al., 2003) Jim Van Der Pol – who grazes and direct-markets pork, chicken, and beef in Minnesota – says in his "The pastured pig" series in *Graze* magazine:



Despite being single-stomached animals that often need some grain, hogs are wonderful pasture animals. Digestively, they are durable and flexible. They do not bloat, founder on grain, or ingest hardware. They eat weeds readily, even prefer them. If conditions get tough for the sward [grass-covered ground], they can be removed and switched immediately to a grain ration with no worries about digestive upset (Van Der Pol, 2002).

A three-year study by Auburn University's swine nutritionist Terry Prince proved that as much as two-thirds of a sow's feed needs can be satisfied by a well-managed pasture program, if vitamin and mineral supplements are provided. (Anon., 1987)

A 2003 paper presented at the Third National Symposium on Alternative Feeds for Livestock and Poultry held at Kansas City, Missouri states:

Fibrous feeds traditionally have not been used for nonruminants due to their documented depression of diet digestibility in pigs and poultry. However, some types of fiber and fiber sources do not exert such negative effects on nutritional digestibility in older growing pigs and sows. Dietary fiber can have a positive effect on gut health, welfare, and reproductive performance of pigs. Hence, nutritionists are attempting to gain a more thorough understanding of dietary fiber in swine diets (Johnson et al., 2003).

Pasture, Hogging Off, and Fibrous By-products

Colin Wilson, who farms with his father and brother Dan at Paullina, Iowa, has worked the bugs out of their pasture-farrowing system by trial and error the past 20 years. Wilson stresses that timeliness is critical, and that many jobs require two or even three people. They use a three-year rotation in three adjacent 18-acre fields. The rotation begins with corn, followed the next spring with a drilled mix of 3.5 bushels of oats, 10 pounds of alfalfa, and 3 pounds of orchardgrass. Oats are harvested, leaving a thick pasture cover for the hogs the following year. Colin explained that it took a long time to develop a successful pasture mix. He found that pastures with too little alfalfa were not as palatable to hogs, and that pastures with too much alfalfa did not produce a good orchardgrass stand and tended to be muddy in wet years.

Fencing the pasture is also important for the Wilsons' operation. As soon as possible in the spring, they string a two-wire (14-gauge) electric fence around the perimeter of the pasture; one wire is 4 to 8 inches high, and the other wire is 18 to 24 inches high. Each wire has its own charger, so there is always a hot wire if one charger malfunctions. This pasture is then divided into 150 by 300 foot pens, also using double wires. Wilson says it is not a good idea to charge the gates. If the gate is charged, the hogs learn not to pass that point, and then the producer will not be able to drive the hogs through the gate when it is open.(Cramer, 1987)

In addition to legumes and grass pastures, non-legume brassicas – turnips, rape, kale, fodder beets, and mangels – are high in protein, highly digestible, and make an excellent pig pasture.

Another option is the practice of having pigs self-harvest the grain, otherwise known as “hogging off” the crop. Some of the benefits of hogging off are that harvesting costs are eliminated, crop residues and manure are left on the land, and parasite and disease problems may be reduced. Many different crops can be used with this practice, as long as there are also legumes or brassicas available. Some examples of grains that can be self-harvested by hogs are wheat, rye, oats, dent corn, Grohoma sorghum, Spanish peanuts, and popcorn.(Nation, 1989) Such direct harvesting can sometimes turn a profit from even a low-yielding grain crop.(Nation, 1988a)

In pastures available to hogs, inspect for weeds that can be poisonous to them, including pig-weed, Jimson weed, two-leaf cocklebur, young lambsquarters, and nightshades. A couple of Web sites providing information and pictures of many poisonous plants are www.vth.colostate.edu/poisonous_plants/report/search.cfm and www.spokanecounty.org/weedboard/pdf/2004ToxicPlants.pdf. Your veterinarian or county Extension agent should also be able to help with weed identification. The ATTRA publication *Considerations in Organic Hog Production* has additional information on using pastures for hog production.

If pastures are not available, feeding feedstuffs high in fiber is another possibility. Honeyman notes that studies show that fibrous feeds and protein by-products can make up as much as



Corn and oats in northeast Iowa. Small grains such as oats can be used to reduce the amount of corn in swine rations.
Photo by Lynn Betts, USDA NRCS

90% of a gestating sow's rations, because of the sow's lower energy needs and large digestive tract. Acceptable feeds include alfalfa hay (need to feed good quality hay; moldy alfalfa can cause abortions), haylage (not more than 20% of a sow's ration), alfalfa and orchardgrass hay, grass silage, sunflower and soybean hulls, corn-cob meal, and beet pulp. Honeyman says even growing – and finishing – pig rations can be 10 to 30% forages, if energy levels are maintained.(Cramer, 1990b)

Alternative Energy Sources

Small grains can be used to reduce the amount of corn in swine rations. Wheat, triticale, barley, and hullless barley can totally replace corn, but need to be more coarsely processed than corn to reduce dust and flouring effects – continuous feeding of finely ground grains can cause ulcers in pigs' gastrointestinal tract. The differing nutritional values of small grains means that the ration will have to be formulated to meet the hogs' energy and protein needs – especially for the amino acids lysine, tryptophan, threonine, and methionine, and the minerals calcium and phosphorus. Light and/or weedy small grains that would be discounted at the elevator can be fed to pigs with no difference in their performance. Barley and hullless barley need to be stored after harvest before feeding them to swine. In the publication *Barley Production in Alberta: Harvesting* on the Alberta Agriculture, Food and Rural

Development Web site, it states:

Newly harvested barley, whether dry, or high moisture, should always be stored about four to six weeks before being fed to any class of livestock. This storage period is often called a sweat period. Serious losses in cattle, pigs and poultry have been attributed to feeding newly harvested grain. There is some evidence that certain compounds in the newly harvested grain may be toxic to livestock. In storage, such compounds undergo chemical changes that make them non-toxic. Processing newly harvested barley for feed apparently does not eliminate the problem of toxicity—a rest or sweat period is necessary (Anon., 2002a).

The following publications offer further information about feeding small grains to hogs.

- *Feeding Wheat to Hogs*
<http://osuextra.okstate.edu/pdfs/F-3504web.pdf>
- *Triticale Performs in Pig Feeds*
[www1.agric.gov.ab.ca/\\$department/newslett.nsf/all/bb501?OpenDocument](http://www1.agric.gov.ab.ca/$department/newslett.nsf/all/bb501?OpenDocument)
- *Feeding Barley to Swine & Poultry*
www.ext.nodak.edu/extpubs/ansci/swine/eb73w.htm

Some other small grains to consider are oats, rye, flax, hullless or naked oats, and high-fat oats. All of these small grains can be used in varying amounts in hog rations, according to their unique characteristics and nutritional values. Newer varieties of rye are less susceptible to ergot contamination—a fungal infection that can cause abortions—than older varieties and can be used as up to 30% of the energy source. (Racz and Campbell, 1996)

Oats' feed value is only about 80% that of corn; it has high fiber content and can be used as 20% or more of the energy source. A 2002 study by Mark Honeyman, Sebblin Sullivan, and Wayne Roush at Iowa State University discusses changes in performance of market hogs in deep-bedded hooped barns with the addition of 20% and 40% oats to the diet. The study didn't find any reduction in daily gain, feed intake, feed efficiency, or other crucial factors for either level of oats in the ration. The study is available at www.extension.iastate.edu/ipic/reports/02swinereports/asl-1819.pdf.

Up to 5% flax can be added to hog rations to increase the omega-3 fatty acids in the pork and improve sow performance. In 1995, South Dakota State University researchers tested feeding flax in a corn-soybean meal ration during the final 25 days of finishing. The results showed that the omega-3 fatty acids had increased. However, a consumer taste panel could detect differences in the bacon in rations that contained more than 5% flax. University of Manitoba researchers replaced some of the soybean meal and tallow and added 5% flax to gestation and lactation sow rations. The study showed that the sows fed flax delivered more piglets at farrowing, that the piglets had heavier weaning rates, and that the sows lost less weight during lactation and rebred sooner. (Murphy, 2003)

Hullless or naked oats and high-fat oats are newer varieties with improved nutritional characteristics that make them good alternative feeds. Hullless oats can be used as the total energy source in swine rations; however, because of the limited cropping history and marketing opportunities, their yield potential and economic value are unknown in many areas and first should be tested in small quantities.

