ANIMAL WELFARE (Pigs) CODE OF WELFARE 2010

REPORT

Introduction

1. The Animal Welfare (Pigs) Code of Welfare 2005 has been reviewed by the National Animal Welfare Advisory Committee (NAWAC), pursuant to the Animal Welfare Act 1999 (the Act). This report accompanies the draft Animal Welfare (Pigs) Code of Welfare 2010 (the Code) recommended by NAWAC to the Minister, as required by section 74 of the Act.

   The report notes:

   - the reasons for NAWAC's recommendations;
   - the nature of any significant differences of opinion about the Code, or any provision of it, that have been shown by the submissions; and
   - the nature of any significant differences of opinion about the Code, or any provision of it, that have occurred within NAWAC.

   In providing this report, NAWAC notes that it fully considered all submissions it received and reviewed relevant scientific literature, and that there was debate among NAWAC members on many points. This report is not required to, and does not attempt to, show every detail of the analysis and discussions that took place.

2. There are a number of minimum standards where the animal welfare implications are self-evident and require no explanation for their inclusion. NAWAC has decided that it will not provide comment on these minimum standards or recommended best practices, but will provide explanations on minimum standards which it believes are complex or controversial or on which it received submissions with significant differences of opinion. Minimum standards as drafted may have been amended for a number of reasons, including to make them legally robust, to ensure a more effective coverage of the issue, or to change from a recommended best practice to a minimum standard (or vice versa).

3. It should be noted that the Act does not define "significant differences". While there were a variety of opinions expressed in the submissions, NAWAC did not consider that all differences necessarily represented significant differences of opinion. NAWAC has taken the view that significant differences are either where there are large numbers of submissions which are contrary to a minimum standard in the Code, or where a submission puts forward a justification based on scientific evidence or good practice for a different or alternative minimum standard. NAWAC notes that some individuals or organisations may interpret "significant differences" in a way that varies from the NAWAC view.

4. The Code applies to all persons responsible for the welfare of pigs in all types of management systems regardless of the reasons for which they are kept.

5. When the Animal Welfare (Pigs) Code of Welfare 2005 was released, NAWAC indicated that it expected to review the code in 2009. The specific issues for review were the use of gestational stalls and farrowing crates. In 2004, NAWAC considered that the use of

gestational stalls and farrowing crates for extended periods did not fully meet the obligations of the Act by constraining normal behaviour and used exceptional circumstances provisions of the Act (s73) to restrict the period that sows may be contained in them.

6. When developing the code in 2005, NAWAC considered all the current evidence for and against various production and housing systems, as well as the public submissions received. However, due to a lack of scientific evidence for or against the use of sow stalls and farrowing crates, NAWAC stated that it wished to see further research into alternative housing systems, their impact on the welfare of pigs and ways and means that negative impacts can be managed.
7. NAWAC has reviewed the world's scientific literature so that it is fully aware of the latest research and developments in pork production systems, both from New Zealand and internationally. The information will be part of the considerations that take place, along with current good practice, available technology, international trends and practices, practicality and economic effects of any change.
8. At its meeting on 20 May 2009, NAWAC developed a plan for the code review in order to meet the desire of the Minister of Agriculture who asked the committee to make this code a priority.

Code preparation and public submissions

9. The Act allows for the review of a code of welfare by NAWAC. In addition, as required by the Act, representatives (including farmers, veterinarians and welfare organisations) of those likely to be affected by the Code were consulted during the review and before public notification.
10. NAWAC wishes to point out that it decided not to make any final decisions on the Code until it had received submissions. The Code is required to be publicly consulted, and for NAWAC to come to any conclusion prior to this consultation would have meant that NAWAC was not following due process by acting in a predetermined manner.
11. The Code was publicly notified on 3 March 2010 by notices in the major newspapers in Auckland, Wellington, Christchurch, and Dunedin. In addition, it was sent to specific interested groups. The closing date for submissions was 16 April 2010.
12. A total of 310 full submissions were received during the public consultation period. In addition 14,464 SAFE postcards and 4,232 emails with the same message, 321 Green Party E-cards, and another 214 form letter emails were received. All submissions were read in their entirety and taken into account. A summary of the submissions received on the draft Code was prepared and NAWAC's responses to the submissions were noted.
13. All submissions were carefully considered by a subcommittee of four members appointed by NAWAC to review the Code. The subcommittee reviewed the Code in detail and all the submissions received on it. The subcommittee met for three full day meetings on 24 May, 16 June and 5 July and teleconferences on 10 May and 28 July. Throughout the period the Code was under review, subcommittee members worked in collaboration by phone, email, and in consultation with MAF Animal Welfare Directorate staff.

14. The membership of the subcommittee also visited pig production operations and consulted with the industry (NZPork) and veterinarians (NZVA Pig Veterinary Society). The subcommittee reported the Code back to NAWAC on 18 August 2010 for final consideration and approval for recommendation to the Minister. The Code was peer reviewed by Dr Hans Spoolder, an international pig welfare expert.

New Zealand Pig Industry

15. The New Zealand pig industry is described as small and contracting. As at October 2009 there were some 32,000 breeding sows and mated gilts in a total population of nearly 380,000 pigs.

16. In 2002, there were 360 farms (Statistics New Zealand, 2002), but New Zealand currently (2010) has 204 registered pig farms, of which 174 have sows; the other 30 farms buy in weaner pigs for farming through to slaughter. There are approximately 32,000 sows on the 174 farms. Scale is variable with 30 farms having less than 10 sows; 33 have between 10 and 49 sows; 129 have 20 sows or more. The fourteen largest farms with over 500 sows each have about one third of the total sow numbers. Around 75 farms run 18,000 sows outdoors or in groups. Just over 690,000 pigs were produced in 2009, which is a decrease of 10% from in 2008.

17. Each year, New Zealand consumes about 20kg of pork per capita, totalling about 86,000 tonnes. Approximately 46,000 tonnes (55%) of this pork is produced domestically. However nearly 40,000 tonnes (45 %) is imported, and import volumes have doubled over the last ten years. The majority of imported pork originates from Canada (35%), Australia (24%), USA (21%) and Scandinavia (20%). Domestic pork consumption fell from 2008 to 2009, while the amount of imported pork consumed per capita in New Zealand increased over the same period to stabilise the consumption of pork at 86,000 tonnes per annum. Import volumes have been steadily growing over the last ten years. Virtually all the imported pork is either imported frozen and further processed in NZ or imported as processed off-shore. Most ham and bacon consumed in NZ is now imported.

18. The industry generates in excess of $188 million p.a. at the farm gate, most of which is retained by local communities through employment, service and support industries (New Zealand Pork Industry Board, 2009). After a rapid rise in farm gate prices for pork in mid-2008, prices fell equally rapidly in mid-2009 and the average price for pigs in September 2009 was lower than that in September 2008.

19. Pig production is especially susceptible to grain prices as feed accounts for about 70% of running costs (labour is next largest at 10-12%). Grain availability is affected by factors such as demand for biofuels, and by the exchange rate (New Zealand Pork Industry Board, 2008). While 2007-08 was a difficult for producers (high grain prices meant, for a period, losses of $50 per pig) there is now increasing confidence in the industry. The decrease in demand for pork seems to have stabilised and the future is based on growing demand for fresh pork. Country-of-origin labelling, New Zealand's increasing Asian population, and biogas treatment of waste are all expected to further contribute to the industry and local economies.

Key issues

20. The following key issues represent the significant concerns raised from the public consultation on the draft Code.

- Scope of the Code
  Should this Code include example indicators?

  How does this code balance physical, health, and behavioural needs?

- Food
  Why is competition for food a welfare concern?

  Why must colostrum be provided within 24 hours of birth?

- Shade and shelter
  What measures should be taken to enable pigs to cope with climatic temperature extremes?

- Housing
  What should the minimum space allowances be for growing pigs?

  What should the minimum space allowances be for sows, gilts and boars?

- Temperature
  Should heating devices be provided for all piglets following birth?

- Behaviour
  What sort of system would enable pigs' behavioural requirements to be met?

- Farrowing sows
  What are the normal patterns of behaviour for a farrowing sow?

  What are the options for housing of farrowing sows?

  What can be done to improve the welfare of piglets in different systems?

  What can be done to improve the welfare of the sow in the farrowing crate?

  How long should sows be in farrowing crates?

- Managing Dry sows
  What are the normal patterns of behaviour for a dry sow?

  What are the main welfare risks to pregnant sows?

  What is the optimal system to house sows during the weaning to oestrus interval?

  Does housing in dry sow stalls meet the minimum requirements of the Act?

