

Västgötmodellen: Sweden's sustainable alternative for swine production

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Abstract. In a harsh, northern climate and under restrictive animal welfare laws and a strict ban on the use of subtherapeutic antibiotics, Swedish pig farmers have developed a management-intensive system of pig production that relies on straw, the animals' natural behavior, group housing dynamics, and keen husbandry skills. The system is very efficient, with excellent pig reproduction and growth performance. The housing is simple and versatile. Called "Västgötmodellen" after the region in western Sweden where it was developed by farmers during the 1980s, the system now is successfully used on approximately 100 farms in Sweden. The system is specific to producing feeder or weaner pigs of 25 to 30 kg for feeding in more conventional European-style finishing units. Västgötmodellen may represent an agricultural system that is well adapted and economically competitive on modest-sized farms but not well suited for very large farms.

Key words: sustainable livestock systems, livestock housing, animal behavior

Introduction

Animal agriculture is a fundamental segment of sustainable agriculture (Baker et al., 1990). There are inherent advantages in linking crop and livestock enterprises on the same farm or in the region where feed is produced. This linkage allows for nutrient cycling and other environmental advantages. From a socioeconomic viewpoint, livestock are an important value-added agricultural product, generating jobs and rural economic activity.

Swine production is an important type of livestock production in some regions, where it may make a critical contribution to sustainable agriculture. Sustainable swine production is a combination of production

techniques that enhance profit and improve the area's environmental and socioeconomic conditions (Honeyman, 1991).

A system of swine production that may fit this definition is used in Sweden. It is called the Västgötmodellen system, after the Västgötland region in western Sweden where it was developed by farmers, largely in response to Sweden's ban on subtherapeutic use of antibiotics for livestock in 1986 and the passage of strict animal welfare laws in 1988. The system is efficient and competitive with conventional confinement systems. Feeder or weaner pigs (25 to 30 kg) are produced for subsequent feeding to slaughter weight in more traditional European-style finishing units. Västgötmodellen is interesting because it relies on the natural behavior of the pig and good husbandry skills by the farmer. The system has possible applications in other parts of the world and has lessons for everyone interested in sustainable agriculture and swine production. Additionally, Västgötmodellen may represent a rare instance of a size-specific technology system developed by farmers for diversified, modest-sized farms.

Development

Fig. 1 shows the two variations of the Västgötmodellen system of swine production. Type 1, also called the Ljungström system, is the more common, and is successfully used on about 100 Swedish swine farms (B. Algers, Swedish Univ. of Agric. Sciences, Skara, personal communication, 1994). It is named after Gunnar Ljungström, an enterprising farmer who began the system in the 1980s in response to a space shortage and a disease problem on his farm near Skara. He put sows and litters for the lactation period in a machine shed with a large amount of straw. The sows weaned more pigs than his penned sows, after which he began refining the new system.

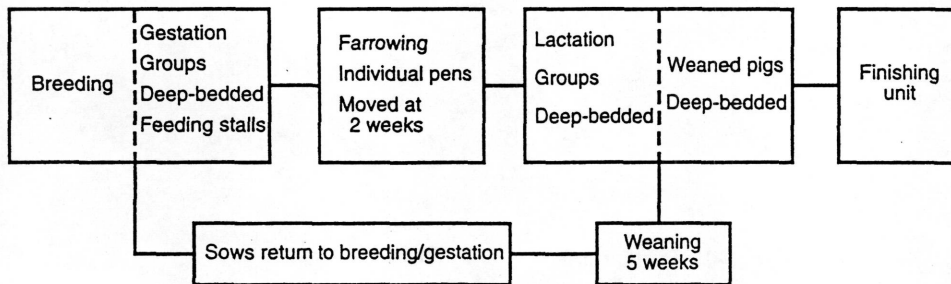
A neighboring farmer, Connie Thorstensson, took the approach one step further and developed Type 2. He farrowed the sows in temporary free-stall cubicles in the deep-bedded room. After two weeks, he removed the cubicles and began group lactation. The Type 2 Västgötmodellen is successfully practiced on fewer than five Swedish farms, probably because it represents a greater variation from conventional production and requires a more extreme management approach. From a U.S. perspective, the Type 2 (Thorstensson) variation is intriguing because it mimics outdoor pasture farrowing systems, where sows are allowed to choose their farrowing hut (cubicle) freely and are allowed free access to feed and water. However, being indoors allows the producer to capture the advantages of outdoor farrowing year-round while eliminating problems of environmental extremes (cold, heat, rain, wind, and mud) and predators (coyotes, wild dogs, and birds