Several other alternative grains that can be used in hog rations are cull, unpopped popcorn and buckwheat. Popcorn has nearly the same nutritional value as yellow corn and can replace corn on an equal weight basis. If you happen to be in an area where cull popcorn is available, it can sometimes be less costly than corn. (Anon., 1990b)

Buckwheat can be used to replace about 25 to 50% of corn. Buckwheat has only 80% of the energy value of corn but is higher in fiber and can be planted later in the season as a substitute crop in emergencies. Buckwheat should not be used for nursery rations or for lactating sows, because of their higher energy requirements. Buckwheat should be limited to 25% replacement of corn for white pigs housed outside. Buckwheat contains a photosensitizing agent called fagopyrim that causes rashes on pigs' skin and intense itching when the pigs are exposed to sunlight. This condition is called fagopyrism or buckwheat poisoning. (Anon., 1993)

A 2004 paper by Lee J. Johnson and Rebecca Morrison at the Alternative Swine Program of

the West Central Research and Outreach Center in Morris, Minnesota, reported trying alternative ingredients – barley, oats, buckwheat, field peas, and expelled soybean meal – in the ration to help reduce the additional carcass fat in pigs raised in hoop shelters rather than confinement houses. The study shows that feeding a low-energy diet based on small grains slows the growth rate and marginally improves carcass leanness in hoop-sheltered hogs, but doesn't affect the eating quality of the pork. The study is available at <http://wcroc.coafes.umn.edu/Swine/xp0246%20final%20rpt%20no%20economics.pdf>.

Alternative Protein Sources

Soybean meal can be replaced or reduced by the use of alternative protein sources. Canola meal, sunflower meal, cottonseed meal, linseed meal, or peanut meal may be available locally, depending on your location. These alternative meals can substitute for soybean meal, but they do have different amino acid ratios and mineral levels that need to be taken into consideration when balancing the rations. Cottonseed meal contains various levels of free gossypol – a compound found in cottonseed that is toxic to hogs. The 2003 Oklahoma Cooperative Extension publication *Gossypol Toxicity in Livestock*, by Sandra Morgan, provides specific information on gossypol toxicity levels for swine and other livestock. You can find this publication at <http://osuxtra.okstate.edu/pdfs/F-9116web.pdf>.

Roasting or extruding whole soybeans is another option; the heat breaks down the trypsin inhibitors found in raw soybeans. Processed, green, frost-damaged beans that would be discounted at the elevator can be used in the ration without any problems. (Jeaurond et al., 2003) The higher oil content of whole, processed soybeans produces a faster rate of gain than soybean meal. The cost of processing equipment and the fact that the extruded and roasted products don't store well are considerations that the producer has to take into account. Additional information on feeding soybeans to hogs is available at www.gov.on.ca/OMAFRA/english/livestock/swine/facts/info_green_soybeans_pigs.htm.

Sweet white lupines can make up to about 10% of the ration for most finishing and gestating animals. Lupines' protein content can vary from 25 to 38%, and they have about half the lysine

of soybeans. Lupines should be supplemented with iron at 400 parts/million (Anon., 1989) and methionine. (Golz and Aakre, 1993)

Field peas are another option. The South Dakota State University publication *Using South Dakota Grown Field Peas in Swine Diets* states:

Field peas are a good source of energy and amino acids for swine. However, variety differences exist, and producers must know the nutrient content of the peas they are working with to properly formulate them into swine diets. Field peas are a good source of lysine, but the concentrations of methionine, tryptophan, and threonine must be watched closely. While peas can contain anti-nutritional factors, they are usually in such low concentration that field peas can be fed raw (Thaler and Stein, 2003).

The publication is available at <http://agbiopubs.sdstate.edu/articles/ExEx2041.pdf> or by calling the Agriculture & Biological Science (ABS) Bulletin Room at 605-688-5628 or 800-301-9293.

Mung beans can be used as an alternative to soybean meal. Mung beans contain from 24 to 30% crude protein, but about equivalent lysine levels as a percentage of protein. Mung beans contain a trypsin inhibitor just like raw soybeans. This limits mung bean use in swine rations to about 10% for growing pigs, 15% for finishing pigs, and 10% for sow rations, unless the mung beans are heat-treated like whole soybeans. (Luce and Maxwell, 1996)

The Oklahoma State University Extension publication *Using Mung Beans in Swine Diets* is available by calling the University Mailing Services at 405-744-5385.

Distillers Dried Grains with Solubles (DDGS) is a co-product of the ethanol industry. During ethanol production, a bushel of corn produces about 2.6 gallons of ethanol and about 17 pounds of a wet, spent mash that is processed and blended into DDGS. Distillers Dried Grains with Solubles can vary greatly in nutrient concentrations, with crude protein ranging from about 23 to 29%, and highly variable lysine levels. One major concern in using DDGS is mycotoxins from molds on the corn. Mycotoxins are not destroyed in the fermenting process. In fact, they are concentrated by threefold in the DDGS if there are molds on the corn fermented into ethanol. The 2002 South

Dakota State University Extension publication *Use of Distillers Dried Grains with Solubles (DDGS) in Swine Diets*, by Bob Thaler, provides specific information on using DDGS in swine rations. You can find the publication at <http://agbio-pubs.sdstate.edu/articles/ExEx2035.pdf> or by calling the ABS Bulletin Room at 605-688-5628 or 800-301-9293.

Balancing Rations

It is important to remember that any changes to your rations, including adding alternative feedstuffs, may change the growth rate of the hogs. It is best to determine the feed-cost savings and any changes in market patterns before making any changes to your feeding program. Always assess any changes to your rations so that all the pigs' nutritional requirements are being met at every stage of growth. Alternative feeds have varying food values, so it is important to know the nutritional contents of each feed ingredient. Nutrient testing of alternative feed ingredients will eliminate any guess work.

Producers can formulate their own rations or check with a swine nutritionist to help formulate a balanced ration for different swine weights and groups. *Feedstuff Magazine Reference Yearly Issue* contains feeding values and analysis tables for many by-products and unusual feeds (see **Further Resources: Magazines**). The 1998 National Research Council's (NRC) *Nutrient Requirement of Swine: 10th Revised Edition* discusses the nutrient needs of swine, including requirements of amino acids and other nutrients (see **Further Resources: Books**). The University of Minnesota publication *Designing Feeding Programs for Natural and Organic Pork Production* provides nutritional comparisons and some rations using alternative feedstuffs (see **Further Resources: Publications**). Please see the Appendix for two tables showing energy and protein composition of various feeds, suggested inclusion rates, and factors affecting inclusion.

Food Wastes

Food wastes are another alternative food for swine. Pigs are excellent scavengers of what we would consider garbage. Food wastes are often available from restaurants, schools, grocery stores, and institutions, and include leftovers, bakery wastes, out-of-date food items, fruits, and vegetables. It is more difficult to balance the diet of hogs when feeding food wastes. Unbalanced

diets can compromise the growth of the pigs and may cause them to produce low-quality meat with off-odors or flavors. Also, the producer may want to consider the marketing of garbage-fed hogs: if you are selling directly to consumers, this may not be a practice to advertise.

Many states do not allow any food wastes to be used to feed swine. Make sure that your state allows food-waste or swill feeding. Check with your state's Health Department or Department of Agriculture for restrictions and regulations. A garbage feeder's license is required in states that do allow feeding food wastes.

If your state does allow swill feeding, remember that according to the 1980 Swine Health Protection Act, all food waste containing any meat product has to be heat treated to reduce the risk of diseases and pathogens being passed to the pigs. Some of these diseases are hog cholera, foot and mouth disease, African swine fever, swine vesicular disease, Trichinella, and many other pathogens. The Act does not require cooking of non-meat products, such as bakery waste or fruit and vegetable wastes. The 2003 University of New Jersey — Rutgers Extension publication *Feeding Food Wastes to Swine*, by Michael Westendorf and R. O. Meyer, provides specific information on heat treating food wastes and other concerns in using food wastes in swine rations. You can find the publication at www.rce.rutgers.edu/pubs/pdfs/fs016.pdf or by calling the Publications Distribution Center at 732-932-9762.