  What are the feasibility and practicality issues of phasing out dry sow stalls?

  What would the economic effects be of phasing out dry sow stalls?

- Weaning
  From a welfare perspective what is the optimal weaning age?

- Elective Husbandry Procedures
  Why should elective husbandry procedures be carried out on a routine basis?

21. **Scope of the Code**

(a) ***Should this Code include example indicators?***

NAWAC has concluded that a minimum standard should, as far as possible, describe the intended welfare outcome for the animal and be capable of measurement or assessment. Minimum standards need to be formulated in a way that does not stifle innovation and they must remain relevant in an environment of constant change. There are several challenges to developing standards that achieve welfare outcomes consistent with current scientific thinking, meet societal expectations for the welfare of animals, are readily understood and accepted by those who must abide by them while ensuring that welfare is assured, and are effective tools for those who have to ensure compliance with them. NAWAC believes that these objectives are most easily achieved by writing codes that focus on defining welfare outcomes for animals based on known needs in a manner that requires those outcomes to be delivered, rather than prescribing the facilities and management systems that should be provided.

Example indicators that may be used to measure or assess the achievement of the intended outcome have been provided in a separate table (NAWAC, 2009) and NAWAC believes that their inclusion here is appropriate.

NAWAC believes codes that employ outcome-based statements of expected animal welfare with each outcome accompanied by one or more example indicators by which achievement of the outcome can be measured or objectively assessed are likely to be more readily understood by the public as they relate more directly to the public's expectations than facilities-based regulations. They can be applied to animals raised in a range of production systems without the need to specify necessary inputs. They afford owners/producers the opportunity to use their own expertise, experience, available technology, and judgement to meet the standard, rather than having an operational standard imposed.

(b) ***How does this code balance physical, health, and behavioural needs?***

While the Animal Welfare Act does not provide for trade-offs between the physical, health and behavioural needs as defined in s4 of the Act, it qualifies needs by referring to a case-by-case application according to the species, environment and circumstances of the animal. NAWAC acknowledges that, in general, balancing between the needs of animals is inevitable in order to arrive at an overall optimum welfare outcome because the requirements to satisfy each need may be in conflict. This code provides NAWAC's view as to what constitutes the acceptable range of "needs" in the environment and circumstances of pigs.

22. **Food**

(a) ***Why is competition for food a welfare concern?***

Submissions outlined concerns in regard to the necessity for pigs to be provided with sufficient feed to satisfy their requirements (in terms of providing them with the correct nutrients for good health and satisfying their appetite) and use appropriate feeding methods to reduce competition for feed and resulting levels of aggression between conspecifics.

Food is commonly restricted to gestating sows as excessive weight gain and obesity in sows can lead to a number of health problems and related issues with reproduction (D'Eath et al., 2009). The level of feed provided to gestating sows is usually about 0.4 to 0.6 of the voluntary intake (Pethrick and Blackshaw, 1989) and is provided in one or two meals, which the sows consume rapidly. This restricted feeding level may not meet the sows' requirements to satiate their appetite and they may experience hunger and may also become aggressive or develop stereotypic behaviour as a result of redirecting their requirements to perform feeding behaviour (see Mason and Latham, 2004; Rushen et al., 1993; Wiepkema et al., 1983; Bergeron et al., 2008). Moreover, aggression affects each individuals' access to feed and feeders and high-ranking animals often dominate lower-ranking individuals (Chapinal et al., 2008) which can lead to the lower ranking individuals becoming undernourished and losing condition (Kongsted, 2006).

There are a number of different methods that can be used to feed pigs including floor feeding, the use of trickle feeders, feeding stalls, and computerised or electronic sow feeders. All systems have advantages and disadvantages in terms of costs and level of knowledge and skill to operate them. They also differ in the way they protect pigs from feeding related aggression. The best system for use in a particular situation will require research and investigation prior to installing.

An alternative management strategy to reduce competition and aggression for feed is to increase the amount of roughage/fibre in the diet, which adds bulk to the feed, but doesn't result in an increase in sow bodyweight. Group-housed sows fed an unrestricted amount of high-fibre diet were generally less active (and by inference more satisfied) than those with access to a restricted amount of low-fibre diet (Zonderland et al., 2004). Lower levels of aggression were also found in groups of floor fed sows receiving a high fibre diet, compared to a conventional diet (Whittaker et al, 1999), as long as they were housed on barren floors. Straw covered floors had the opposite effect.

Rauw et al. (1998) argued that domesticated animals have been bred to be hungry – selection for faster growth and larger animals perhaps altering, even damaging, the brain's satiety mechanisms leading to a failure to diminish the hunger drive. Hunger and biological performance and optimal sow welfare may therefore require different levels of feeding.

NAWAC therefore considered it appropriate to include minimum standards requiring all pigs to receive sufficient food to meet physiological demands and maintain good health, and the use of appropriate management strategies to prevent unnecessary feed related competition and injury.

(b) ***Why must colostrum be provided within 24 hours of birth?***

Most submissions agreed with the inclusion of a minimum standard stating that piglets must receive colostrum as soon as possible after birth or that, if required, fostering or a colostrum substitute should be provided instead. Ensuring that a piglet receives colostrum during the first day of life is vital to its welfare and well-being, since the colostrum contains maternal antibodies which are passed on to the piglet and provide immune protection for the pig (Holland, 1990). If piglets are receiving inadequate nutrition from a lactating sow, then the timing for piglet fostering is critical and it should be carried out within 24hrs of the sow farrowing (Horrell, 1982) as at 24-36 hrs of age, the ability of the intestinal epithelium

to absorb the antibodies is severely decreased (Ekström and Weström, 1991). Failure of the piglet to receive colostrum within the first 24 hours of its life will severely decrease its chances of survival (Svendsen, 1992).

NAWAC considered it important to include a minimum standard stating that piglets must receive colostrum (or a substitute) within 24 hours of birth and that fostering, if required, must be carefully managed to ensure that this is achieved.

23. **Shade and Shelter**

(a) ***What measures should be taken to enable pigs to cope with climatic temperature extremes?***

Submissions outlined concerns in regard to appropriate shelter, in particular, for outdoor housed pigs, and requested that shelter in the form of sheds/farrowing arks, with clean and dry bedding, be provided at all times. Information in relation to the behavioural indicators of heat and cold stress in pigs were also requested to be included within the Code.

The maximum and minimum temperatures that define a sow's thermal comfort zone will vary according to the individual's age, type, the group size, floor type and wetness, energy intake and other factors (Charles, 1994). Sows can be kept in temperatures that are below their thermal comfort zone but, to thrive under these conditions, they must be given alternative means to enable them to thermoregulate, such as additional bedding and/or the provision of additional feed.

Adverse climatic conditions can cause chronic stress which, in turn, as well as being detrimental to an animal's welfare, can also affect reproductive success (Spoolder et al., 2009). Pigs showing signs of heat stress may be at risk of physical damage and distress (Stansbury et al., 1987) and, to prevent harm occurring, management systems must be put in place to prevent this occurring. The provision of shelter for pigs housed outdoors enables them to thermoregulate effectively, and escape from the sun if necessary, to prevent them becoming sunburned.

Exposing pigs to cold environmental conditions can lead to cold stress and maintaining pigs at a low temperature can have deleterious effects on health such as increasing the incidence of coughing, diarrhoea and tail biting (Sällvik and Walberg, 1984; Geers et al., 1989). A reduced environmental temperature has also been shown to have detrimental effects on the milk intake of piglets following birth (Le Dividich and Noblet, 1981). Straw supplied on the pen floor helps pigs to maintain body temperature close to the thermoneutral zone.

NAWAC has therefore included a minimum standard stating that all pigs (irrespective of the housing system used) must be provided with the means to assist them to thermoregulate effectively, enable them to minimise the effects of adverse weather and avoid heat or cold stress. Behavioural indicators that may suggest that a pig is cold or heat stressed have been included in the example indicators.

24. **Housing**

(a) ***What should the minimum space allowances be for growing pigs?***

Information on the spatial requirements for pigs was included in the General Information section of the public draft of the code. Generally the submissions considered that standards

should be set for space requirements, however suggestions about the amount of space that should be provided varied substantially. Some submitters stated that pigs should be given sufficient space to enable them to perform natural behaviours such as lying on their side without touching another pig, standing up, turning around and performing exercise, space for separate areas for dunging and feeding, with a dunging area situated a sufficient distance from sleeping and feeding areas as well as materials to enable them to root and forage. Other submissions stated that the current spatial requirements are sufficient and should not be increased and that the current allowance does not compromise the welfare of the pigs. There were also concerns raised by producers and the industry over the potentially very large financial implications of requiring increased space for growing pigs than is current industry practice. NZPork stated that increasing the space requirements is likely to increase the number of shifts required for pigs and thus increase the welfare concerns that can arise from such shifts such as inadequate cleaning and disinfection of the pens between moves, additional stress inflicted on the pigs as a result of the moves and an increase in the challenge of maintaining disease control.

