ANIMAL WELFARE ON ORGANIC FARMS

GUIDANCE FOR ORGANIC PIG PRODUCTION

The ECOA Animal Welfare Task Force (AWTF) has reviewed the Canadian standards for organic production (CAN/CGSB 32.310-2006 Organic Production Systems General Principles and Management Standards) and has provided additional guidance for the optimal welfare of pigs in the context of the standard. The information provided is based on best management practices outlined in various animal welfare standards and in published research on animal welfare and organic systems of production.

The numbering refers to the specific paragraph numbers in the 2008 amended version of CAN/CGSB 32-310-2006.

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6. LIVESTOCK PRODUCTION

6.1 General

Paragraph 6.1.3 states the principle that organic livestock production is a land-related activity. Herbivores must have access to pasture and other animals must have access to the outdoors whenever weather conditions permit.

Guidance 6.1.3
The size of the production unit should take into consideration the availability of land for outdoor access and potential for environmental pollution, as well as the availability of good quality organic straw for bedding.

6.4 Livestock Feed

6.4.1 & 6.4.2 require that the operator of an organic livestock operation provide livestock with an organic feed ration balanced to meet their nutritional requirements, and that the ration be made up of substances that are necessary and essential for maintaining the animals' health, well-being and vitality while meeting the physiological and behavioural needs of the species in question.

Guidance 6.4
Feed quantity and quality should ensure an optimum body condition score of 3 and should not be less than 2.5 for lactating sows (See appendix for body condition scoring of pigs).

Paragraph 6.4.3a requires that specific rations for young animals take into account the need for natural milk.

Guidance 6.4.3a
Weaning at 8 weeks is recommended provided the health and welfare of sow or piglets is not adversely affected.

Rationale: Stress is less for both piglets and sow. Piglets benefit from increased suckling period, they grow better and mortality is reduced as their immune system is better developed. The earlier the weaning, the more piglets are prone to disease and harmful social behaviour such as tail biting[5]. At 4 weeks, immunity passed by the sow in colostrum is waning and natural immunity is still very immature. Later weaning ensures better health without the need for antibiotics. The gut is better developed and less scouring occurs. Research has shown that sows do not suffer more by longer lactation but overall productivity/sow is less because there are fewer litters. [8]

The risk of sow welfare problems with an 8 week lactation period is greater with modern hybrid breeds with large litters than with heritage breeds which typically have fewer piglets/litter. Sows should be able to lactate for 8 weeks without dropping below a BCS of 2.5 providing they were in good body condition prior to farrowing and the lactation diet provides sufficient energy, protein etc. If sows are regularly in poor body condition by the time the piglets reach 6 weeks, changes to the breeding line or feed ration should be made rather than reducing the weaning age.

Paragraph 6.4.3e specifically mentions the need for vegetable matter other than grain in the ration for pigs.

Guidance 6.4.3.e
Gestating sows fed a low volume diet should have continuous access to straw or other high fibre/roughage to satisfy hunger and the need to chew, and to allow for natural foraging behaviour.[9,5] Roughage intake of 5-10% of total energy can be obtained without compromising daily gain.[8]

Younger pigs and boars also benefit from a bulkier diet and/or forage to prevent behavioural problems resulting from a concentrated diet which leaves pigs feeling constantly hungry.

Ad libitum feeding of a high energy and high protein diet is one of the factors causing leg disorders in fattening pigs. [20]

6.5 Breeding

The standard states that the operator must select breeds and types of livestock suitable for the site-specific conditions of the production system and that are resistant to prevalent diseases and parasites.

Guidance 6.5a

Genetic selection for rapid growth and lean meat has led to leg disorders and cardiovascular malfunction in fattening pigs when in stressful conditions or with high levels of activity. [20] Therefore, care should be taken to choose pig breeds that are suitable for organic production.

6.6 Transport and Handling

This section requires that stress, injury and suffering be minimized in all handling, transportation and slaughter of livestock. In addition 6.6.2 also specifically prohibits the use of electrical stimulation or allopathic tranquilizers.

Guidance 6.6.1

Pigs should be handled quietly and gently, with no pulling or dragging by tail, ears or limbs. [3]

Guidance 6.6.2

Loading and unloading of pigs is extremely stressful for pigs. Facilities should be designed to facilitate quick and easy movement. See Temple Grandin's list of 12 tips for sorting and loading of finishing pigs (Appendix 2) and http://grandin.com/references/handle.pigs.performance.html.