Waste Management

The goal of sustainable waste management is to enhance on-farm nutrient cycling and to protect the environment from pollutants. Hog manure is an excellent soil builder — supplying organic



matter and nutrients and stimulating the biological processes in the soil to build fertility. When manure is used to its full potential, it can yield substantial savings over purchased fertilizers and lead to improved soil fertility through the benefits of increased soil organic matter. Using manure can also cause problems, including human food contamination, soil fertility imbalances caused by excess nutrients, increased weed pressure, and potential pollution of water and soil. The ATTRA publication *Manures for Organic Crop Production* has information on organic manure handling practices to help prevent some of these problems. ATTRA's *Sustainable Soil Management* discusses concepts and practices critical in soil nutrient management and in planning a farm's individual fertility program. The ATTRA publication *Nutrient Cycling in Pastures* has additional information on good pasture management practices that foster effective use and recycling of nutrients.

Hogs, like most livestock, are not very efficient at converting feedstuffs into meat. About 75 to 90% of the feedstuffs' nutrients are excreted with the manure. (Tishmack and Jones, 2003) Swine manure has a high concentration of organic material. It has a higher nitrogen content than beef or dairy manure, but less than poultry manure. The amount of organic matter and nutrients in manure depends on the rations, the type of bedding, and whether the manure is applied as a solid, slurry, or liquid. (Tishmack and Jones, 2003)

Application rates should be based on crop needs and soil tests (tests available through the Extension Service or a soil testing lab). Determine manure application rates based on those nutrients that are present in the manure in the largest amounts. Basing application rates on manure nitrogen content alone should be done with care, since this can sometimes lead to soil nutrient imbalances if other macro- or micro-nutrients become excessive. Because the ratio of crop needs to manure nutrient contents is lower for phosphorus than for nitrogen, many states are concerned about phosphorus buildup in soils and are requiring soil tests and manure management plans. On October 24, 2004, the Iowa Environmental Protection Commission approved rules to prohibit applications of livestock manure on fields that test very high in phosphorus. (Anon., 2004b)

Comprehensive Nutrient Management Plans (CNMPs)

Increased public awareness of the threat to water quality posed by hog manure has prompted regulatory actions at local, state, and federal levels. Hog farmers must stay informed to avoid violating these regulations – and to avoid polluting the environment.

In April 2003, the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) created a permit system governing animal feeding operations (AFOs). The permit system determines how AFOs can be defined as concentrated animal feeding operations (CAFOs) and required to get a NPDES permit from the EPA or a designated state permitting authority. AFOs are classified CAFOs depending, in large part, on whether the operation is considered large, medium, or small. However, no matter what size your AFO, it can be designated a CAFO. Your operation could need a CAFO permit if your permitting authority finds that it is adding pollutants to the surface water. For a copy of the rule and additional supporting information, visit the EPA Web site at <http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm>, call the Office of Water Resource Center at 202-566-1729, or call the CAFO help line at 202-564-0766.

A CNMP must be tailored specifically to a site. The Natural Resources Conservation Service (NRCS) has information to help set up this type of management plan. Contact your local county NRCS office for further information, or visit their Web site at www.nrcs.usda.gov/programs/afo for help to in finding your local office, for the 2003 series of 33 CAFO Fact Sheets, the CNMP manual, and additional information.

Manure Characteristics for Different Types of Hog Production Systems

When raised on pasture, hogs distribute their manure themselves. With proper rotations on stable, non-erodible lands – not wetlands, streams, waterways, or riparian areas – the hazards of pollution are small, and the potential for parasite and disease transfer is reduced. The pasture loading rate varies greatly with climate, forage type, and rotation schedule. The vegetation in the pasture is the main indicator of the proper stocking rate. See ATTRA's *Protecting Riparian Areas: Farmland*

Management Strategies for additional information on riparian zone management and ATTRA's *Considerations in Organic Hog Production* for additional information on pasture management for farrowing and finishing.

Pasture hog production can have problems also. Working outside in the cold, heat, rain, snow, wind, and dark is not always pleasant. Dave Odland, a farmer at Clarion, Iowa, says, "With my system you have to be willing to get up at 3 a.m. to keep squealing pigs out of the mud and rain. And, you have to be able to take those days when you lose a litter or two because of the weather." (Anon., 1990a) Tim McGuire, who farms at Wisner, Nebraska, comments that from November to March, they do not feed hogs outside because it is too difficult to keep water, heaters, straw, and feed in place. (Gralla, 1991)

When using a Cargill-style finishing unit (an 18 by 120 foot, monoslope, open-front shed with an outside concrete area for feeders and waterers) or other open-lot operations, whether paved or unpaved, manure is handled as a solid. The manure is scraped regularly from the lots to reduce buildup, as well as to help control odor and fly populations. Scraped manure is either stockpiled for field spreading later, spread immediately on the field, or composted. Composting manure allows long-term storage, with reduced odor and pollution problems and the production of a superior soil amendment. Raw manure contains high levels of pollutants and must be properly managed to prevent contamination of nearby surface or ground water.

Manure from deep-bedded hooped shelters is also handled as a solid. All of the bedding is removed, usually with a front-end loader, following each group of hogs. The composition

A Cargill-style finishing unit.



Hooped shelters, originally developed in Canada, are among the more promising and intriguing options for finishing hogs. Hooped shelters are so successful that more than one million hogs are produced in them in Iowa. They are popular due to their low cost and because they allow the pigs to express social behavior. But pigs in hooped shelters require more feed per pound of gain, especially during extreme weather conditions.

Hooped shelters are arched metal frames, secured to ground posts and four- to six-foot side walls, then covered with a polyethylene tarp. The ends are left open most of the year for ventilation but are adjusted appropriately in winter to circulate fresh air and reduce humidity. The hooped shelters come in various sizes but usually house from 75 to 250 head per shelter. Stock density in the shelter can range from less than 12 square feet per pig to about 16 square feet per pig. The smaller (12 square foot) space occasionally leads to fighting among the hogs, so some organic producers reduce stock density to allow more space per hog.

Two-thirds of the floor area inside the hoop shelter is a deep-bedded area, with the remainder of the floor area a concrete slab where the feeders and waterers are located. Deep bedding is the key to the hooped shelter's performance. The bedding consists of 14 to 18 inches of materials such as small-grain or soybean straw, baled cornstalks, grass hay, ground corncobs, or a combination of several organic materials. The bedding absorbs moisture, slowly composts, and helps keep the pigs dry and warm. The back third of the bedded area is generally dry and serves as the sleeping area, while the middle third is where the pigs dung. Please refer to ATTRA's *Hooped Shelters for Hogs* for specific information on using hooped shelters for finishing and/or gestating hogs.

Besides hooped shelters, several alternative methods for sustainable hog

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production have been researched, such as the Swedish deep-bedded nursery system and pasture farrowing, as well as other alternative farrowing and finishing systems. Among the limiting factors in producing hogs outdoors are the climate, the amount of land available, topography of the land, ground cover, and pollution potentials. Some major differences between alternative finishing systems and conventional slatted floor finishing are the use of deep bedding, the manure management practices, use of natural ventilation, the number of hogs in a group, and the lower initial investment. (Gentry et al., 2001) See ATTRA's *Considerations in Organic Hog Production* for additional information about these alternative methods.

In a 2001 annual report from Dickinson Research Extension Center in North Dakota, researchers reported on the study "An Economic Analysis of Swine Rearing Systems for North Dakota," comparing hogs raised in outdoor pens, hoop shelters, and conventional confinement buildings. Pig performance and carcass data were analyzed to estimate the net return per pig from the three systems. The evaluations considered turns/year, facility investment, fixed costs, operating costs, and total carcass values after premiums and discounts were applied. The net return per pig was calculated by deducting the total cost of the pig from the total carcass value. The report concluded, "Accounting for all business parameters, rearing in the hoop structures returned the greatest net return per pig. Compared to the conventional confinement system, the hooped structures and outdoor pen reared pigs returned 6.63% and 4.07% more net income, respectively." (Landblom et al., 2000)



photo by Keith Weller, USDA ARS

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varies greatly, because of high concentrations of bedding in some areas of the hooped shelter and high concentrations of manure in others. The variability of the manure creates problems in accurately figuring the nutrient content of the manure and its fertilizer value. For more information on deep-bedded hooped shelters, see ATTRA's *Hooped Shelters for Hogs*.