Animals can be said to have three types of space requirements: static, dynamic and interaction requirements. The static space represents the amount of space a pig requires in relation to its size; the dynamic requirement refers to the pig's static space requirement plus the additional space it requires for movement (Curtis et al., 1989) and the interaction space refers to the space it requires to enable it to perform social interactions.

The static space required for housed pigs can be calculated using the equation: Area (m^2) per pig = k x liveweight $^{0.67}$. This formula gives an indication of the 'footprint' of a pig that is lying down (without sharing space with another pig). EFSA (2005) opinion was that the minimum space allowance should be k=0.036 in the temperature comfort zone. Gonyou et al. (2006) found a k- value of between 0.032 and 0.035 provided optimal growth performance. Ekkel et al. (2003) calculated that lying pigs require an average space equal to k=0.033. More recently Averós et al. (2010) recommend a threshold k-value of 0.039 for slatted floors and almost double that for non-slatted floors. They further suggest that the ability to rest as space availability decreases may be compromised before a reduction in performance becomes apparent.

Current New Zealand practice and Australian requirements are based on a value of k = 0.030. This is the space allowance which Edwards et al. (1988) found lead to optimal performance on slatted systems. This was then adopted in the form of a banded system by EU Council Directive 91/630/EEC (c.f. Spoolder et al., 2000) which recommends a particular space allowance related to their particular weight band. The k value varies between k=0.019, which is static space for growing pigs that are lying in a sternal position (on its belly), and a value of k = 0.047 which will allow a pig to lie fully recumbent (on its side) (Petherick, 1983).

Submissions received by pig farmers and industry representatives during public consultation indicated that there would be significant cost associated with increasing the space available to growing pigs in high-density commercial piggeries. There has been little formal analysis of the financial or economic cost of increasing space for growing pigs. Preliminary modelling by MAFBNZ suggests that the impact of increasing space for growing pigs would have a similar impact on pork producers as the proposed ban on dry

sow stalls, i.e. about a 4.5% increase in price and a 4.8% decrease in the quantity of pig meat produced.

Growing pigs are usually kept in the same group from weaning through to finishing, and during that time will have one or two shifts to larger pens. It is as the pigs are approaching a size when they will be ready to be moved to a larger pen, that space will become constrained. Once they are shifted on to the next stage of their growing cycle (a larger pen that will accommodate them for the next few weeks) the space available will increase. NAWAC therefore made the decision that the minimum space that each growing pig requires can be calculated using the formula Area (m^2) per pig = 0.03 x liveweight $^{0.67}$ (kg). This space allowance has therefore been included as a minimum standard. For most of the growing cycle, pigs will have more space than that required by the minimum standard.

NAWAC believes more space is required to provide for all pigs movement and social needs, and has therefore included a recommended best practice and other statements within the code encouraging farmers to provide more space.

In addition, above 21˚C, pigs require more space to be able to lose heat and maintain their body temperature. In warmer environments pigs choose to lie further away from conspecifics and display less huddling behaviour in an attempt to remain cool. Therefore at higher temperatures, pigs require additional space to enable them to thermoregulate effectively (Huynh et al., 2005). Therefore, the formula for pigs to be able to lie fully recumbent (Area (m^2) per pig = 0.047 x liveweight $^{0.67}$ (kg) has been included as a recommended best practice. In addition providing more space is included as one of the measures to reduce overheating of pigs, in the housing temperature section.

(b) ***What should the minimum space allowances be for sows, gilts and boars?***

Submissions for sows, gilts and boars reflected those for growing pigs stating that pigs should be given sufficient space to enable them to perform natural behaviours to move, perform exercise, standing up and turning around, lie down simultaneously and perform other natural behaviours.

Currently, the appropriate space allowance or optimum group size for sows in group housing systems is unknown. There is a lack of knowledge about the minimum amount of space required to allow sows to express normal behaviour and to perform behavioural interactions such as moving, exploring and socialising with conspecifics. However, scientific evidence has shown that insufficient space in group housed sows increases the consequences of aggressive behaviour at mixing and induces chronically raised cortisol levels (Barnett et al., 2001) as well as causing a higher incidence of skin lesions particularly on the feet and legs. These injuries can be inflicted by contact with pen fittings or flooring, or non-agonistic interactions between individuals such as gilts stepping on each other (Harris et al., 2006).

NAWAC added information within the code stating the static requirements for growing pigs, but did not specify a space allowance in the minimum standard for gilts, sows and boars as the optimum amount of space that each pig requires is dependant on a large number of factors including the group size, the age of the animals and the ambient temperature. Guidance has been provided in this respect within the general information,

where it is noted that all relevant factors should be taken into consideration when determining the amount of space to be provided for each pig.

25. **Temperature**

(a) ***Should heating devices be provided for all piglets following birth?***

Public submissions supported the need to maintain an appropriate environmental temperature for piglets. Studies have shown that the rectal temperature of piglets following birth had an effect on survival, with piglets that died pre-weaning having lower birth rectal temperatures (Herpin et al., 2002a). Piglets differ in their abilities to thermoregulate at birth (Herpin et al., 2002b; Baxter et al., 2008) and to display the strength to obtain nutrition from the mother (Baxter et al., 2008). Within the first hour after birth, thermoregulation is compromised in all piglets as a result of the evaporation of the placental fluids and subsequent cooling. Susceptible piglets cannot recover from this initial temperature drop and may fail to suckle, leading to fatigue and starvation, leaving them with a highly increased chance of being crushed by the sow (Weary et al., 1996c; Baxter et al., 2008).

NAWAC has therefore included minimum standards that will ensure that piglets are given the opportunity to thermoregulate effectively following birth.

26. **Behaviour**

(a) ***What sort of system would enable pigs' behavioural requirements to be met?***

The concept of providing animals with the opportunity to display normal patterns of behaviour is one of the main provisions around which the Animal Welfare Act 1999 is based. In addition to their physiological (e.g food, water and thermal comfort) and health needs, animals also have behavioural needs (e.g rooting or nest-building). A 'behavioural need' can be viewed as a motivation to perform species-specific behaviours. Preventing an animal from performing a certain behaviour in a particular situation might cause suffering and reduced welfare.

If the management system used to house animals causes unavoidable problems and prevents them performing natural behaviours that are important to their welfare, however good the care of the animals is, their welfare will be compromised. The pig is a social animal and the welfare of social animals deprived of social contact, or of confined animals deprived of exercise or opportunity to groom, is compromised however well the animals are cared for in those systems.

The behavioural repertoire of a pig includes standing, lying in various positions, walking to resources even at times when all other pigs are lying, exploration, thermoregulation, dunging and interacting socially including avoidance if attacked (EFSA, 2005). These behaviours relate to different biological functions and motivations which were relevant to the living conditions of wild boar and remain relevant to pigs in modern husbandry conditions.

Stolba and Wood-Gush (1984) aimed to define ethologically minimal housing conditions in which pigs can satisfy their behavioural needs. They concluded that key features included keeping pigs together with conspecifics in a stable social unit in a sheltered nest site with feeding, dunging and rooting areas away from the nest site. To enable pigs to be able to perform their natural behaviours they should also be provided with sufficient space and

environmental enrichment which will enable them to perform the species specific natural behaviours as desired. Close confinement, lack of bedding and food restriction prevent the performance of behaviours that may be important to a pig's welfare and impoverishment of the environment in the intensive housing system may lead to redirected exploratory and foraging behaviours. By providing piglets with the opportunity to express appropriate behavioural and mental activities, the frequency and intensity of aggression can be reduced, as can the degree of boredom, stress and the risk of injuries, without negative effects on growth performance (Puppe et al., 2008).

Rooting and exploration are behaviours that pigs are very motivated to perform. The provision of appropriate environmental enrichment is mandatory across the European Union (Council Directives 2001/88/EC and 2008/120/EC and Commission Directive 2001/93/EC) and requires that pigs are provided with a sufficient quantity of high fibre food and permanent access to manipulable material so that they have the opportunity to perform this behaviour and hence reduce the occurrence of bar biting and other redirected rooting and feeding behaviour.