Whenever possible transport in familiar groups to minimize stress. All pigs should be able to lie down during transport without crowding. Scientific literature suggests a space allowance of .425m^2/100kg pig is a suitable compromise between welfare, meat quality and transport economy for journeys longer than 3 hours. This density is also suitable for shorter distances as increased space resulted in the pigs having more difficulty maintaining balance. [13]

Paragraph 6.6.3 states that during transportation and before slaughter the animals must have suitable shelter against inclement weather conditions.

Guidance 6.6.3

Avoid travelling during hottest hours. In hot, humid weather bedding of straw or shavings should not be used. Do not pour cold water on pigs to cool them as the shock can cause death. If temperatures are below 60F/16C straw bedding should be provided and is absolutely necessary below 6-8C. Check the vehicle environment within the first hour of the journey to ensure pigs are comfortable and ventilation is adequate. [1]

In addition 6.6.5 requires the duration of transportation to be as short as possible.

Guidance 6.6.5
Transport time should be under 8 hours whenever possible. If duration is longer than 8 hours water should be available in the transport vehicle. (13)

Guidance 6.6
Feed withdrawal 3-4 hours before shipping reduces travel sickness. (13)
Fasting must not exceed 18 hours prior to slaughter. (3, 9)

6.7 Livestock Health Care

Paragraph 6.7.1 requires the operator to establish and maintain preventative health care practices including, amongst other things, the establishment of practices to minimize the occurrence and spread of diseases and parasites, and conditions that allow for a reduction in stress.

Guidance 6.7.1c
If introducing breeding stock from an outside herd, quarantine for one month and test for diseases and parasites before moving into herd. Farms should have a biosecurity plan to minimize risk of introducing disease from other herds. (9,10)

Guidance 6.7.1.d
High levels of stress make animals more prone to disease as the immune system is impaired. (5)

The operator must also provide prompt treatment for animals with disease, lameness and other ailments. Allowed preventative practices include the use of vaccines for diseases that are communicable and cannot be combatted by other means.

Guidance 6.7.1.e
Provision should be made for the segregation and care of sick and injured animals. Close attention should be given to the condition of the feet. (3)

Guidance 6.7.1.f
Passive immunity transfer is being effectively used as a technique by producers with alternative (outdoor) systems. Methods include keeping pigs in mixed age groups and exposing sows to pathogens prior to farrowing to maximize resistance. This can be achieved by the feed-back of manure from farrowing pens to gestating sows which is effective for exposing stock to gastrointestinal pathogens. (10) Vaccines are recommended for other diseases.

6.7.2 allows physical alterations when absolutely necessary to improve the health, welfare or hygiene of animals, or for identification or safety reasons. Alterations must be done in a manner that minimizes pain, stress and suffering, with consideration given to the use of anesthetics, sedatives and non-steroid anti-inflammatory analgesics. Tail docking of pigs and trimming of needle teeth in piglets is only allowed when necessary to control problems that have a negative impact on the welfare of other animals. Farmers must also document the measures they have taken to eliminate the problem.

Guidance 6.7.2a: Trimming of needle teeth
Research and producer experience indicate that teeth trimming is not necessary but litters should be monitored carefully. If piglets are causing injury a tooth grinder can be used to blunt the tip of the needle teeth. (5, 7) There are fewer problems with smaller litters (<10 piglets) because competition between piglets is reduced and there are less injuries. (5, 9) Piglets with intact teeth have higher weight gains and lower pre-weaning mortality. (14)

Guidance 6.7.2a: Tail docking
Tail docking is not necessary and should not be allowed. Tail biting is related to welfare deficiencies such as overcrowded pens with no bedding to direct foraging and chewing behaviours, or discomfort caused by ventilation problems and temperature fluctuations. Tail biting can be prevented by providing a behaviourally appropriate and comfortable environment; the provision of bedding and sufficient space is most important. Eliminate slatted floors and provide good balanced nutrition. If there is an outbreak the victim and culprit should be isolated and the environment or stocking density changed before resorting to tail docking. (5,7,20) Anecdotal evidence suggests that biting outbreaks can occur when weather and humidity fluctuate greatly e.g. in spring (Malleau pers.com.).