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Sweden's Västgötmodellen System of Swine Production

Type 1: Ljungström (most common)



Type 2: Thorstensson

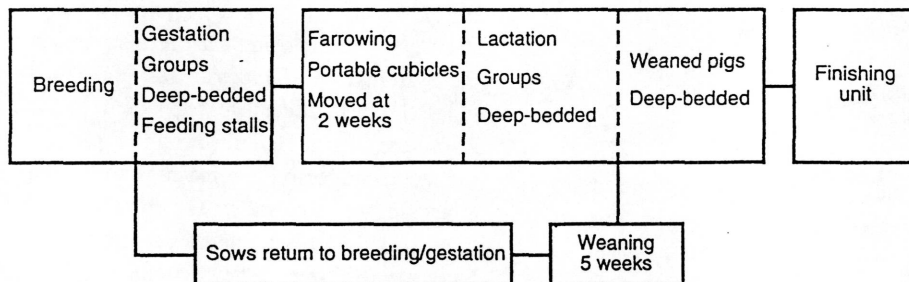


Figure 1. Sweden's Västgötmodellen System of Swine Production.

of prey). In essence, Type 2 Västgötmodellen brings pasture farrowing indoors.

The Västgötmodellen system developed in a region that includes a small group of respected animal ethologists at the Swedish University of Agricultural Sciences in Skara who specialize in livestock. This group conducted intensive studies on the natural behavior of domestic pigs in a free range "pig park" beginning in 1983 (Jensen, 1986; Jensen et al., 1987). The scientists interact considerably with the area's farmers and no doubt helped to get animal behavior science or ethology included in the design of Västgötmodellen.

The strong pig cooperative in this region also is an important element. The coopera-

tive owns the slaughter plant and controls breeding stock. Cooperative advisors routinely visit swine farms and provide advisory and recordkeeping services. These advisors helped shape Västgötmodellen and spread it throughout the region.

Description

The Västgötmodellen system has been documented primarily by Algiers (1991) and Halverson (1991a,b), and in the U.S. popular press by Halverson (1994) and Bowman (1993). As shown in Fig. 1, it uses group housing of sows in deep straw during breeding and gestation. During gestation the sows are fed daily in individual feeding stalls with

rear gates that the farmer closes after the sows have entered the stalls. The stalls also have front access gates that open into the feeding alley. The stalls offer the advantages of individual stalls: individual feeding, control of the sow for vaccinations and artificial insemination, and easy sorting of sows. The group housing helps stimulate estrus and reduce stress on the sows by allowing them to live in groups, which they prefer. Fighting is minimized by using feeding stalls and introducing new sows to the groups at optimum times, such as at farrowing. Conception rates are high, sow longevity is long, and sow mortality and culling rates are low.

The producer controls the swine herd and closely keeps exact records of breeding. This is a key to successful Västgötmodellen. As parturition approaches, the pregnant sows are moved to individual farrowing pens, and pregnant gilts are added to the group. These gilts have been bred to coincide with a given farrowing group of sows.

The farrowing pens are large and bedded with straw. Straw (oat, wheat, or barley) of high quality is a major system input. About 1,400 to 2,100 kg of straw is required per sow per year. Sow manure is removed twice daily. Most new farrowing pens have a slatted dung area with a scraper underneath. A heat lamp is provided in the creep area for warmth and to attract the piglets away from the sow. Swedish law prohibits farrowing crates.

Two weeks after farrowing, the sows and litters are moved to a lactation room. The move is done gradually; only two or three sows and litters are moved, after which there is a wait of several hours before more sows and litters are moved. This allows the sows and their piglets to reestablish their bonds before more sows and piglets are added to the group. The sow-pig bonding is important for successful group lactation. There are 6 to 16 sows in a group, with 8 to 10 optimum. According to the Swedish farmers (Halverson, 1991a,b), larger groups usually are unsuccessful because of fighting and social disorder. Smaller groups are considered economically impractical (Halverson, 1991a,b).