NAWAC believes that the performance of normal behaviours should be catered for as far as possible and has included a minimum standard that pigs must managed in a manner that provides them sufficient opportunities to express and satisfy their normal behaviours. The housing system in which pigs are kept should also reflect their requirements as social animals and to live in groups, to vocalise, root, chew and perform other forms of oral and nasal stimulation. If pigs are provided with relative freedom, the choice of movement and the ability to perform a range of behaviours as they do in the wild, it is likely that their welfare will be enhanced.

NAWAC recognises the advantages of providing manipulatory material, such as straw, on the floor of housing systems to enable pigs to increase their physical and thermal comfort and to enable them to express behaviours such as rooting and exploration. NAWAC would prefer to see advances made toward systems where straw can be provided to increase the welfare of pigs. However, a large number of housing systems used within New Zealand cannot currently cater for the presence of straw and other manipulable material due to the inability of the drainage systems to cope with this material. Hence, the provision of manipulable material has not been included as a minimum standard within the Code except for farrowing sows (see Section 27). However, provision of material that will enable pigs to perform rooting and exploration behaviours is important to ensure their good welfare and so this has been included as a recommended best practice.

27. **Farrowing Sows**

(a) ***What are the normal patterns of behaviour for a farrowing sow?***

Submissions expressed concern about the space allowed for sows when housed in farrowing crates and the provisions made for them to express their natural behaviour.

When farrowing and nursing in the wild, the sow leaves the herd and isolates herself for 1-2 days before farrowing (Stolba and Wood-Gush, 1994). She looks for a nest site with some shelter and dry and smooth ground. She roots a shallow hole and rips small branches and grass, collects and arranges these to form a nest, and then farrows. She stays with the litter

for 7-10 days, then walks to join the other maternal groups with litters. She will wean her own litter at about 15-20 weeks.

The motivation to move around and build a nest before farrowing has been shown to still be very strong in domestic sows (Jensen, 1993). Nest building behaviours are performed even in the absence of nest building materials and if hindered may lead to the performance of bar biting stereotypies (Lawrence and Rushen, 1993). Providing the sow with an already built nest does not fulfil her needs as she is motivated to perform the behaviour involved in creating the nest (Arey et al., 1991). In addition to the occurrence of stereotypies, restrictions in nest building behaviour result in restlessness, frequent posture change, increased stress and prolonged duration of farrowing (Thodberg et al., 2002; Verhovsek et al., 2007). The provision of straw for a farrowing sow has been shown to stimulate activity during nest building (Thodberg et al., 1999), reduce the risk of piglets being crushed (Damm et al., 2010; Herskin et al., 1998), make sows calmer during parturition (Herskin et al., 1998) and benefit maternal behaviour after farrowing (Tuyttens, 2005).

Nesting behaviour is the most critical element of farrowing behaviour for the sow's welfare. The ability to display these behaviours also improves reproductive performance and piglet viability. NAWAC has therefore recommended that manipulable material must be provided in any new farrowing systems and promotes as best practice that nest building material is provided for all sows.

(b) ***What are the options for housing of farrowing sows?***

Farrowing Crates

The predominant form of housing for the farrowing/lactating sow is the farrowing crate. In New Zealand, 76 % of sows are farrowed in crates, but only 68 % are held in crates until weaning (Gregory and Devine, 1999). The farrowing crate was first introduced in the 1960's to reduce piglet mortality and to make the most efficient use of housing space. Prior to that, farrowing/lactating sows were housed indoors in straw bedded pens, outdoors in straw yards or outdoors in paddocks in pasture-based systems. An estimated 41% of sows in New Zealand are now housed outdoors (McIvor pers. comm. 2010), however some of them may also farrow in crates. A small number of farms may also utilise farrowing pens, which historically in Europe and in the early days of New Zealand's pig industry, were the main form of farrowing housing.

Farrowing crates are aimed at providing a hygienic environment for sows and litters whilst making management as easy as possible. The crate is used to control sow movement which reduces the risk of crushing piglets, and heated creep areas are provided to allow optimal temperature control for piglet comfort and growth. Crates also protect the stockperson from sow aggression, allowing free access for litter management tasks. Farrowing crate systems therefore provide pig farmers with good working conditions and the piglet mortality rate from crushing is minimised. However, the crates impose restrictions on sow behaviour and have been shown to increase stress and the duration of farrowing (Hansen and Vestergaard, 1984; Biensen et al., 1996; Verhovsek et al., 2007).

There are many farrowing crate designs in use. Some are commercially available models while others are homemade or are adaptations of purchased models. The most common

have bowed or finger rails and slatted flooring. Variations include those with hydraulics and moveable floors.

There is currently no single alternative farrowing system that meets all the welfare aims and has commercially acceptable levels of performance. Sow and litter productivity can be as good or better in some alternatives when compared with the farrowing crate. However, these alternatives generally require more space than farrowing crates.

Farrowing Pens

In the farrowing pen system, sows are able to turn around and they can express a higher level of maternal behaviour than in crates, but piglets are more prone to being killed by crushing.

Many farrowing pen designs are in use internationally. They often have piglet protection bars around the walls and the sow is restrained during parturition by a hinged gate and the pens can also be used as weaner pens. Floor space is limited and many pens are designed with fully slatted floors to maintain a high standard of hygiene. Larger pens are required for systems that use deep litter in a separated lying area and these require a higher labour input. Production figures indicate that many farrowing pen designs perform as well as farrowing crates, and capital costs are often similar for both systems. Although this system generally results in higher piglet losses through crushing, there are often fewer stillbirths and results from both Denmark and Switzerland, where group housing systems are utilized, have shown that keeping sows loose in individual farrowing pens does not increase piglet mortality compared to housing in farrowing crates (Andersen et al., 2010).

Many scientific reports show that farrowing pen design is of high importance for the performance of the sow and piglets at farrowing and lactation. The provision of a ‘creep’ area, where piglets can lie separate from the sow can help to prevent excessive piglet crushing (Verhovesk et al., 2007) and is often provided in these pens, although problems have been encountered when trying to encourage piglets to use this area during the first 2 days of life, as the piglets prefer to remain close to the sow at this time (Andersen et al., 2010). The addition of floor heating has positive effects on piglet physiology, behaviour and survival (Malmkvist et al., 2006; Pedersen et al., 2007). Designing pens with a nest area in which the piglets can stay when nursing, but providing separate areas for the sow to use when feeding, drinking and performing elimination may be beneficial (Andersen et al., 2010). The availability of straw, floor design, pen area and design of the piglet corner are all important in reproductive performance (Westin and Algers, 2006).

Group Based Farrowing Systems

Group based systems for farrowing sows are also in use. Examples of these are the deep-litter group based farrowing systems developed in Sweden and Switzerland. Large enriched communal areas are provided for a group of sows and their piglets. Often in these systems, sows farrow using traditional farrowing pens, after which they are returned to a large communal group pen where they all nurse together with their offspring. Various management systems are employed to manage the groups, minimise aggression and ensure piglet survival. Such systems have been shown to reduce the incidence of mastitis and to achieve good production results. However, the preweaning mortality has been very high and excellent stockmanship skills are essential.

Extensive Systems

Outdoor systems offer a good level of survival and productive performance that is often on a par with that encountered in the indoor environment (Baxter et al., 2009), although, when compared with indoor systems, a higher labour input using different husbandry skills is required.

Piglet survival can be further improved in extensive systems by employing breeding programmes that incorporate piglet survival traits. Initial studies (Baxter et al., 2009) suggest that survival indicators important in outdoor systems are piglet body shape and size, farrowing traits and thermoregulation.

Research is currently being conducted to develop these outdoor systems to an extent that they can ensure the welfare of pigs. At the present time, due to issues associated with group housing of sows (competition for food, aggression etc) and the climatic restrictions and environmental impact of housing sows in outdoor systems, this type of system is unsuitable for a large number of production facilities in New Zealand.

At the present time, the use of the farrowing crate confers the best protection for the piglets and reduces the chance of mortality from crushing etc, when compared with other systems. NAWAC has therefore decided that these crates be allowed for a restricted time period between farrowing and weaning to maintain the health and welfare of the piglets. However, future development of alternative systems may make them a viable option in the future.

(c) ***What can be done to improve the welfare of piglets in different systems?***

One submission stated that the use of farrowing crates was a trade off between the decreased risk of crushing to the piglets in these crates against the ability of the sow to express natural behaviours. When considering a transition from current to new practices, NAWAC takes into account the feasibility and practicality of the transition, as well as any adverse effects that may result from such a transition. One of the main considerations when considering a transition to a different housing system was the effects that the transition may have on the health and welfare of the piglets.