Guidance 6.7.2a
Pigs will spend up to 75% of their time in exploratory behaviour (nosing, chewing and rooting) in a semi–natural environment. In a barren environment pigs are likely to direct this type of behaviour towards companions.(20) To reduce the time spent in harmful social and aggressive behaviour pigs should be given additional stimuli to encourage foraging or other non-injurious activities e.g. by adding bulk to diet, topping up foraging substrate daily, by scattering whole grains. (3) Straw occupies pigs longer than a range of toys and other enrichment objects. (5) Chains, tires and other 'toys' will not redirect behaviour patterns of sows and boars and may cause frustration. Other materials can be added to straw such as chopped beet roots or tree bark and branches. (20)

Social behaviour is highly developed in pigs. Aggression is reduced by keeping sows in small stable groups and by keeping litter mates together.

Guidance 6.7.2c: Castration [6]
Castration causes considerable pain and distress (Weary 98), but leaving males intact can increase the risks of fighting and of boar taint in meat. These risks are lowered if males are marketed at lower weights (well before sexually maturity), but intact males may need more space and special management to avoid aggression. If castrating, the procedure should be performed before piglets reach 2 weeks of age. [1, 9, 7] Castration at older ages requires the use of anaesthetics and analgesia.

In Canada hogs are usually marketed at 106 -125 kg although the tendency is for increased size. Castration is demanded principally to avoid boar taint which occurs at about 90kg or heavier. If pigs can be marketed at lower weights the benefits of not castrating include: up to 13% faster growth, more efficient feed conversion (can be 14 % higher), and 20% leaner carcass.[6] The Soil Association standards prohibit castration –average liveweight at slaughter in the UK is 98Kg (74kg CW).

Cull boars should not be castrated. Tusks should not be removed [2], but can be trimmed if they are growing into the face or to prevent them from harming humans or other pigs. [14]

Guidance 6.7.2.c: Identification
Ear notching within the first week is preferable to ear tags which have a poor retention rate in pigs. Slap tattooing is painful and should be avoided if possible.

RECOMMENDATION FOR ADDITION TO STANDARD:
Nose rings are prohibited

Rationale: Rings inhibit functional behaviours (e.g. foraging and digging out wallows) and result in abnormal behaviours which suggest a degree of reduced welfare. [12] Other strategies for controlling damage to pasture include plenty of space with low stocking density, rotation to give vegetation time to recover, allowing access for only part of the time, and use of breeds that graze more than root e.g. Saddlebacks. [5] However allowing access only part of the time may restrict opportunity for natural behaviour. Research shows 51% of the day is devoted to rooting if pigs are allowed as much freedom as possible. [17]

Paragraph 6.7.4 prohibits the withholding of medical treatment for sick or injured livestock to preserve their organic status.

Guidance 6.7.4
Individual animals in need of medical treatment must be treated to prevent deterioration in health or increase in distress and prolonged or acute suffering. Producers are encouraged to develop a plan for positive health to prevent the need for such treatment.

According to paragraph 6.7.9 there must be a comprehensive plan to minimize internal parasite problems in livestock.

Guidance 6.7.9
Proper bedding management and removal, as well as regular pasture rotations will prevent the build up of parasites. [7] Pigs should only follow pigs on pasture after at least one year break. [10] Climatic conditions will impact the length of rotation. A four year rotation is recommended to reduce problems with parasites or diseases that have an intermediate host such as snails or for parasites that can go into a dormant stage. [16]

6.8 Livestock Living Conditions

Guidance 6.8
The system must be fitted to the animals rather than the animal fitted to the system. [7]

Paragraph 6.8.1 requires the operator of an organic livestock operation to establish and maintain animal living-conditions that accommodate the health and natural behaviour of all animals.