The Type 2 (Thorstensson) variation eliminates the farrowing pens. When the pregnant sows are removed from the gestation area, they go directly to the lactation room as a group. Temporary farrowing cubicles are set up in the lactation room for the

sows to farrow. The cubicles are removed when the piglets are about two weeks old (Fig. 1).

The lactation rooms are large and quiet. They are approximately square, with a solid concrete floor, a large access door for delivering straw (usually large round bales) and removing manure, automatic waterers, and a raised feeding platform (1.25 m wide, 40 cm high). No supplemental heat is used in the rooms. Animal heat, manure pack heat and the straw bedding provide a good environment for the pigs. This remarkably spacious and simple approach to swine housing is in sharp contrast to elaborate U.S. farrowing and nursery confinement facilities.

While the piglets are from two to five weeks of age, they and the sows occupy the lactation rooms. During this time the sows are allowed free access to feed and water and the piglets begin consuming feed, often with the sows. Piglet mortality is low, about 6% (Halverson, 1991a). Straw is added often, usually daily, when the pigs are inspected. Within the group the piglets' age varies by only 3 to 5 days. At nursing, the sows position themselves around the room. Some cross-suckling occurs, but it is not a problem because of uniform pig age and size. The quiet rooms allow for good sow-pig communication (Algers, 1993). Many producers grind off the piglets' needle teeth to minimize fighting injuries. Sow lactation problems (e.g., mastitis, metritis and agalactia) are negligible, probably because the sow has plenty of exercise and consumes some straw as a fiber source, and because stress is low (Algers, 1993; Algers, personal communication, 1994). The sow's feed intake and milk output are high, which results in rapid piglet growth (Algers, 1992).

The piglets are weaned at five or six weeks of age by moving the sows back to the breeding/gestation area. Weaning stress is minimized by removing the sows rather than the piglets. The piglets are fed in the lactation rooms as a group until 25 to 30 kg or 14 weeks of age, when they are moved to a finishing unit, which is usually at a different location.

The U.S. and Swedish systems differ markedly, but both can achieve high production levels. Table 1 shows a simple comparison of Västgötmodellen and typical U.S. confinement production systems. The U.S. systems rely on mechanization, auto-

mation, confinement, and antibiotics. The Swedish Västgötmodellen system, however, relies more on animal behavior, husbandry, and minimizing stress on the pigs.

Performance

The Västgötmodellen system seems to be performing well on many farms. Most producers report they produce 20 to 24 pigs per sow per year with a five-week weaning age. These statistics are reliable because of the recordkeeping system of the producers' cooperative. Halverson (1991a,b) reported an average of 21.5 pigs per sow per year for the Type 2 (Thorstensson) system, an excellent level. In comparison, the 1992 Iowa Swine Enterprise Records reported an average of 19.4 pigs per sow per year for the most profitable feeder pig producers and an average of 17.2 pigs per sow per year for all producers (Stevermer, 1993). There was no relation between size of farm and profitability (Stevermer, 1993). The Pork Industry Handbook (Mayrose et al., 1991) describes

a production level of over 20 pigs per sow per year as excellent.

Exact economic comparisons are difficult, however, because production can be calculated several different ways. In Sweden, the producers buy replacement gilts at either 30 kg or as pregnant gilts. In the U.S., many producers raise their own replacement gilts. The time at which gilts are considered part of the breeding herd, promptness in selling unproductive sows, and age at weaning are additional variables in determining pigs per sow per year.

Sow death loss (mortality) is low in the Västgötmodellen system, probably less than 1% (exact records not available). The Iowa Swine Enterprise Records Summary reports an average sow death loss of about 5% for Iowa feeder pig producers (Stevermer, 1993). A combination of natural service and artificial insemination is used on most farms. Also, in Västgötmodellen, the sow culling rate is low and sow longevity is longer than for typical U.S. production standards. Most producers keep sows

Table 1. A comparison of Swedish Västgötmodellen and conventional U.S. confinement pig raising systems.