Mortality in piglets is related to their ability to survive the first few crucial days of life and estimates of piglet mortality are up to15-20% (Leenhouwers et al., 2002). Piglets may die at or soon after birth as a result of a number of factors including problems associated with farrowing, crushing, malnutrition, failure to receive colostrum or savaging by the mother. A number of studies have been performed examining the behaviour and physiology of sows during farrowing in confined and loose housing (Wechsler and Weber, 2007; Pedersen, 2008; Weber et al., 2007; Arey and Sancha, 1996). Studies show that when housing sows in farrowing pens there is a tendency for increased piglet mortality due to crushing, whereas when housing sows in crates, the deaths were due to other causes, such as litter size at birth (Andersen, 2008; Weber et al., 2007). The incidence of crushing varies greatly from study to study and different pen designs can yield very different results (Blackshaw et al., 1994; Cronin and Smith, 1992; Weary et al., 1996a; Wechsler and Hegglin, 1997).

Features of the natural behaviour of sows can play an important role in preventing crushing of piglets in a farming situation, such as the sow entering her nest from the same angle every time and vocalising as she enters. This will get most of the piglets on their feet as the sow roots through the nest leaving a ’piglet free channel’ in which to lie down. The lying

down is performed very slowly under natural conditions. These behaviours together with the nest material and the tactile and acoustic stimuli from piglets constitute a protection against crushing. Due to the intensive conditions that many sows are kept in, the communication process may not be working effectively and hence piglets are crushed.

The use of farrowing rails along the sides of the pen have been shown to reduce piglet mortality due to crushing (Marchant et al., 2001; Andersen et al., 2007) however, if given the choice, pigs may choose to lie down using solid walls rather than those fitted with rails (Damm et al., 2006). Sloping walls can be used as an alternative, and an attractive lying wall may be able to guide a pig to lie in a position that would be beneficial for the piglets' survival. Provision of bedding has also been shown to decrease the rate of mortality due to crushing (Damm et al., 2010). However, other studies have stated that piglet survival is likely to depend more on the maternal traits of the sow and the farmers' effort in helping piglets, rather than on the design of the farrowing crate itself (Andersen et al., 2007; Andersen, 2008).

There is evidence that the occurrence of crushing is significantly related to individual differences in sow behaviour (Wechsler and Hegglin, 1997; Burri et al., 2009). Studies have shown that sows that did not crush any of their piglets had a more protective mothering style; performing more nest building, interacting more with their piglets, and reacting more to their distress calls and absence (Andersen et al., 2005; Hutson et al., 1993). When housing sows in crates, maternal behaviour may have been negatively selected for in favour of other attributes that would make them more suitable to the crate environment (Gustafsson et al., 1999). Thus, such sows, which respond less negatively to restraint when housed in crates, may be less suitable for activities that would promote the survival of piglets a group environment (Wechsler and Hegglin, 1997).

The main factors that influence piglet survival in loose-housed systems are summarised below.

Litter size

One major factor influencing the mortality rate (and maternal behaviour) of pigs in pens is the size of the litter. Large litters are subject to higher mortality due to crushing and starvation, and have lower piglet weight and lower weight gain during the lactation period (Andersen et al., 2010). Sows having larger litters also show a sharp decline in nursing frequency from the start to the middle of the lactation period, and spend more time on activities not involving the piglets (Andersen et al., 2010). Larger litters, and the associated decrease in care by the sow, also means that the farmer has to increase his efforts at the time of farrowing to maintain piglet survival – in particular, in helping piglets obtain colostrum.

Body weight at birth

The body weight of the piglets can affect their survival rate, with piglets exhibiting a lower early weight gain being more likely to be crushed. This could be due to the fact that these piglets may spend more time near the sow, sucking and stimulating the udder in an attempt to increase their intake of milk (Fraser, 1990; Weary et al., 1996b), whilst also increasing the chances that they may be crushed. The more variable the body weight of the piglets in each litter, the higher the mortality rate in those piglets of low birth weight.

Heat loss

Heat loss in newborn piglets is the major cause of mortality (Pedersen, 2008; Andersen et al., 2010). Pens fitted with heated floors during the critical first 2 days of life can help piglets establish the correct body temperature after birth and also encourage colostrum intake. However, the provision of heated floors has to be balanced against overheating the sows, which can cause them heat stress.

Birth

The birth process itself can affect the survival rate of the piglet, as can the order in which a piglet is born in the litter (the later born piglets have a lower chance of surviving; Baxter et al., 2008). Reducing stress around the sow at the time of farrowing may reduce birth time, birth problems and hence reduce the number of stillborns.

Wechsler and Weber (2007) recommended that to obtain good performance, sows due to farrow should be kept individually in sufficiently large pens containing nest and activity areas. After birth, achieving high production was largely about focussing on management actions that ensured high piglet viability and good maternal behaviour.

Stockmanship

A common view following the increased focus on housing systems and associated new requirements is that the welfare of pigs is related more to the management and the environmental features of the housing system than the design of the system per se (Barnett et. al., 2001).

A combination of good observation skills by stockhandlers and good, well-founded knowledge and skill is crucial to good animal welfare (Hemsworth et al., 1995). Refinement of management procedures and a willingness to pay attention to detail can result in an increased success rate of fostering piglets, a decreased rate of piglet mortality due to crushing and ensuring that piglets receive sufficient colostrum (Andersen et al., 2007).

The attitude of the stockperson and especially a willingness to increase the care provided to sows and piglets will have significant positive effects and will also increase piglet survival rates in an economically viable way (Holyoake et al., 1995). The positive returns obtained as a result of the extra work in the farrowing room often stimulates stockpersons to improve their skills further and increase their knowledge about caring for pigs (Hemsworth et al., 1995).

The animal welfare impact on those piglets that are destined not to survive can be managed by ensuring that they are humanely destroyed as soon as problems are observed. Thus the animal welfare issues associated with piglet mortality are able to be managed to some extent in the commercial pen and group housing system.

NAWAC has included minimum standards and a recommended best practice to address the health and welfare of pigs in different farming systems, however the feasibility of each system will be dependent on the particularities of each individual farm. NAWAC believes the compulsory transition to group or pen based housing systems is, at the present time, not a viable option until the housing design details, risk of increased piglet mortality, and the

different management practices and husbandry skills required in group or pen housing systems have all been addressed.

(d) ***What can be done to improve the welfare of the sow in the farrowing crate?***

Some submissions asked for an increase in size to be made a requirement if sows were to be housed in farrowing crates for any length of time.

When gilts farrow in crates, the provision of additional space lead to them displaying behaviour at parturition more closely resembling that seen in free-ranging sows (Jarvis et al., 2004). Enlarging a crate by 60% and adding straw reduced the tendency of piglets to behave aggressively during feeding later in life (Chaloupková et al., 2007a,b). Providing a back area to the farrowing crate fitted with mats, feeding and watering facilities resulted in the sows using it, being more active, and having fewer, non-productive nursings in late lactation (Devillers and Farmer, 2008). Wechsler and Weber (2007) recommend that, to obtain good performance in sows due to farrow, they should be kept individually in sufficiently large pens containing nest and activity areas.

NAWAC has recommended that sows be provided with sufficient space to be able to lie down at full length without leg restriction and, when standing, they must be able to do so without touching both sides of the stall simultaneously and they must be provided with sufficient space so that their backs do not touch the top of the stall. Support must be provided to enable the sow to rise and lie down to minimise the risk of injury to her litter. A recommended best practice has also been included that straw should be provided for the sow in advance of farrowing to enable her to nest build and NAWAC has recommended a minimum standard that manipulable materials must be provided for in any new farrowing systems constructed after the issuing of this code.

(e) ***How long should sows be in farrowing crates?***

Submissions ranged throughout the spectrum in regard to opinions on the future of the use of farrowing crates with some submitters requesting immediate banning of these crates, and some asking that they are phased out within a particular time period. In summary, some submissions requested that they are used for 4 days post farrowing only, and others requesting no more than 4 weeks. However, other submissions stated that these crates were used to maximise the welfare of the sow and piglets and that the banning of these crates would lead to an increase in piglet mortality and decrease the safety of the handler due to the potential for the sow to display aggressive behaviour.

NAWAC considered how long sows should be in farrowing crates, from not at all, for 7-10 days, or for three or four weeks following farrowing. Algers (1998) stated that “In choosing the crating alternative, the welfare of the piglets and production, in terms of weaned piglets per sow and year, is given priority over the health and welfare of the sow.”