Guidance 6.8.1
Pigs are strongly motivated to graze, forage and root for food, to play, to explore and socialize with herd or litter mates and to build a nest at farrowing. Their environment should enable them to fulfill natural behaviours and maintain stable social relationships. [7] Welfare problems arise due to failure to address behavioural and biological needs which pigs have inherited from wild ancestors. [5,17]

Good animal handling and management practices are key to maintaining good welfare. Farm staff should be observant and knowledgeable of normal and abnormal behaviours, common diseases, and the biological and psychological needs of pigs. [9] Handling skills training to ensure positive human contact will have positive effects on welfare and productivity. [18]

6.8.1a states that the living conditions must include access to the outdoors, shade, shelter, rotational pasture, exercise areas, fresh air and natural daylight suitable to the species, its stage of production, the climate and the environment.

Guidance 6.8.1a

Access to pasture or fields particularly for the breeding herd from spring to fall is encouraged. [7] The herd should have access to pasture for at least 150 days from 15 April to 1 November. [8]

A lactating sow will not gain weight but can maintain weight on high quality legume forage. Pigs will not bloat on alfalfa. Coloured breeds perform better. [11]

Piglets aged 6 weeks and older should have access to the outdoors. [2]

Access is not just an open door, it means providing pens or lots outside the building and ideally pasture. The system should be designed to prevent soil and water pollution.

Outdoor areas must be free of debris, objects, equipment or openings that could cause injury to the animals. [7]

Guidance 6.8.1.a

Choose pig breeds that are adapted to local conditions. [5]

Pigs should be protected from heat stress. For summer conditions, a shaded area to protect from sunburn should be accessible which has sufficient space to allow pigs to lie down simultaneously and to lie apart from each other if they wish to. Wallows, drips, sprinklers or fans should be provided to assist with cooling whenever temperature exceeds 18 degrees Celsius. [3, 9, 1, 7]

a) Steel pipe, smooth wire and electric fencing are the preferred types of field fencing.
b) Electrified barbed wire fencing should not be used.
c) For ranges, sustainable range management practices, such as rotational grazing, should be employed. [9]

For extensively kept pigs during winter a windproof and waterproof shelter must be accessible that has sufficient lying space for all pigs; and an ample supply of dry bedding. [3,9,]

Provide supplemental heat or sufficient bedding when needed for all age groups of pigs so that each group maintains its effective temperature in the appropriate comfort zone. Signs of discomfort are huddling, dunging in eating and sleeping areas, decreased feed consumption, and outbreak of disease (scours). [1] Air movement affects thermal comfort and drafts should be avoided.

Thermal Comfort Range [14]:

kg	°C
5-15	26-32
15-25	18-26
25-60	16-25
60-100	14-25
>100	10-22
Nursing sow	15-24
Litter	30-32 (in creep area)

Animals must also have access to fresh water and high-quality feed according to their needs.

Guidance 6.8.1b

Competition for food should be minimized

a) For ration feeding in a trough there must be enough feeding space (1.1 times shoulder width) for all pigs to feed simultaneously.

b) For ad lib feeding there must be no more than 6 pigs per feeding place when using a dry feeder with no full head barriers between each feeding place;
10 pigs per feeding place when full head barriers; or
14 or 12 pigs per feeding place when there is an opportunity to mix water with the feed (wet and dry feeders).

c) If wet feeding of sows indoors in used, head and shoulder barriers should be erected between each feeding place. [3,9]

When feed is constantly available 5-6' (150 -180cm) of feeder space is recommended for every 2-3 market pigs. [7]

Hunger can be the cause of unrest and aggressive behaviour in group housed gestating sows.[5]
Group floor feeding is not recommended to avoid chronic aggression at feeding times unless it is distributed over a wide area and sows are of similar size with similar feed requirements.[14]

Care should be taken to ensure drinkers are adjusted so that water is accessible for every pig. A flow of 1-2L/min is recommended for lactating sows. [14] There should be one nipple for 1-15 pigs or 6 sows. [1]

In addition, there must be sufficient space and freedom to lie down in full lateral recumbency, stand up, stretch their limbs and turn freely, and express normal patterns of behaviour.

Guidance 6.8.1c

A total floor space 3.5 m^2 /mature adult is recommended for sows (when not farrowing). The space can be less for first and second parity animals. [3] The lying area should be at least equal to the square of the length of the pig. Increased space for gilts reduces foot and leg problems in later life.[1]

The environment should be arranged in such as way that every animal has sufficient space - the space should be arranged that the group as a whole is able to maintain separate eating, lying, and dunging areas. [7,5] Hot weather may require increased floor space requirements to allow for heat dissipation.