Liquid manure systems are generally used in confinement hog production, including CAFO's, because they require less labor than handling solids (as in bedding and scrape systems). Liquid manure is stored in underground pits, anaerobic lagoons, or outdoor slurry storage tanks, above or below ground. During storage and mixing or agitation, high concentrations of ammonia and hydrogen sulfide can be released, endangering the farm workers and livestock. (Tishmack and Jones, 2003) In a study completed in November 2002, the Prairie Swine Centre in Saskatchewan, Canada, showed that hydrogen sulfite gas emission in swine barns with shallow manure pits often reached levels that pose a threat to workers' health. (Whelan, 2003)

Manure or compost can be spread on pastures or crop lands before or after harvest. If possible, manure should always be incorporated into the soil as soon as possible after spreading to avoid losses of nitrogen and reduce odor. To prevent runoff, avoid spreading manure on frozen ground. Manure spreaders, liquid manure application tanks, and drag-hose application equipment should be properly calibrated. Your county Extension or NRCS office has information on these operations.

Regardless of whether manure is handled as a solid, slurry, or liquid, a well-designed collection, storage, transportation, and application program is necessary to avoid water pollution. See ATTRA's *Protecting Water Quality on Organic Farms* for practices that can help protect water quality.

Odor Control

According to R. Douglas Hurt, director of the Center for Agriculture History & Rural Studies at Iowa State University, "Hog odor is the most divisive issue ever in agriculture, damaging the fabric of rural society and disenfranchising pork producers from their communities, even on the roads in front of their farm." (Smith, 1998a)



Liquid manure from a hog operation in northeast Iowa is pumped onto cropland. Photo by Tim McCabe, USDA NRCS

Most complaints about hog operations involve odor. Many hog farmers are finding their odor control efforts are not meeting their neighbors' expectations. Because livestock operations are increasing in size, and more people are moving into rural areas closer to livestock operations, problems are increasing.(Anon., 2002b) One of the reasons odor causes negative reactions differently from person to person is that there is no consensus agreement between farmers and neighbors – or between any part of industry and the public – on how to evaluate odors. The total amount of odor coming from a farm depends on the type and number of animals, the type of housing, the manure storage and handling practices, the wind direction and speed, and many other weather variables.(Jacobson et al., 2002)

Odors are from gases created by the decomposition of the manure and other organic matter. The gases can include from 80 to 200 different compounds that cause odor, some of them at extremely low concentrations. The interaction between the different odor-causing compounds can produce either more or less odor than that of an individual compound. Odors are also absorbed and moved by dust particles.(Anon., 2002b) Dust from hog operations can come from the feed, bedding material, manure, and even the hog itself. Some of the factors that can affect dust and odor levels are animal activity, temperature, relative humidity, wind, stocking density, feeding methods, and the feed ingredients themselves.

Predicting odor and dust problems can be difficult because the odors and dust are moved

by the wind, so the problem areas and odor intensity can change frequently, depending on wind direction and speed. Some of the gases are heavier and travel slower, close to the ground, while lighter gases disperse faster into the atmosphere.(Anon., 2002b)

Odors are considered a nuisance only when their intensity and character are sufficiently objectionable to get complaints from neighbors. One legal basis for the nuisance concept is that people should not use their property in such a way that it would interfere with the adjoining property owners use of their property. Odors from hog production systems are regarded as nuisance pollutants not regulated under the Clean Air Act. How odor affects people varies. In an article from *Inside Agroforestry*,

the author states:

People respond to odor differently. Although the human olfactory organ is quite sensitive, the response to odor is related more to past memories or cultural experiences. There is not very much information about the impact of odor to human health. Most of the existing information refers to the adverse health effects of individual gases, e.g. ammonia, or dust, but no specific information about odors. One study did show that odors from a swine facility had a negative effect on the moods of the neighbors such as anger and frustration. These psychological impacts can be as significant as a person's physical health (Anon., 2002b).

Even if these odors are non-toxic, they do affect how people feel and react. Farmers must be current on county zoning laws, Right-to-Farm laws, and other local and state laws affecting land use. Many neighbors will be tolerant of occasional odor problems, but if odor persists or is fairly frequent, trouble will arise.

One management practice that helps is the use of shelterbelts. According to an article in *Inside Agroforestry*, shelterbelts can help relieve livestock odors in several ways.

- Facilitate distribution of odor by creating surface turbulence that intercepts and disrupts odor plumes.
- Encourage dust to settle by reducing wind speeds.
- Physically intercept dust and other

aerosols that collect on leaves and reduce the micro-particles leaving.

- Act as a sink for chemical constituents of odor, because Volatile Organic Compounds (VOCs) have an affinity for the outer layers of plant leaves, where they are absorbed and broken down.
- Provide a visual and aesthetic screen for the operation.

(Colletti and Tyndall, 2002)

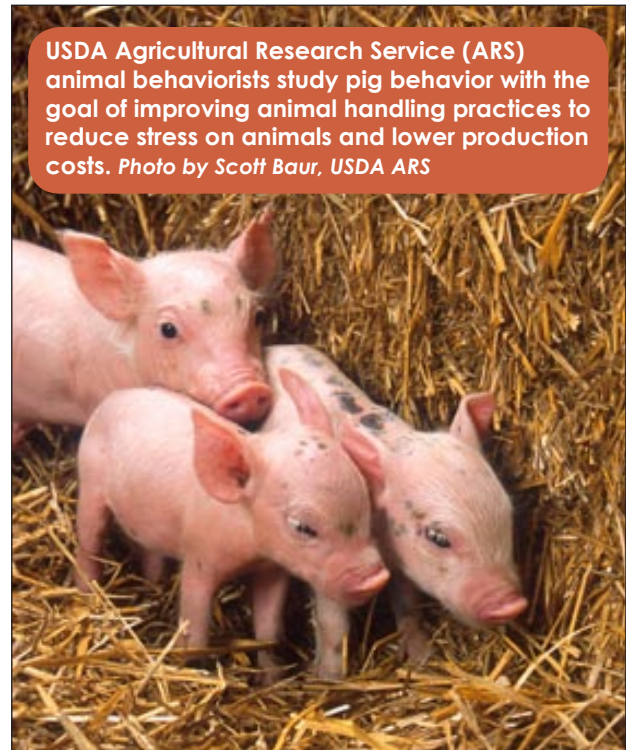
The Forestry Department of Iowa State University Web site has additional information on wind-break research and odor mitigation available at www.forestry.iastate.edu/res/Shelterbelt.html.

The University of Minnesota publication *OFFSET – Odor From Feedlots Setback Estimation Tool* (**Further Resources:** Publications and Books) is designed to help estimate average odor impacts from different animal facilities and manure storage. The publication is based on odor measurement for farms and climate conditions in Minnesota, and estimating odor impacts in other parts of the country should be done with caution and in consultation with the authors. OFFSET created what they call odor emission numbers, which are the average of 200 odor measurements from 79 different Minnesota farms and are average values of measurements from each type of odor source. The odor emission number varies: 34 to 50 for swine housed with deep manure pits, 20 to 42 for pull-plug systems, 11 for loose housing and open concrete scrape areas, and 4 for deep-bedded hoop and Cargill open-front barns. (Jacobson et al., 2002)

A farmer cannot create an odor-free or dust-free hog operation, but certain types of buildings and manure management strategies can help. Common sense, as well as talking to and listening to your neighbors, is probably your best defense against odor and/or dust complaints. If possible, manure should not be spread on Friday, Saturday, or Sunday, when neighbors are more likely to be at home and outdoors. Farmers should concentrate on sound management practices before trying any extreme measures.

Health Concerns

The priority in sustainable swine production should be prevention and disease eradication, rather than disease treatment. Reducing stress



is important in increasing the pigs' resistance to diseases. Stress is caused by:

- Taxing living conditions, such as heat, cold, wet or muddy environment, or poor air quality (dust, ammonia, and other gases)
- Not allowing natural behavior, such as nesting, rooting, wallowing, or foraging
- Improper handling during weaning, moving, or sorting, and mixing strange pigs together
- Poor nutrition—low energy and protein levels, vitamin and mineral deficiencies

Vaccinations are another important tool for disease prevention and helping to build immunity in the pig. However, because of varying disease pressures, management styles, housing conditions, farm locations, climatic conditions, etc., each producer's situation is unique, and any recommendations for routine vaccinations and health procedures need to be based on a veterinarian's suggestions.