	Sweden	U.S.
Subtherapeutic antibiotics	no	yes
Swine buildings	simple, easily modified	specialized, single purpose
Potential production level	high	high
Equipment	almost none	extensive
Gestation	group	individual crates
Farrowing	individual pen with straw or free-choice boxes	farrowing crates
Lactation	group with straw	farrowing crates
Nursery	large groups in pen with straw	controlled environment, small group decks
Weaning	sows removed, pigs stay	pigs moved to hot nursery
Tail docking	no	yes
Cross-fostering	yes	yes
Floors	solid concrete with straw	slats and manure pits
Manure	solid	liquid
Replacement gilts	buy as gilts or bred gilts	raise or buy as gilts
Finishing pen size	small	large
Finishing group size	8-15 pigs	25-35 pigs
Finishing pen floor	partial slat/straw	total slat, no straw
Bedding (straw)	yes	no
Feed	liquid	dry
Pig behavior	important	not important

through the sixth parity, and one reported keeping sows through the tenth parity. Overall reproductive performance of the Västgötmodellen system was very good. Pig health seemed excellent in this system, which was designed to be compatible with the animal's innate behaviors and to minimize stress.

Without the subtherapeutic use of antibiotics, management of the pigs becomes an important factor in successful production. Producers use strict batch production and all-in, all-out techniques, with no commingling of piglets from different groups. A narrow farrowing interval and precise breeding management insure that the piglets within a group usually differ in age by no more than five days. Odd litters born out of sequence are housed in separate overflow areas and kept separate until they are moved to the finishing unit. The "soft" environment of straw, established groups, loose-housing, quiet insulated rooms, and good ventilation, plus keen management, reduces stress and health problems.

Most Swedish pig farmers using Västgötmodellen observe their pigs closely, viewing every pig at least once a day. One farm couple visit the farrowing area five times per day! These producers enjoy pigs very much and have attained excellent results using the Thorstensson system. Clearly there is a strong positive pig-human bond on their farm. The pigs are tame and friendly. Where humans handle pigs in a positive manner, growth and reproduction are enhanced. Sows that are relaxed around human researchers tended to have higher reproductive performance (Hemsworth et al., 1981). Västgötmodellen would be viewed positively by most people concerned about livestock care and welfare.

In the Västgötmodellen system, management is a key to success. The management requires close attention to detail, an understanding of pigs and their behavior, and consistency from day to day and from group to group. Precise breeding management is critical to ensure the narrow farrowing interval that allows for successful group lactation.

Implications

Västgötmodellen is an example of a farmer-developed, management-intensive alternative swine production system. It was

developed in response to public concerns and laws related to subtherapeutic antibiotic use and livestock welfare. Västgötmodellen is an excellent example of creative solutions brought together by farmers into a system that is equal or superior to conventional systems. This process testifies to the remarkable creative resources of independent farmers and farm families in responding to the forces of change. As U.S. swine production becomes more industrialized and less diverse, the loss of independent farmers and their creative energy and quick ability to address change may become a great problem. Västgötmodellen may have application in the U.S., with some modifications for a more severe continental climate in the Midwest. Alternative sources of bedding also may be explored, such as corn stalks or newspapers. Västgötmodellen may be a size-specific system that is not well suited for large operations. This is unusual among most farm technologies, but may be characteristic of management-intensive systems.

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UPCOMING EVENTS (continued from page 128)

October 10-11, "The Next Generation of Legal, Regulatory and Marketing Issues Facing the Organic Products Industry" will be held Oakland, CA; contact Organic Farming Research Foundation, P.O. Box 440, Santa Cruz, CA 95061; (408) 426-6606.

November 15-17, "Environmental Enhancement Through Agriculture," organized by Tufts University, Center for Agriculture, Food, and Environment; American Farmland Trust; and Henry A. Wallace Institute for Alternative Agriculture, will be held in Boston, MA; contact William Lockeretz, School of Nutrition, Tufts University, Medford, MA 02155; (617) 627-3233; e-mail wlockeretz@infonet.tufts.edu