Group housed sows must be provided with enough space for a subordinate sow to show submission to one of higher rank. Sows require a meeting distance of 6-7' in order for the subordinate sow to turn aside and avoid conflict [7].

Service pens must be large enough to allow courtship and mating [3]; this should be at least 10.5m^2. [9, SA Standards]

Space allowances must be appropriate for livestock health as well as feed production capacity, soil nutrient balance and environmental impact.

Guidance 6.8.1d
Overcrowding is a risk factor for disease and increases the level of aggressive behaviour. [20] Space allowances should facilitate environmental enrichment.

There must be appropriate resting and bedding areas in accordance with the needs of the animal. The floor must not be entirely of slatted or grid construction and must be covered with a thick layer of dry bedding that can absorb excrement.

Guidance 6.8.1f
For group-housed animals, it is recommended that specific areas be provided into which bullied animals might escape. [1,3] Rest is impaired if pens are overcrowded. [20]

Recommendation for amendment to the standard (6.8.1g)
Delete "The floor shall not be entirely of slatted or grid construction"; replace with "Slatted floors are prohibited"

There is a higher incidence of foot and leg injuries on slatted than on solid floors. [20] These can be caused by feet getting caught in the openings or slippery and rough surfaces.

Guidance 6.8.1g
Bedding is important for physical and thermal comfort and allows pigs to carry out foraging activities; straw provides fibre and can help reduce hunger when fed a restricted diet. Straw is also important in farrowing pens for nest building. [5]

The minimum depth of straw or other materials in non-deep bedded system should be:
for temperatures below 39F - 8"/20cm; 40-59F - 6"/15cm; 60F - 3"/7.5cm [7]

There are economic, social, and environmental benefits to deep bed systems; costs are 40-60% lower than slatted systems, emissions of ammonia are 50% lower and there is a reduction in H_2S and other gases. [5]

Guidance 6.8.1g
Pigs kept indoors should have a lying area of solid construction; bedded to sufficient extent to provide a dry surface. In service pens, the floor area should be dry or bedded to allow adequate footing during service. [3]
If sows spend noticeable amounts of time in a sitting position it is likely the floor is too slippery for sure-footing. [14]

Guidance: Buildings
Interiors of pig buildings, pens, holding crates and alleys accessible to pigs should have no sharp edges or projections that might cause injury. [1]

Inhalable dust should not exceed 10mg/m3 (PM 10 or less) and ammonia must not exceed 25ppm averaged over an 8-hour period. [3,9] Hydrogen sulphide levels must be minimized to allow animals to breathe freely and safely. [7]

Effective ventilation of buildings to avoid high humidity, condensation and drafts is essential as pigs are susceptible to respiratory diseases.[3] Research has found better lung health in organic (outdoor) systems than in conventional, Hansen et all 1999, Feenstra 2000. [8]

Indoor housing should allow animals to experience natural light. [7] Lighting should allow for thorough inspection at any time (100 lux at pig level) and be available for a minimum of 8 hours a day. Artificial lighting should not be provided for longer than 16 hours or the prevailing outdoor day length whichever is longer [9].

A fire plan should be in place; electrical wring must be protected from pigs and heat lamps placed where pigs cannot disturb them.[7]

The standard also requires that outdoor stocking densities be low enough that soil degradation and overgrazing is prevented.

Guidance 6.8.1h
Pigs root and will inevitably cause soil degradation if kept on a permanent site year after year. Rotation with the use of portable structures is recommended, followed by the reestablishment of forage or crops after moving the pigs.

Paragraph 6.8.4 requires cleaning and disinfecting of facilities and equipment to prevent build up of disease organisms.

Guidance 6.8.4
"All-in, all-out" principle of batch rearing should be applied as a preventative measure with facility cleanout and rest period. [2]

Paragraph 6.8.13 states specific requirements for pigs. Sows must be kept in groups except in the last stages of pregnancy and while piglets are suckling. Flat decks or cages are not allowed for piglets. Exercise areas must allow for rooting by the pigs.