For additional information on how vaccinations provide immunity, as well as on reducing stress from hog handling practices and on allowing natural behaviors, see the ATTRA publication *Considerations in Organic Hog Production*.

Using antibiotics in hog production is becoming more controversial, especially when they are used as growth promoters and in subtherapeutic doses. The 2004 report *Antibiotic Resistance – Federal Agencies Need to Better Focus Efforts to Address Risk to Humans from Antibiotic Use in Animals*, by the Government Accounting Office (GAO), suggests that “scientific evidence has shown that certain bacteria that are resistant to antibiotics are transferred from animals to humans through the consumption or handling of meat that contains antibiotic-resistant bacteria.” The 100-page GAO report is available at www.gao.gov/new.items/d04490.pdf. Additional information on antibiotic-resistant bacteria and livestock is available from the Land Stewardship Project in Minnesota in their Land Stewardship Letter article “Antibiotics, Agriculture & Resistance,” available at www.landstewardshipproject.org/pdf/antibio_reprint.pdf.

The 2003 research article “Antibiotics in Dust Originating from a Pig-Fattening Farm: A New Source of Health Hazard for Farmers?” in *Environmental Health Perspectives* comments on one possible antibiotic problem. It states that 90% of the dust samples taken during a 20-year period from the same hog building had detectable residues of up to 5 different antibiotics. The researchers concluded:

High dust exposure in animal confinement buildings is believed to be a respiratory health hazard because of the high content of microorganisms, endotoxins, and allergens. Further risks may arise from the inhalation of dust contaminated

with a cocktail of antibiotics. Apart from that, our data provide first evidence for a new route of entry for veterinary drugs in the environment (Hamscher, 2003).

Respiratory problems seem to be increasing for hog farmers using confinement hog houses. The 220-page, 2003 University of Iowa report *Iowa Concentrated Animal Feeding Operation Air Quality Study* found that at least 25% of swine CAFO workers have reported current respiratory problems. The report is available at www.public-health.uiowa.edu/ehsr/CAFOstudy.htm.

Raising hogs in a deep-bedded system has advantages over slatted confinement production. Hogs raised on bedding show less tail biting, fewer foot pad lesions, fewer leg problems, and fewer respiratory problems. Research comparing growth and meat quality for pigs finished in hoop shelters is limited, but some research has determined that hoop-finished pigs have fewer abnormal behaviors, have a greater rate of play behavior, and have fewer leg injuries than pigs finished in a non-bedded confinement system. (Gentry et al., 2001)

Pigs produced on pasture are usually healthier than pigs produced in confinement. Pastured hogs often have fewer respiratory diseases, rhinitis, and foot and leg problems. (Cramer, 1990b) A 1978–79 survey of Missouri hog producers demonstrated that hogs raised on pastures had the lowest health costs. Hogs raised in a mixture of pasture and confinement had the highest health expenses. This suggests that the hogs had a difficult time adjusting from one type of facility to another. (Kliebenstein, 1983)

Raising pigs outdoors can be more animal friendly and environmentally friendly, if managed correctly. However, poor management of outdoor pigs will lead to poor pig performance and environmental damage. Pigs need a dry, draft-free place to lie down; mud and slop will not produce healthy, happy hogs. Producers need to be concerned about rotating pastures and the need for vegetative cover in the pens.

Probiotics (live, beneficial bacteria) – available as gels, drenches, dry mixes, or for use in water – can replace or supplement naturally occurring gut microbes during times of stress or disease. During periods

Hogs being raised on a pasture rotation system, Manhattan, Kansas. Photo by Jeff Vanuga, USDA NRCS



of stress, such as weaning, shipping, or changes in weather or feed, the populations of beneficial and pathogenic microbes can fluctuate, changing the balance in the intestinal tract.(Carter, 1990) Research on the use of probiotics is not conclusive. Probiotic firms argue that in laboratory conditions the stress is not enough to conclusively demonstrate the value of probiotics. Dr. Austin Lewis, a swine researcher at the University of Nebraska, suggests that this assumption may be accurate, because laboratory conditions usually demonstrate a lower response to antibiotics, too. Many farmers have observed the benefits of probiotics in their everyday experiences, but finding research to support probiotic use is difficult.(Cramer, 1990a) Since probiotics must be live to work, they need special care. Heat, moisture, oxygen, and time can all reduce the viability of probiotics. It is also important to remember that antibiotics can kill probiotics' beneficial bacteria as well as pathogens, so it is best to check product compatibility.

Humane Treatment

Sustainable pork producers need to consider how the consuming public views their operations. Finishing and gestation buildings that restrict movement and interaction among pigs have become targets of media attacks. A sustainable system allows hogs a chance to pursue their natu-



Under the Animal Welfare Institute's (AWI) Humane Husbandry Standards, sows are able to fulfill their instincts to build a nest before delivering their piglets.
Photo by Diane Halverson/AWI

ral instincts, reduces their stress level with more space to freely move about, and provides access to either pasture or deep bedding.

The producer must choose a production system that is profitable, but that also addresses the public's concerns about humane treatment of animals, safe food, and a clean environment. Economics, environmental concerns, and humane treatment may conflict, so it is usually up to the producers to reconcile these issues in their operations. Information on humane treatment of livestock is available from the American Humane Society at 303-792-9900, www.americanhumane.org; the Animal Welfare Institute at 703-836-4300, www.awionline.org; and the Humane Society of the United States at 202-452-1100, www.hsus.org.

According to the USDA National Organic Program (NOP) regulations, organic hog producers need to provide living conditions that accommodate the health and natural behavior of their animals. These regulations support concerns for animal welfare, the sustainability of production, and environmental quality. The methods organic hog farmers use to meet the NOP requirements can include a wide range of alternative production practices. For additional information on humane concerns, please see ATTRA's *Considerations in Organic Hog Production*, and **Further Resources:** Web sites.

Summary

A sustainable hog operation is not an end in itself. All aspects of a farm are tied together. When you are producing pigs in a sustainable manner, you are using all parts of your farming operation. The manure or compost is used to help produce the diversified crops that feed the hogs. Legumes are also used to help feed the livestock and to add nitrogen back to the cropland. Animals are treated as parts of a living organism, not just parts of a product. The family is involved in the whole farm and as a part of the community. Sustainable agriculture exists in the interaction between the different aspects of farming; it is not the individual parts but the interaction among them that makes up the whole farming operation.

John Ikerd, in his presentation to the 2003 Sustainable Hog Farming Summit in Gettysburg, Pennsylvania, discussed some of the environ-

mental and social problems associated with vertical integration.

Thankfully, there are other, better ways to farm and to raise hogs; the “sustainable agriculture” movement addresses the need to protect the rural environment and support rural communities, while providing opportunities for farmers to earn a decent living. But, sustainable farming takes more imagination and creativity than contract production – it requires taking care of each other and taking care of the land. Sustainable hog producers all across North America are finding that deep-bedding systems, including hoop house structures, and pasture based hog production systems often are not only more humane, ecologically sound, and socially responsible, but also, are more profitable than CAFOs. But, such systems require more management, more imagination, more creativity, more thinking, and thus, are more difficult to “promote” (Ikerd, 2003).

For additional information on any subject mentioned in this publication, or for information on any other aspect of sustainable hog production, please contact ATTRA, the National Sustainable Agriculture Information Service.

Enclosures

Van Der Pol, Jim. 2001a. Today’s hog won’t work outdoors. *Graze*. April. Vol. 7, No. 4. p. 10-11.

Van Der Pol, Jim. 2001b. Setting up the gestating sow system. *Graze*. May. Vol. 7, No. 5. p. 1, 10.

Van Der Pol, Jim. 2001c. The tools and psychology of pasture farrowing. *Graze*. June-July. Vol. 7, No. 6. p. 8-9.

Van Der Pol, Jim. 2002a. Hogs Improve Swords! *Graze*. October. Vol. 9, No. 8. p. 10.

Van Der Pol, Jim. 2002b. In search of the perfect pasture sow. *Graze*. November. Vol. 9, No. 9. p. 10.

Van Der Pol, Jim. 2002c. Pastured sow logistics. *Graze*. December. Vol. 9, No. 10. p. 10.