NAWAC re-affirms the view it stated in the 2005 code that the use of farrowing crates should be phased out eventually, but only when key criteria can be met. That is, the availability of alternative technology and management systems which deliver better welfare outcomes overall at a practical and economic cost which allows New Zealand producers to remain competitive with producers of imported product. This means comparable protection of the piglets while allowing sows greater freedom of movement and fulfilling their desire

for nest building and isolation from the herd at the critical period around birth. While the pressure to change is spawning investigation of alternative systems for indoor and outdoor production, no alternative indoor farrowing systems that provide the lactating sow and her piglets with greater benefits than those conferred by farrowing crates have yet reached a stage that NAWAC could, with confidence, require the New Zealand industry to adopt them. However, while acknowledging the benefits of farrowing crates (reduced piglet mortality, allows cross-fostering) NAWAC also noted the disadvantages of confinement of the sow and her inability to build a nest.

NAWAC examined what is happening in other countries in terms of these criteria. Legislation in the European Union allows for the use of farrowing crates at the present time due to the current lack of viable alternatives. However, the health and welfare implications of farrowing crates are recognised and alternatives to the crate are being sought. Some countries have introduced national legislation phasing out farrowing crates. Australia will limit the use of farrowing crates to a maximum of 6 weeks from 2018. Farrowing crates were banned in Switzerland in 1997, with a 10 year transitional period. Since this legislation came into force, many farms in Switzerland have introduced loose farrowing systems (Weber et al., 2009).

NAWAC does not believe there are alternative viable systems at the present time that meet the physical, health and behavioural needs of both the sows and piglets. NAWAC does consider that the confining of sows in farrowing crates for extended periods does not fully meet the obligations of the Act, and has included three separate minimum standards outlining the time that farrowing crates can be used pre-farrowing, during farrowing and lactation.

Pre-farrowing

Sows are usually placed in farrowing crates in anticipation of farrowing, so that sows and the piglets do not have to be moved later when they would be susceptible to additional problems associated with the move. Therefore, when considering the amount of time that a sow spends within the confines of a farrowing crate, the additional time pre-farrowing must also be taken into account. As many of the indoor farming systems that use farrowing crates induce the onset of farrowing artificially to enable additional control within the production system, the onset of farrowing can be fairly accurately predicted. Therefore NAWAC has included a minimum standard stating that sows must not be placed in a farrowing crate more than 5 days prior to farrowing.

Farrowing and lactation

Sows are usually confined to a farrowing crate for the 4 weeks between the birth of the piglets until the point where they are old enough to be safely weaned (at around 28 days of age). A number of the farming systems using crates in New Zealand are, due to the associated issues with using alternative group housing systems (i.e. aggression between sows and increased risk of piglet crushing), presently unable to switch to these systems, at any time during lactation, whilst maintaining effective care and management of both the sows and piglets until such time as the piglets can be safely weaned. Hence, a large number of production systems, at the present time, require the continued option to use crates to ensure that piglets receive the sustenance and protection they require prior to weaning. Hence, NAWAC has decided that, until effective alternative systems are developed, the use

of farrowing crates can be continued for 4 weeks only post farrowing. However, NAWAC would prefer these crates be phased out in favour of alternative systems that conferred the same benefits for the piglets (reduced crushing etc) but give the sow freedom to move and express a greater range of behaviours including building a nest.

Nurse sows

Following weaning, some of the sows which are still lactating may be retained in the farrowing crate to provide milk for those piglets in the next 'batch' who are not able to obtain sufficient milk from their own birth mothers. The sows which are retained for this purpose are known as nurse sows and will undertake 'fostering' of piglets, to ensure that they receive sufficient milk and nutrients. Fostering of piglets however, means that the sows will be retained within the crate for an additional period of time. NAWAC has therefore included a minimum standard stating that nurse sows must be retained for no more than one week and that no more than 5% of sows in any one farrowing group can be retained as nurse sows at any one time.

28. **Managing dry sows**

(a) ***What are the normal patterns of behaviour for a dry sow?***

Commercially bred pigs that were examined in a semi-wild environment showed a high level of activity. In 31% of observations they were grazing, in a further 21% rooting with their snouts, and in another 23% working over the enclosure (walking and nosing the ground). They used the rooting pad of their snout to level out roots and overturn tussocks of grass, raked with their forelegs, gnawed at roots and other items and wallowed in mud in warmer weather. Being social animals, each member of the group carried leaves and grass to the communal nesting site and used a dunging area well away from this sleeping area. There was very little aggression, what there was being associated with the delivery of foods. However, in this situation, threatened pigs could simply move away from the aggressor (Stolba and Wood-Gush, 1989).

If given the opportunity within a domestic environment to express behaviours such as rooting, exploration, grazing, wallowing, dunging away from the nesting site and performance of interactive behaviours with conspecifics, pigs will perform these behaviours. However, despite pigs possessing the motivation to perform these behaviours, many of today's housing systems do not provide the space or enrichment that will enable them to do so.

NAWAC does recognise the restrictions that confinement in stalls places on the sow's physical health and her ability to express natural behaviour and hence, from 2013, the use of these stalls will be reduced to a maximum of 4 weeks in any reproductive cycle. Sow stalls will be completely phased out over this time and their use will not be allowed from 5 years after the code has been issued other than for the period between weaning and mating (see (c) below).

(b) ***What are the main welfare risks to pregnant sows?***

The European Food Safety Authority (2007a) review identified the major welfare risks to pregnant sows as pain due to leg injuries and stress caused by inadequate flooring conditions, stress due to insufficient space allowance in loose housed sows and frustration

due to lack of a fibrous diet and foraging material. They also identified the major welfare risks in sows in early pregnancy, from weaning to 4 weeks after weaning, as: frustration, stereotypes and restlessness due to lack of fibre diet and lack of or no appropriate forage material; being kept in crates; pain due to stomach ulcers caused by inappropriate feeding; and impaired getting up and lying down behaviour due to being kept in crates.

Spoolder (2009) examined the main risk factors associated with using group housing systems and how these factors can be addressed. Techniques for reducing risks to gilts and sows included ensuring that feeding systems are used correctly and efficiently to minimise aggression between gilts and sows so that each individual receives sufficient food to aid reproductive success. The provision of sufficient space and visual barriers when housing small groups of sows (which are more susceptible to aggression due to the lack of the space for submissive sows to retreat) can reduce the number of aggressive interactions.

The provision of bedding will reduce the occurrence of injuries associated with aggression, enable the sow to express explorative behaviour and reduce the development of stereotypic behaviour. Consistency in group formation can also reduce aggressive interactions as sows are able to remember social conspecifics. Breeding gilts can, to some degree, be taught social behaviour by exposing them to older dominant sows a few times, prior to introducing them to a large group. Efficient and competent stockmanship and management systems will reduce stress in sows and gilts in a group housing system and ensure that reproductive success and welfare is at optimal levels.

NAWAC has included a minimum standard stating that when sows are group housed, they must be managed to minimise the effects of aggression. This can be achieved using a variety of techniques and this information is provided in the code.

(c) ***What is the optimal system to house sows during the weaning to oestrus interval?***

The system used to house sows during the weaning to oestrus interval is often dependant on the consequences of regrouping sows, since the majority of sows are currently individually housed during lactation. Although less common, outdoor systems enable the sows to mix with the boars in large paddocks in a multi-sire system. Other systems control the mating process more carefully and use specific pairing of animals or the use of AI to inseminate sows.

If sows are mated in stalls, then this time period also has to be accounted for when determining the total length of time that sows should be confined in stalls. However, during this time period there are significant welfare risks in housing sows in groups. Sows return to heat very soon after weaning (typically within 5 days). If mixed at this time, when the sows may still have enlarged udders following the cessation of lactation, as many as 50% of the sows may sustain significant injuries to the udder and elsewhere. As sows then come into heat they display riding behaviour of other sows which may result in irreparable injuries to their hips and legs of the ridden sows. There are therefore welfare benefits in housing sows separately during this time period and so NAWAC has included a minimum standard stating that sows can be confined to mating stalls during this period, however it must only be for the express purpose of service of sows and must be for no longer than one week in total. NAWAC is also aware of recent research investigating innovative mating,

suckling and weaning management, which aims to eliminate the need for sow confinement in stalls by mating sows during lactation.