Guidance 6.8.13
Group housing should be designed for group sizes of fewer than 9 or more than 25 sows to reduce aggressive interactions. [1] Research has found fighting and mixing challenges have declined as group size increased over 25 and when electronic sow feeders are used. In larger groups they appear to develop a tolerance for unfamiliar pigs. (Banff Pork Seminar Jan 2008) [19]

For communal farrowing and lactation, groups of less than 10 with no more than 5-7 days spread between farrowings works best [10] or a maximum group size of 12 with 8 preferred [7].

A reduced group size means fewer hierarchy positions to settle and less fighting.

It is recommended that the age range of the nursery group be kept tight and to isolate from older animals until the immune system develops. [10]

Pigs must be kept in stable groups with as little mixing as possible [3,14] and they should be of similar body size to prevent bullying. To prevent fighting and injuries a single animal should never be introduced into an established social group. [7] If fighting occurs a plan must be devised to address factors which prevent injury: e.g. environmental enrichment, reduction in stocking density or changes in feeding regime. [3]

Mixing animals into large groups at weaning and subdividing into smaller ones as they grow older minimizes aggression related problems. Ideally keep groups intact throughout grow-finish stage but if mixing is necessary, mix in a neutral pen that is well bedded with straw. [14]

In outdoor systems sows and litters can be separated with an electric fence so piglets mix; the fence is removed after 5 weeks allowing sows to mix. This mimics natural behaviour and reduces stress. [5]

Recommendation for addition to standard: Farrowing crates are prohibited.

Rationale: Farrowing crates (including turnaround farrowing crates) restrict or prevent nest building, proper interaction and ability of get away from off spring. Lack of nesting material will cause stress and impair welfare. Crated sows are more likely to have wounds and skin lesions, and a higher incidence of disease mastitis-metritis-agalactia. [20] There is evidence that gilts are more restless and frustrated and thwarting interactions with piglets makes them more likely to crush or savage young (Hansen & Curtis 1980, Ahlstrom et al 2002). With loose housing weaning weights are higher, and culling rates of weak pigs are lower (Nat. Cmttee for Pig Production 2004). Sows ate more and produced more milk. Free farrowing v crate pig mortality at day 21: 11.3% for free, 12.2 % for crate (Dunn 2002). It is recommended the breeding program select for sows with good mothering abilities.

Some standards (e.g. Quebec, Brazil, Sweden) tolerate crates for short periods (5 days) at the time when piglets are most at risk. However this causes stress because the sow is confined during nesting and farrowing phases. Some recommend crates for 1st pregnancy so the stockperson can provide extra care, but there is more stress at first farrowing so it could be counterproductive. [5]

Guidance: Farrowing

Sows must be settled in to clean, comfortable farrowing quarters before piglets are born. Materials such as grass or straw should be available to allow sows to build a nest. [7]

The size should be determined by the size of the sow and the litter. Sows need space to maneuver so they can coordinate their behaviour with piglets to avoid crushing them [5, Schmid 1991]. Farrowing pens of 3 X 3 m (10 x10) are preferred. [3] When using pens of this size or larger a protected area for piglets must be provided of at least 0.8m^2.

Sows will use pen walls to assist them in lying down. Piglets are at greatest risk in the first 24 hours, therefore it is recommended that at least ¾ of the pen has bumper boards along the edge (25-30cm above the floor; 15-20cm from the wall) to prevent piglets becoming trapped when the sow slides down the wall. (Joe Stookey, pers. comm.).

If the sow is unable to leave the farrowing nest she frequently retains urine and feces, since soiling nest is against nature – this can be stressful. [11, 3]

Sufficient space should be provided in "creep" areas to allow all piglets to lie together in the protected area and move around without difficulty. Creep areas must be provided with supplementary heating to ensure they are thermally comfortable [9] and an easily accessible, separate water source should be provided to piglets.

Natural behaviour patterns indicate the sow and piglets should be placed with other sows into group lactation 7-10 days after farrowing.

Keep noise level and activity to minimum; natural vocalizations contribute to effective nursing. [1]

Guidance: Boar housing

Boars may be raised in individual enclosures, although not in individual stalls which restrict movement [2].