Van Der Pol, Jim. 2003. Changing behavior through genetics. *Graze*. June-July. Vol. 10, No. 6. p. 12-13.

References

Anon. 1987. Save gestation feed with pasture system. *National Hog Farmer*. May 15. p. 16, 18.

Anon. 1989. Raw lupines are fine for hogs. *The New Farm*. May-June. p. 8.

Anon. 1990a. Gilts help put profit in pigs on pasture. *Sensible Agriculture*. November. p. 6-7.

Anon. 1990b. Popcorn replaces yellow corn in starter, grow-finish diets. *National Hog Farmer*. February 15. p. 42

Anon. 1993. Buckwheat can replace corn in swine rations. *High Plains Journal*. July 19. p. 17-B.

Anon. 2002a. Barley production in Alberta: Harvesting. Alberta Agriculture, Food and Rural Development. 8 p.
[www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/crop1256?OpenDocument#7](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/crop1256?OpenDocument#7)

Anon. 2002b. Odor is more than what meets the nose. *Inside Agroforestry*. Spring. p. 4-5.

Anon. 2003a. Swine scientist: ‘Wal-Mart effect’ creates niches for family farms. *The Land Stewardship Letter*. December. p. 9.
www.landstewardshipproject.org/lsl/lspv21n5.pdf

Anon. 2003b. Hogs on pasture – The future of pork. *Acres USA*. September. p. 1, 8-9.

Anon. 2004a. Checkoff analysis of USDA price data. National Pork Board News Release. Thursday, March 4. 2 p.
www.porkboard.org/News/NewsEdit.asp?NewsID=403

Anon. 2004b. Iowa EPC adopts controversial P index. *Pork Magazine Industrial News*. June 28. 1 p.
http://www.porkmag.com/news_editorial.asp?pgID=675&ed_id=2797&component_id=805

Carter, Heidi. 1990. Probiotics can be an economical and effective part of livestock health. *The Kerr Center for Sustainable Agriculture Newsletter*. August. p. 1.

- Colletti, Joe, and John Tyndall. 2002. Shelterbelts: an answer to growing odor concerns? *Inside Agroforestry*. Spring. p. 3, 7.
- Cramer, Craig. 1987. Profitable pigs – on pasture. *The New Farm*. January. p. 26–29.
- Cramer, Craig. 1990a. Healthy livestock with fewer drugs. *The New Farm*. February. p. 23, 26–30.
- Cramer, Craig. 1990b. Profitable pork on pasture. *The New Farm*. May-June. p. 15-18.
- DiGiacomo, Gigi. 1995. Factory farms are poor rural development tools. *Farm Aid News*. March 21. 5 p.
Gdigiaco@igc.apc.org
- Gentry, Jessica G., Mark F. Miller, and John J. McGlone. 2001. Alternative production systems: Influence on pig growth pork quality. *Pork Industry Institute, Texas Tech University*. 18 p.
www.depts.ttu.edu/porkindustryinstitute/research/Brazil%20paper%20Meats%20&%20Environment%20single%20spaced.htm
- Golz, Theresa, and Dwight Aarke. 1993. Lupin. *North Dakota State University Extension*. 9 p.
www.ext.nodak.edu/extpubs/alt-ag/lupin.htm
- Gralla, Shawn. 1991. Fit for a Pig – Low-Cost/Sustainable Strategies of Resourceful Hog Farmers. *Center for Rural Affairs, Hartington, Nebraska*. p. 25.
- Hamscher, Gerd, Heike Theresia Pawelzick, Silke Sczesny, Heinz Nau, and Jorg Hartung. 2003. Antibiotics in dust originating from a pig-fattening farm: A new source of health hazard for farmers? *Environmental Health Perspectives*. October. p. 1590–1594.
<http://ehp.niehs.nih.gov/members/2003/6288/6288.pdf>
- Hillyer, Gregg, and Jim Phillips. 2002. Squeeze play. *Progressive Farmer*. December. p. 20–22.
- Ikerd, John. 2001. Economic fallacies of industrial hog production. 8 p.
www.ssu.missouri.edu/faculty/jikerd/papers/EconFallacies-Hogs.htm
- Ikerd, John. 2003. Hogs, economics, and rural communities. 6 p.
<http://ssu.agri.missouri.edu/Faculty/JIkerd/papers/HogSummit.htm>
- Jacobson, Larry, David Schmidt, and Susan Wood. 2002. OFFSET – Odor From Feedlots Setback Estimation Tool. *University of Minnesota*. 10 p.
www.extension.umn.edu/distribution/livestocksystems/DI7680.html
- Jeaurond, Eric, Janice Murphy, and Kees de Lange. 2003. No adverse effects from feeding roasted green soybeans. *Ontario Ministry of Agriculture and Food*. 2 p.
www.gov.on.ca/OMAFRA/english/livestock/swine/facts/info_n_feedsoy.htm
- Johnson, Lee J., Sally Noll, Antonio Renteria, and Jerry Shurson. 2003. Feeding by-products high in concentration of fiber to nonruminants. 26 p.
http://wcroc.coafes.umn.edu/Swine/KC_Fiber%20paper.pdf
- Kelsey, Darwin. 2003. Small farms key to sustainable farming. *ALBC News*. July–August. p. 2.
- Kliebenstein, J.B. et al. 1983. A survey of swine production health problems and health maintenance expenditures. *Preventive Veterinary Medicine*. Vol. 1. p. 357–369.
- Klober, Kelly. 2003. Downsizing and free spirits, and Larger is not the answer [sidebar]. *Small Farm Today*. September. p. 22–23.
- Landblom, D. G., W. W. Poland, B. Nelson, and E. Janzen. 2001. 2001 Annual Report–Swine Section. *Dickinson Research Extension Center*. 5 p.
www.ag.ndsu.nodak.edu/dickins/research/2000/swine00c.htm
- Lawrence, John, and Glenn Grimes. 2000. Producer and production profile. *In: Pork Facts 2002/2003*. National Pork Board, Des Moines, Iowa. p. 12.
www.porkboard.org/docs/2002-3%20PORK%20FACTS%20BK.pdf
- Luce, William G., and Charles V. Maxwell. 1996. Using mung beans in swine diets. *Oklahoma State University Extension*. F-3506. 2 p.

Martin, Andrew. 2004. Survey finds 3% of farms are thriving. Chicago Tribune. Friday, June 4.

Maulsby, Darcy. 2003a. Fred Kirschenmann addresses the disappearing middle. 3 p. http://newfarm.org/depts/talking_shop/1203/biodynamic2.shtml

Maulsby, Darcy Dougherty. 2003b. Iowa pork producers focus on animal welfare. The New Farm. Downloaded July 2004. http://newfarm.org/features/0103/wilson_hogs/

Moeller, David. 2003. Livestock production contracts: Risks for family farmers. Farmers' Legal Action Group, Inc. March 22. 13 p. www.flaginc.com/pubs/arts/artcf005.pdf

Murphy, Janice. 2003. Flax - The health-giving facts. Ontario Ministry of Agriculture and Food. 3 p. www.gov.on.ca/OMAFRA/english/livestock/swine/facts/info_flax.htm

Nation, H. Allan. 1989. A year-round forage program for pigs. The Stockman Grass Farmer. September. p. 22.

Nation, H. Allan. 1988a. Pastured pigs. The Stockman Grass Farmer. August. p. 6.

Nation, H. Allan. 1988b. Pastured pigs. The Stockman Grass Farmer. October. p. 18.

Oates, Bryce, and Rhonda Perry. 2003a. Exploring sustainable hog production methods for Missouri farmers. In Motion Magazine. March 18. www.inmotionmagazine.com/ra03/minn.html

Racz, Vernon, and Leigh Campbell. 1995. Winter Cereal Production: Rye. University of Saskatchewan. 3 p. www.usask.ca/agriculture/plantsci/winter_cereals/winter_rye/Rye2.htm

Smith, Rod. 1998a. Divisiveness of hog odor issue could have social-tragic results. Feedstuffs. June 1. p. 1, 22

Smith, Rod. 1998b. Pork producers on schedule to increase production 40%. Feedstuffs. June 15. p. 1, 5.

Stumo, Michael C. 2003. Agricultural consolidation and the Smithfield-Farmland deal.