(d) ***Does housing in dry sow stalls meet the minimum requirements of the Act?***

Public submissions related to the intensive farming of pigs showed a deep public concern for the perceived welfare of pigs. This concern mainly centred around the lack of ability for sows to move and perceived 'cruelty' of the confinement of sow stalls. There was concern that the manner in which pigs are kept in sow stalls did not meet the criteria as stated in the Animal Welfare Act 1999, and that these stalls did not enable a sow to express behavioural freedom. The public perception overall was that welfare would be higher if pigs were kept in systems that would allow them to interact with conspecifics and have access to outdoor areas to enable them to have behavioural freedom. For this reason, a large number of the submissions asked for a phase out of sow stalls. There was also voiced concern that allowing the intensive farming of sows was putting a higher emphasis on economics and profitability than it was on the welfare of the animals and that producing pork in this way did not uphold the reputation of New Zealand as an animal and environmentally friendly country. There was a broad view among the submissions that the New Zealand public would be willing to pay the additional costs for 'welfare friendly' products in terms of an increase in price in the supermarket. This claim is, however, contrary to historically observed behaviour in New Zealand. Consumer preferences towards animal welfare issues also indicates that actual willingness to pay for animal welfare improvements varies significantly across consumer groups (Nocella et al., 2010).

Other submissions expressed an opposing view, and the New Zealand Pork Industry Board stated that the use of sow stalls is current good practice. NZPork states that no scientific evidence exists that freedom of movement should be given priority over the compromises that may occur as a result of housing sows in a group situation and that group housing sows will not necessarily improve the welfare of sows. They believe a ban on dry sow stalls cannot be justified.

Documented disquiet with confined animal housing systems dates back to the 1960s. Among other things, the British Government's Brambell Commission recommended that animals have the freedom to 'stand up, lie down, turn around, groom themselves and stretch their limbs' - beliefs which evolved into the current Five Freedoms (see Webster,1994), which in turn form the basis of the physical, health and behavioural needs defined in New Zealand's Animal Welfare Act 1999. Arguably, these beliefs are, over four decades later, still at the heart of contemporary discontent with confined housing. In general public opinion, the modern intensive production piggery is considered inherently 'bad' because of lack of space, because the environment is barren, and because the system relies on technology. In contrast, outdoor housing is considered 'good' as it provides a more 'natural' environment and pigs may have the option to perform a large number of behaviours over a relatively large area. The system is also less reliant on technology, and so is considered to be less prone to negative outcomes due to technological breakdowns.

When contrasting the physical and health needs and the behavioural needs of a dry sow there are two fundamental interpretations. One is that in housed "environments" and in "circumstances" of high stocking density, it is essential to confine sows in stalls and restrict their movement in order to avoid the welfare costs of aggression which is especially

prevalent in the early stages of pregnancy. Such confinement is considered by some to achieve an overall better welfare outcome for all sows through satisfying needs such as access to food and water, avoidance of injury and the ability to give sows the individual attention they may require. Other benefits often given by producers for the use of dry sow stalls such as efficient use of limited space, production benefits through efficiency of food utilisation and health and safety benefits for stockhandlers are not animal welfare benefits.

A counter argument is that by changing the environment and circumstances of the sows, the same welfare and production benefits of confinement in stalls can be obtained in group housing with the additional welfare benefits of giving the sows greater opportunity to exhibit behaviours such as relative freedom of movement, freedom to choose what they do, oral-nasal stimulation and social interaction. Close confinement prevents investigation of the environment and visual inspection of the area behind the animal and those exploratory behaviours are likely to be important to the animal. Providing sows with enough space to explore and exercise may not only satisfy their drive to explore (behavioural need), but also gives them a chance to exercise, which is good for their physical and health needs (Marchant and Broom, 1996).

Because the advantages and disadvantages of housing systems are qualitatively different, there is no simple or objective way to rank systems for overall welfare (Rhodes et al., 2005). It is not possible, using science alone, to balance different attributes of housing systems and say, for example, how much freedom of movement is equal to how much freedom from aggression or how many scratches are equal to how much frustration from not being able to root and move around freely (Rhodes et al., 2005). However, attempts to balance these attributes, e.g. through a technique called ‘semantic modelling’ (Bracke et al., 2002) have resulted in the welfare benefits of group housing systems outweighing those of individual confinement. Further more, management strategies can be employed in the group housing system to tip the balance in favour of a higher level of welfare in this system, whilst also allowing the sow the opportunity to express her behavioural needs.

Sows may sustain physical or health problems in indoor group housing situation for a number of reasons including issues arising from competition for food, social aggression and the resulting injuries; injuries sustained from the flooring (e.g skin lesions) which cause locomotion to be affected and environmental discomfort as a result of provisions not being made to enable a sow to thermoregulate. However, all these factors can be managed in a group housing situation using appropriate strategies, potentially reducing the level of fear, stress and suffering to which a sow is exposed in an intensive farming system. In addition, the group housing situation enables a sow to express her behavioural needs, which the crate system does not and cannot allow her to do.

NAWAC has decided that sow stalls should be phased out entirely to enable sows to meet their behavioural needs. Allowing for a ‘transition period’ should allow producers to make the required capital investments and gain the experience necessary to maintain the sows’ physical and health needs at an adequate level in addition to meeting their behavioural needs. NAWAC recognises that this move will be a gradual process, that new facilities and management systems will be required to ensure that effective production can be achieved in the group housing system, whilst maintaining the welfare of the sows. Nevertheless, the

move to systems in which sows can express their behavioural needs can be achieved and NAWAC considers this move to be essential for their welfare.

There are a number of factors to consider when housing pregnant sows and these are summarised below.

Movement and exercise

One of the main criticisms of individual housing is that it severely restricts pigs from moving and prevents opportunities to interact in a complex physical and social environment. Movement reflects animals' needs to have a sense of control over their environment, to have opportunities to select the most comfortable microenvironment, as well as to benefit from exercise (Gonyou, 2005) which has been shown to improve bone density (Schenck et al., 2008) and muscle strength (Marchant and Broom, 1996).

Environmental complexity

Group housing, because of its larger area, presents an opportunity for a more enriching and comfortable environment through, for example, the provision of straw (see Tuyttens, 2005; Groenestein et al., 2006). The provision of straw enables pigs to perform rooting behaviour. Rooting in pigs is a species-specific behaviour that they, under wild conditions, spend a large proportion of their time performing (Horrell, 1992; Stolba and Wood-Gush, 1989). The provision of straw and rooting materials has been shown to have a number of positive effects on the welfare of pigs including increasing the amount of activity and exploration behaviour that they display (Fraser et al., 1991; Guy et al., 2002a; Morgan et al., 1998) and decreasing abnormal behaviours such as oral stereotypies (Spoolder et al., 1995). Bedding improves the physical comfort of the floor and, unless temperatures are high, straw enables pigs to somewhat control their microclimate, thereby increasing thermal comfort.

Reproductive performance

Simple comparisons of production rates between group and gestation-stall housing is difficult because of the wide range of management systems and factors that can affect farrowing performance (Séguin et al., 2006). The effects of housing system on litter size has been reported to be reduced, increased or unaffected by group compared with individual housing (see Séguin et al., 2006). The conflicting evidence relating to reproductive performance in different systems is also reflected in other studies, for example, the success of artificial insemination was greater when pigs were grouped 7 days after mating rather than 28 days, suggesting the longer period of stall-housing was detrimental to reproductive performance (Hoy and Bauer, 2005) whereas in another study, stall-housed sows had greater pregnancy rates than group-housed sows (Munsterhjelm et al., 2008). Gilts housed individually or grouped with their herdmates or mixed with novel pigs on either 3-4 days or 8-9 days of pregnancy had similar embryo survival rates or numbers of embryos (van Wettere et al., 2008) and in another study, the number of embryos was the same in stall and group-housed gilts (Estienne et al., 2006). Finally, stressing gilts by repeated mixing and twice-weekly feed competition resulted in fighting, but did not impair reproductive performance (Soede et al., 2006). These conflicting results suggest pregnancy and embryo survival rates may be related to the management systems in place within the specific housing systems.

Embryo implantation/mortality and ovulation in the sow

One reason given for housing sows individually is to avoid mixing them during the period leading up to when the embryos attach to or implant in the wall of the uterus. After a sow is bred, the fertilized embryo floats free in the uterus for several days before implanting in the uterus wall at days 11-16. This period, and shortly thereafter, is the so called 'maternal recognition of pregnancy' period, and during this time many hormonal changes take place. If the sow is stressed at this time (due to fighting, climatic factors, adverse handling, aggression or a combination of some or all of these), the embryo can be lost. Litter size of sows is therefore predominantly determined by the level of embryo mortality (Spoolder et al., 2009). To avoid the loss of embryos as a result of the stress initiated when mixing groups of animals, mixing of sows has often been delayed until after mating and implantation. However, if mixing of the sows is performed immediately following mating and conception, the group hierarchy is usually stabilised by days 11-16 and the embryos implant successfully (Spoolder et al., 2009).