They should not be kept in solitude or isolation so they need to be housed where they can maintain visual and physical contact with compatible animals. [7] Boars can be safely kept in pairs or small groups only if they have been together from a young age and do not show any aggression toward each other. [14]

Guidance obtained from the following documents:

1. Recommended code of practice for care and handling of farm animals Pigs. AAFC Publication 1898/E, 1993.

2. CAAQ Quebec Standard 2007

3. Humane Farm Animal Care. Animal Care Standards PIGS March 2004, Herndon VA, USA

4. Pig Ignorant? A Soil Association Guide to Small Scale Pig Keeping, Soil Association, UK 2004

5. Animal Welfare Aspects of Good Agricultural Practice – Pig Production, Compassion in World Farming Trust, UK. 2005 (recommended reading contains lots of references to original research)

6. EFSA Journal (2004) 91, 1-18 Welfare Aspects of the Castration of Piglets. Scientific report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of the castration of Piglets. (EFSA is European Food Safety Authority)

7. Animal Welfare Approved Standards for Pigs. Animal Welfare Institute. Washington BC 2006-2007

8. Development of organic pig production systems. Hermansen, Larsen & Andersen, (Danish Inst.) 2002. (Livestock Production Science)

9. SPCA Certified – Pig Standards

10. Managing for Herd Health in Alternative Swine Systems: A Guide. Practical Farmers of IOWA and IOWA state university Extension July 2007

11. Considerations in Organic Hog Production, ATTRA'S Organic Matters Series, Lance Gegner July 2001

12. Horrell, Ness, Edwards and Eddison, Feb 2001, Animal Welfare Vol 10 No 1. Use of Nose Rings in Pigs: Consequences for Rooting, Other Functional Activities and Welfare.

13. The Welfare Implications of the Transport of Pigs: the scientific background of current international loading density standards & the scientific background of current international journey duration standards. Bench, et al, CFIA Drafts 2007

14. Canadian Council on Animal Care (CCAC) 2009, CCAC Guidelines on: the care and use of farm animals in research, teaching and testing, Ottawa, ON. Will be available at:
www.ccac.ca/en/CCAC_Programs/Guidelines_Policies/GDLINES/Guidelis.htm.

15. Widowski T & S. Torrey, 2002, Neonatal Management Practices, Swine Welfare Fact Sheet Vol 1,No 6, December 2002, National Pork Board, Des Moines, Iowa USA

16. Animal Health and Welfare in Organic Agriculture, M Vaarst, S Roderick, V Lund and W Lockeretz. CABI publishing 2004

17. D.G.M Wood-Gush & A. Stolba, 1982 Behaviour of pigs and the design of a new housing system, Appl. Anim. Ethol, and other Stolba references.

18. P.H. Hemsworth Human Livestock Interaction in The Well Being of Farm Animals Challenges and Solutions, G. John Benson & Bernard E Rolin Blackwell Publishing 2004; See also P.H. Hemsworth "Targeting human-animal interactions to improve animal welfare and productivity and ProHand for Pork Producers – stockperson training program http://www.animalwelfare.net.au/comm/prohand.html

19. Harold W. Gonyou, The social behaviour of pigs in Social Behaviour in Farm Animals, edited by L.J Keeling and H.W Gonyou, CABI publishing 2001

20. Opinions & reports on pig welfare by Scientific Panel on Animal Heath and Welfare of the European Food Safety Authority 2008. Summary of main conclusions from reports published in 2007, 2005 and 2004 prepared by Peter Stevenson of CIWF

Other research documents
Influence of environmental enrichment on the behaviour, performance and meat quality of domestic pigs, V.E. Beattie, N.E. O'Connell and B.W Moss. Livestock production Science Vol 65, Issues 1-2 July 2000, pages 71-79 concluded growth rates higher, reduced time in harmful social and aggressive behaviour.

Journal of Animal Science 2007 85: 1311-1317 PJ Lammers, MS Honeyman, JW Mabry, and JD Harmon. Performance of gestating sows in bedded hoop barns and confinement stalls – groups in deep bedded barns with individual feeding stalls perform comparably to confinement with individual stalls.