Written testimony of the private Organization for Competitive Markets presented to the United States Senate Judiciary Subcommittee on Antitrust, Competitive Policy and Consumer Rights. July 23.

www.competitivemarkets.com/news_and_events/press_releases/2003/7-23.htm

Talbott, Chuck. 2003. Finding the lost taste of pork - Our small-scale hog producer project. ALBC News. January-February. p. 3.

Thaler, Bob, and Hans Stein. 2003. Using South Dakota grown field peas in swine diets. South Dakota State University Extension. ExEx 2041. December. 2 p. <http://agbiopubs.sdstate.edu/articles/ExEx2041.pdf>

Thompson, Nancy. 1997. Are large hog operations good for rural communities? Center for Rural Affairs Newsletter. November. p. 3-4.

Tishmack, Jody, and Don Jones. 2003. Meeting the challenges of swine manure management. BioCycle. October. p. 24-27.

Van Der Pol, Jim. 2002. Pastured sow logistics. Graze. December. p. 10

Whelan, Amanda. 2003. High levels of H2S in swine barns is a concern. Bacon Bits. June 2. 2 p. [www1.agric.gov.ab.ca/\\$department/newslett.nsf/all/bb3148?OpenDocument](http://www1.agric.gov.ab.ca/$department/newslett.nsf/all/bb3148?OpenDocument)

Further Resources

Contacts

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Administers the NC A&T free-range program that has been working with small-scale operations producing hogs in woodlots and pastures. Establishing a market with Niman Ranch Pork Co. of Thornton, Iowa.

Pork Niche Marketing Working Group
(PNMWP)
Practical Farmers of Iowa
Gary Huber-Coordinator

Box 349
Ames, IA 50010
515-232-5661, ext. 103
gary@practicalfarmers.org
www.agmrc.org/pork/pnmwg.html

The PNMWP works to address the challenges facing niche pork efforts. Its mission is to foster the success of highly differentiated pork value chains that are profitable to all participants, that incorporate farmer ownership and control, and that contribute to environmental stewardship and rural vitality.

Alternative Swine Production
Systems Program
Minnesota Institute for Sustainable Agriculture
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612-625-6224
marti067@tc.umn.edu
www.misa.umn.edu/programs/altswine/
swineprogram.html

Web site devoted to providing information on alternative swine programs in Minnesota. The mission of the Alternative Swine Production Systems Program is to promote the research and development of low-emission and low-energy swine housing such as hoop structures, deep-bedded systems, and outdoor/pasture based systems. The Alternative Swine Production Systems Program seeks to develop relationships among farmers, researchers, and educators to research and promote alternative swine systems that are profitable, environmentally friendly, and help support rural communities in Minnesota.

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Coordinator of Iowa State University Research and Demonstration Farms and Associate Professor in the Department of Animal Science. Has written many articles and publications on

sustainable and organic hog production and is researching hooped shelters and the Swedish deep-bedded group farrowing systems.

Web sites

Pork Industry Institute – Texas Tech University

www.depts.ttu.edu/porkindustryinstitute

Web site provides extensive information on sustainable outdoor pork production. Has many articles and information from research done at Texas Tech by John McGlone and other researchers.

Iowa Pork Industry Center Home Page

www.extension.iastate.edu/ipic

Has on-line Iowa Swine Research Reports for 1998 to 2002, with many parts of the reports related to sustainable hog production, along with many other sources of information dealing with all aspects of hog production.

Leopold Center for Sustainable Agriculture

www.leopold.iastate.edu/research/grants/
files/2002-PNMWG5_alt_production_AR.pdf

2003 Annual Report, Alternative Swine Cost of Production Project (3/8/04), analyzes records from eight niche pork producers to provide information about cost of production in a sustainable pork operation. The data shows that cost of production from niche market producers is comparable to the cost of production from conventional producers.

The New Farm – Regenerative Agriculture Worldwide Pig Page

www.newfarm.org/depts/pig_page/index.shtml

Web site with good information on sustainable hog production and related items of interest.

Minnesota Department of Administration/Environmental Quality Board

www.eqb.state.mn.us/geis/

Ten on-line technical working papers exploring major environmental topics related to animal agriculture, including Farm Animal Health and Well-Being (312 pages), Impacts of Animal Agriculture on Water Quality (187 pages), Air Quality and Odor Impact (140 pages), and Human Health Issues (126 pages).

Animal Welfare Institute – Alternative Farming Systems for Pigs Page

www.awionline.org/farm/alt-farming.html#pigs

Provides a bibliography that lists many sources of published information on alternative hog production techniques – many in full text.

National Pork Board

www.porkscience.org/documents/other/swinecarehandbook.pdf

Has on-line 2002 Swine Care Handbook that provides ethical management practices for hog producers.

Minnesota Department of Agriculture Sustainable Agriculture Grants Projects

www.mda.state.mn.us/esap/Greenbook.html

Has on-line the 1999 to 2002 Greenbook that lists all completed grant projects of the Minnesota Department of Agriculture Grants Programs – many related to small-scale alternative hog production techniques.

Pigs on Pasture – the Gunthorp Farm Home Page

www.grassfarmer.com/pigs/gunthorp.html

Three on-line documents sharing insights and experiences about raising pigs on pasture.

Organic Valley, Brand name for CROPP (Coulee Region Organic Produce Pool) Cooperative

www.organicvalley.coop/member/requirements_pork.html

Provides info about member requirements and pork production standards.

John E. Ikerd Home Page

<http://ssu.agri.missouri.edu/Faculty/JIkerd/default.htm>

On-line listing of many of Ikerd's recent papers and publications, such as Economic Fallacies of Industrial Hog Production; Hogs, Economics, and Rural Communities; Corporate Hog Production: The Colonization of Rural America; and many others.

Farmers' Legal Action Group, Inc.

www.flaginc.com/home.htm

Several livestock contracting publications, including the on-line publication Livestock Production Contracts: Risks for Family Farmers.

University of Illinois–Urbana-Champaign: Illinois Specialty Farm Products Page

<http://web.aces.uiuc.edu/value/contracts/livestock.htm>

On-line template Livestock Production Contracts: Check List of Important Considerations.

Environmental Health Science Research Center – University of Iowa

www.public-health.uiowa.edu/ehsrc/CAFOS-tudy.htm

On-line report Iowa Concentrated Animal Feeding Operation Air Quality Study.

Publications

University of Minnesota Extension Distribution Center publications:

Designing Feeding Programs for Natural and Organic Pork Production. 2002. By Bob Koehler. BU-07736. 18 p. \$8.00 or view at www.extension.umn.edu/distribution/livestocksystems/DI7736.html

Swine Source Book: Alternatives for Pork Producers. 1999. By Wayne Martin. PC-07289. Three-ringed binder. \$30.00.

Hogs Your Way: Choosing a Hog Production System in the Upper Midwest. 2001. By Paul Bergh. BU-07641. 88 p. \$5.00 or view at www.extension.umn.edu/distribution/livestocksystems/components/DI7641.pdf

OFFSET – Odor From Feedlots Setback Estimation Tool. 2001. By Larry Jacobson, David Schmidt, and Susan Wood. FO-07680. 9 p. \$1.50 or view at www.extension.umn.edu/distribution/livestocksystems/DI7680.html

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The Land Stewardship Project publications:

An Agriculture that Makes Sense: Making Money on Hogs. 1996. By Jodi Dansingburg and Doug Gunnink. 8 p. \$4.00.

A Gentler Way - Sows on Pasture. 1994. By Dwight and Beck Ault. 23 p. Free with *An Agriculture that Makes Sense: Making Money on Hogs*.

Antibiotics, Agriculture & Resistance. 2002. By Brian DeVore. 12 p. \$5.00 or view a copy at www.landstewardshipproject.org/pdf/antibio_reprint.pdf

Killing Competition with Captive Supplies: A Special Report on How Meat Packers are Forcing Independent Family Hog Farmers Out of the Market Through Exclusive Contracts. 1999. By Anne DeMeurisse and Lynn Hayes. 47 p. \$6.00.