Proceedings:
Harold W. Gonyou 2005 Alternatives to Gestation Stalls: Experiences at the Prairie Swine Centre, Saskatoon. Proceedings of Manitoba Swine Seminar 2005
Harold W Gonyou 2007 Indoor Gestation Systems for Group Housed Sows, Sow Housing Forum, Des Mines Iowa June 2007

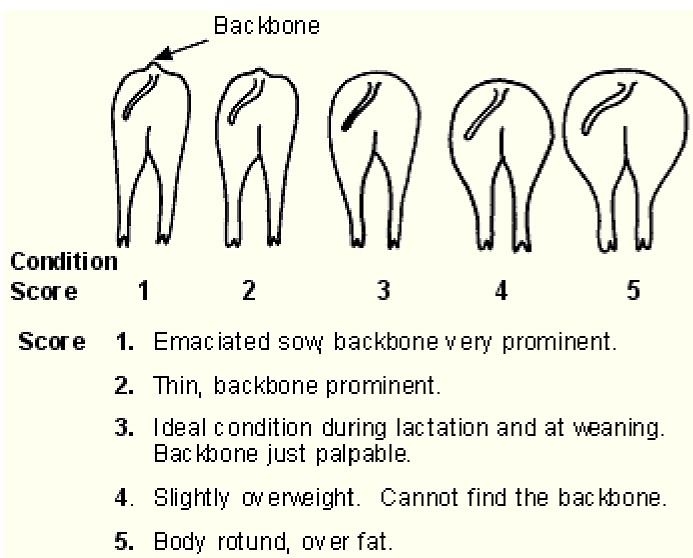
Appendix 1: **Body Condition Scoring in Pigs**

Extracted from Garth, Pig Stockmanship Standards*

written by Dr John Carr, Iowa State University

Score Number	Condition	Description	Shape of body
5	Overfat	Hips and backbone heavily covered	Bulbous
4	Fat	Hips and backbone cannot be felt	Tending to bulge
3.5	Good condition	Hips and backbone only felt with difficulty	Tube shape
3	Normal	Hips and backbone only felt with firm palm pressure	Tube shaped
2.5	Somewhat thin	Hips and backbone felt without palm pressure	Tube shaped but flat (slab) sides
2	Thin	Hips and backbone noticeable and easily felt	Ribs and spine can be felt
1	Emaciated	Hips and backbone visible	Bone structure apparent (ribs and backbone)

Condition scores from left to right, 1: 2: 3: 4: 5



From: Managing Pig Health and the Treatment of Disease

Back fat meter may be more useful. However, note condition score and back fat correlation differs between different breeds.

Appendix 2: **Tips for Moving and Loading Finishing Pigs**

From: Handling Pigs for Optimum Performance on the Farm and in the Slaughter Plant

Updated December 1999, Temple Grandin

1. When loading finishing pigs, move very small groups of 5 to 6 at a time.
2. Do not store large groups of finishing pigs in an alley or holding pen. This will lead to damage caused by fighting. It is best to take each small group of pigs immediately from the finishing pen to the truck.
3. New finishing buildings should have a 3-foot (1 m) wide alley. This is wide enough to allow 2 pigs to walk down it side by side. If a building has a 2-foot (.75 m) alley, only three pigs should be moved at a time.
4. Do not overload the trucks. Overloaded trucks, especially during hot weather, are a major cause of high death losses.
5. Do not allow pigs to stand in a fully loaded truck, get moving immediately. Heat builds up rapidly in a stationery vehicle.
6. In winter, use straw for bedding. In extremely cold weather, straw provides the best insulation and helps prevent frostbite. Observations in packing plants indicate that trucks with inadequate bedding are more likely to contain frost bitten pigs.
7. When there is high heat and humidity, it is best to transport pigs very early in the morning and at night. Stocking density should be reduced.
8. Schedule trucks so that pigs can be unloaded promptly at the packing plant.
9. Minimize the use of electric prods. Electric prods should not be used in the finishing barn.
10. Calm pigs are easier to sort and separate then excited pigs. Pigs are easier to sort if the handler moves slowly and deliberately and separates the desired pigs from the group on the first attempt. Excited pigs stick together and are more difficult to separate.
11. If pigs refuse to leave the finishing building, try shutting off the ventilation or reversing it. Pigs often balk if air is blowing in their faces as they exit the building.
12. To make pigs flow more easily out the door of a finishing building, attach plywood to the last 16 feet (5 m) of pen near the door. This will prevent pigs which are being driven out of the building from seeing or touching pigs which are in pens near the door. After loading, the plywood should be removed because it will interfere with ventilation flow through the pens.