Order from:
Land Stewardship Project
2200 Fourth Street
White Bear Lake, MN 55110
651-653-0618
www.landstewardshipproject.org

Books

Delmar Learning:

Pig Production: Biological Principles and Applications. 2003. By John McGlone and Wilson G. Pond. Delmar Publishers. 480 p. \$91.95. ISBN/ISSN: 0-8273-8484-X

Order from:
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www.delmarlearning.com/browse_start.asp
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www.depts.ttu.edu/porkindustryinstitute

The National Academies Press:

Nutrient Requirements of Swine: 10th Revised Edition. 1998. Subcommittee on Swine Nutrition, National Research Council. 210 p.

\$44.95 or view at <http://books.nap.edu/html/swine/swine.pdf>

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University of Nebraska Press:

Raising a Stink – The Struggle over Factory Hog Farms in Nebraska. 2003. By Carolyn Johnsen. 181 p. \$21.95 plus \$5.00 shipping.

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Storey's Guide to Raising Pigs. 2000. By Kelly Klober. 313 p. Storey Publishing. North Adams, ME.

A Guide to Raising Pigs. 1997. By Kelly Klober. 313 p. Storey Publishing, Pownal, VT.

Raising Pigs Successfully. 1985. By Kathy and Bob Kellogg. 192 p. Williamson Publishing. Charlotte, VT.

Small-Scale Pig Raising. 1978. By Dirk van Loon. 263 p. A Garden Way Publishing Book, Storey Communications, Inc. Pownal, VT.

Raising the Homestead Hog. 1977. By Jerome D. Belanger. 226 p. Rodale Press. Emmaus, PA. Out of Print.

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Video

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Appendix

The following two tables are adapted from Janice Murphy's 2003 Ontario Ministry of Agriculture and Food Factsheet *Comparative Feed Values for Swine* tables showing the "Nutrient Composition and Suggested Maximum Inclusion" and "Factors Affecting Inclusion Rate of Alternative Feed Ingredients for Swine." The publication is available at www.gov.on.ca/OMAFRA/english/livestock/swine/facts/03-003.htm. The tables include many of the alternative energy and protein sources mentioned above that are used in Canada. Some of the ingredients common in southern United States hog rations are not listed in this table.

Table 1

Energy Feeds Nutrient Composition and Suggested Maximum Inclusion							
* Factors Affecting Inclusion Rate							
Feed Ingredient	Dry Matter (%)	Dry Matter Basis			Suggested Maximum Inclusion Rate (% of Total Diet)		Relative Food Value (% Compared to Corn)
		DE kcal/kg	Protein (%)	Lysine (%)	Grower/ Finisher	Nursing/ Dry Sows	
Alfalfa Meal	92	1989	18.5	0.80	5	NR/60	80-90
* High fiber content; low energy; good source of carotene and B vitamins; low digestibility; unpalatable to baby pigs							
Barley	89	3427	12.7	0.46	80	80	95-100
* Higher fiber and lower digestibility than corn							
Beet pulp, dried	91	3148	9.50	.57	10	10	90-100
* High fiber content; low digestibility; acts as a laxative							
Brewer's grains, dried ##	92	2283	28.8	1.17	10	10	110-120
* High fiber content; low energy; low lysine; source of B vitamins							
Corn	89	3961	9.3	0.29	77	77	100
* High energy; low lysine; high digestibility; palatable							
Corn, high moisture	72	3961	9.3	0.29	78	78	80-90
* Higher moisture content (28% vs. 15% for dry); low lysine; diet should be balanced on a dry matter basis							
Corn, distillers dried grains with solubles ##	93	3441	29.8	0.67	20	40	120-125
* High fiber; high fat; low lysine; bulky; source of B vitamins							
Corn, distillers dried solubles ##	92	3614	29.0	0.89	20	?	135-145
* □ products for swine							
Corn gluten feed ##	90	3322	23.9	0.70	25	5/90	110-130
* Low lysine; high fiber; low energy; variable nutrient content; unpalatable; bulky							
Corn gluten meal ##	90	4694	66.9	1.13	5	5	150-160
* Low lysine; low fiber content; variable nutrient content							
Flax ##	90	3400	37.3	1.38	5	5	150-155
* Rich source of omega-3 fatty acids and lignans							

continued on next page

Table 1 *continued*

Energy Feeds Nutrient Composition and Suggested Maximum Inclusion							
* Factors Affecting Inclusion Rate							
Feed Ingredient	Dry Matter (%)	Dry Matter Basis			Suggested Maximum Inclusion Rate (% of Total Diet)		Relative Food Value (% Compared to Corn)
		DE kcal/kg	Protein (%)	Lysine (%)	Grower/ Finisher	Nursing/ Dry Sows	
Oats	89	3112	12.9	0.45	20	20	85-95
* High fiber; low energy							
Oats, hullless	86	4047	19.9	0.55	95	95	110-115
* Low lysine; palatable, variable protein content; expensive							
Rye	88	3716	13.4	0.43	40/77	NR/25	
□ ground too finely							
Triticale	90	3689	13.9	0.43	77	25	95-105
* High protein and lysine content compared to corn; large variation in nutrient content between varieties; some varieties have anti-nutritional factors and poor palatability							
Wheat, hard red spring	88	3864	16.0	0.43	57	57	100-110
* □ and unpalatable if ground too finely							
Wheat, soft white winter	89	3820	13.3	0.37	57	57	100-105
* Higher in energy than corn; similar to corn in digestibility, palatability and protein; dusty and unpalatable if ground too finely							
Wheat Bran	89	2719	17.6	0.72	5	15	110-120
* Variable protein content; high fiber; lower energy; low digestibility; acts as a laxative							
NR = not recommended							
? = not enough information for a recommendation to be made							
## = in both Table1 and Table 2							



Table 2

Protein Feeds Nutrient Composition and Suggested Maximum Inclusion							
* Factors Affecting Inclusion Rate							
Feed Ingredient	Dry Matter (%)	Dry Matter Basic			Suggested Maximum Inclusion Rate (% of Total Diet)		Relative Food Value (% Compared to Soybean Meal)
		DE Kcal/kg	Protein %	Lysine %	Grower/ Finisher	Nursing/ Dry Sows	
Beans, cull white	84	3600	26.4	1.45	12	12	55-65
* Anti-nutritional factors – must be heat treated; low palatability							
Brewer's grain, dried ##	92	2283	28.8	1.17	10	10	40-50
* High fiber content; low energy; low lysine; source of B vitamins							
Canola meal	90	3206	39.6	2.31	12	12	75-85
* Higher fiber than soybean meal; less palatable to younger pigs; anti-nutritional factors							
Corn, distillers dried grains with solubles ##	93	3441	29.8	0.67	20	40	45-55
* High fiber; high fat; low lysine; bulky; source of B vitamins							
Corn, distillers dried solubles ##	92	3614	29.0	0.89	20	?	55-60
* products for swine							
Corn gluten feed ##	90	3322	23.9	0.70	25	5/90	45-55
* Low lysine; high fiber; low energy; variable nutrient content; unpalatable; bulky							
Corn gluten meal ##	90	4694	66.9	1.13	5	5	55-70
* Low lysine; low fiber content; variable nutrient content							
Fababeans	87	3730	29.2	1.86	20	10	65-75
* High fiber content; anti-nutritional factors; low vitamin content							
Fish meal, menhaden	92	4098	67.7	5.23	5	5	160-170
* Variable nutrient content depending on the source; high in lysine, methionine, calcium and phosphorus; high inclusion can result in fishy flavor in pork							
Flax ##	90	3400	37.3	1.38	5	5	60-65
* Rich source of omega-3 fatty acids and lignans							
Lupines, sweet white	89	3876	39.2	1.73	20	20	70-80
* High fiber content; anti-nutritional factors; low availability of lysine							
Peas	89	3860	25.6	1.69	20/35	15	67-75
* Low levels of anti-nutritional factors; variable protein content; good amino acid profile; low in methionine							
Soybean meal, 44%	89	3921	49.2	3.18	25	25	100
* With hulls; good amino acid balance in combination with corn; palatable							
Soybean meal, 48%	90	4094	52.8	3.36	25	25	100-105
* Without hulls; good amino acid balance in combination with corn; palatable							
Soybeans, roasted	90	4600	39.1	2.47	10	25	90-100
* Higher energy and lower protein than soybean meal; can cause undesirable after-taste in pork at high inclusion							
? = not enough information for a recommendation to be made							
## = in both Table1 and Table 2							

The electronic version of **Hog Production Alternatives**
is located at:

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