NAWAC has therefore decided to support the unrestricted use of sow stalls until 3 December 2012 to enable successful embryo implantation and production in systems that are currently not able to maintain production using alternative methods. However, NAWAC recognises the restrictions that confinement in stalls places on the sow's physical health and her ability to express normal behaviour. Hence, after 3 December 2012, the use of these stalls will be reduced to a maximum of 4 weeks after mating. Other than for mating purposes, sow stalls will then undergo a phase-out period and their use will not be allowed from 5 years after the code has been issued.

The use of sows stalls was previously included within the 2005 code under the provisions contained in section 73 (3) of the Act which enables NAWAC, in exceptional circumstances, to recommend minimum standards that do not fully meet the obligations of the Act to ensure that the physical, health and behavioural needs of the animals are met. However, the use of sow stalls does not meet the requirements of the Act and so NAWAC is allowing a transition period to phase out their use. NAWAC have therefore included a minimum standard within the code stating that, from 5 years after the code has been issued sows stalls must not be used after mating and, mated sows and gilts must be provided with sufficient space so that they are able to stand up, turn around without touching the walls, lie comfortably in a natural position, and must be provided with separate dunging, lying and eating areas. The inclusion of this minimum standard will therefore ban the use of sow stalls post-mating from that time forward.

(e) ***What are the feasibility and practicality issues of phasing out dry sow stalls?***

NZPork estimate that today 59% of sows are housed indoors and approximately 69% of sows housed indoors are housed in stalls for some time. Surveys examining sow housing showed that larger producers tend to use dry sow stalls more than smaller producers (Gregory and Devine, 1999).

Changes from crate based systems to group based systems, on the basis of improving the welfare of the sows, can only realistically be achieved if accompanied by a change in procedures to manage a new set of potential welfare risks. There is a complex interaction between management, facilities and feeding and how these separate factors affect the

overall welfare of pigs in a group housing situation. A simple return to group-housing systems won't improve welfare without addressing associated issues which may be as diverse as hunger in sows and optimising environments, management and genotypes, as well as addressing fair and reasonable expectations of producers and consumers. Positive changes can be achieved, but will require information on how best to achieve these changes and how to manage the new systems effectively.

The key welfare issue in group-housed sows is managing to minimise the effects of aggression.

Social aggression

When unfamiliar sows are mixed, they engage in a short period (usually only a few days) of fighting as part of the establishment of hierarchies or social groupings (Spoolder et al., 1998 a,b) and are likely to show aggressive behaviour towards conspecifics which often results in injury, stress and a reduction in welfare. Following the establishment of social hierarchies, a low level of aggression continues to maintain social order (Gonyou, 2005).

In larger groups, pigs tend to show lower levels of aggression towards conspecifics. They tend to alter their strategy of negotiating social encounters where they cannot recognise all individuals and show more avoidance behaviour (Turner and Edwards, 2000; Turner et al, 2001), although ongoing low levels of aggression can be more prolonged than those observed in smaller groups (Ewbank, 1976).

Social aggression in itself is a necessary and normal behaviour when groups are formed. However, the negative consequences have to be mitigated as much as possible. Injuries can be reduced by allowing sows to show submissive behaviour (evasion, fleeing) (Spoolder et al., 2009). The addition of 'pop holes' and areas in which the pigs can escape aggression i.e by disappearing from view from the aggressor, have been shown to reduce the level of aggression in weaners, probably because they reduce visual contact between aggressor and victim (McGlone and Curtis, 1985). The provision of straw on a solid floor will support the legs during fighting, avoiding leg problems. Spoolder et al. (2009) strongly advised providing sows with additional space, a solid floor and bedding during the first days of group formation and NAWAC has included this as a recommended best practice.

Feeding aggression

Feeding aggression in group housing situations can be minimised using a number of methods which are based on either simultaneous or sequential feeding systems.

Simultaneous feeding systems are characterised by once or twice daily bursts of activity during which the animals eat. The level of protection provided to individual animals during feeding in these systems is critical. Sequential feeding systems (electronic sow feeders) can also be used, though these require that sows are 'trained' in their use. Gilts can be taught how to use the feeding systems in the absence of older, more dominant sows and dominant sows must be stopped from returning to the feeder after receiving their feed, so that they do not receive additional provisions. In this way, all pigs can be fed with reduced overall aggression. As discussed previously within this report, roughage can also be added to the diet to increase the bulk of feed. This has been shown to reduce aggression related to competition for food.

Aggression towards stockperson

Unlike lactating sows, pregnant sows will not normally be aggressive to a stockman. However, the level of stockperson skills required to house pigs in a group system is higher than that required in a crate system, both for the purpose of maintaining the welfare of the pigs and maintaining the safety of the handlers.

Individual producers have been involved working together with the New Zealand Pork Industry Board on the review of the Code of Welfare. Many of the top producers and supporting practitioners regularly visit international operations and conferences, and monitor developments, as well as receive experts here. They have a good knowledge of the issues with different housing systems. Although producers are aware of the issues, know and accept they have to move away from their use, and have given them considerable thought, animal welfare is, for them, only one driver of change – economics, personal circumstances and other sometimes competing factors are also important. When producers are making investments in new facilities however, it is important that they are made aware of the animal welfare requirements, both at the current time, and for the future. In this way, producers can plan their investments in new facilities accordingly.

Maintaining the current systems may be favoured because of the investment in, and familiarity with, them as well as ease of management borne of decades of experience and refinement**.** Change represents a level of uncertainty for producers. Globally, individual producers vary in terms of their willingness to meet new welfare standards and farmer attitudes to animal welfare, in particular, to changing from sow stall to group housing, have been found to vary with farmer's age, the likelihood of a successor, herd size and participation in assurance schemes (Tuyttens et al., 2008).

Group-housing has its issues, as well as its benefits, and in making changes individual farmers have to ensure they will retain a viable business. Since there are challenges for staff, management and facility design, the industry prefers to make changes for good reasons, following international and national best practices rather than making changes without sufficient reason or knowledge.

After the ban on sow stalls in the UK in 1999, the prospect of moving to group housing was initially daunting for UK pig farmers, the cost of the transition being only one of many factors which they had to consider to ensure that the move was successful. However, most UK pig farmers have now embraced group housing in pig farming and, if given the choice, would not go back to the use of sow stalls (S. Edwards *pers. comm.*).

NAWAC believes that given the increasing number of producers who are group housing for at least some part of the sows' pregnancy this system is both practical and feasible for the industry if producers are given enough time to change their facilities and develop appropriate management systems.

(f) ***What would the economic effects be of phasing out dry sow stalls?***

As in other intensive agricultural sectors, in recent years pig farming in New Zealand has become more concentrated, moving from a structure typified by small cash businesses with minimal assets and little or no property gain, to an industry with fewer, larger particpants who have made substantial capital investments.

Although, there have been developments overseas in lower fixed-cost housing systems such as hoop-barns (Honeyman, 2009; Lammers et al., 2007; Karlen et al., 2007), new permanent housing facilities are expensive, and adapting existing facilities may be even more so, since the dynamics of the system have to be altered. Converting housing from individual stalls to group pens, may reduce a farm's carrying capacity of sows by about one-third (Lean, 1999). Along with these economic considerations, personal circumstances and staff availability, as well as animal welfare also affect decisions whether and when to individual or group house animals.

For producers, housing sows in gestation stalls represents efficient use of space. Providing additional space for sows increases the costs of the farming system (at the cost of some aspects of welfare). Replacements or modifications to current facilities are costly (converting from sow stalls to group housing reduces an operation's breeding stock capacity and new facilities may also have regulatory costs and constraints). The extent to which acceptable economic performance can be realized in alternative loose housing systems for gestating sows depends on two aspects:

(i) the fixed costs arising from the capital cost of system installation and

(ii) the level of reproductive performance which can be achieved in a given system relative to the variable cost requirement (e.g. feed, bedding and labour costs).

Capital costs of group housing systems for dry sows vary widely depending on the building space requirement and sophistication of feeding system adopted. Total space will be greater than for confinement systems, and initial investment or building conversion cost will therefore be higher unless low cost housing structures can be used, such as deep litter systems in uninsulated buildings or hoop structures. These systems are, however, associated with higher variable costs of production, involving more labour, feed and bedding.

A draft economic analysis of the economic effects of phasing out dry sow use was developed by MAFBNZ for NAWAC and made available for public consultation with the draft code. Only one substantial submission was made on this draft economic analysis, in the form of an independent analysis provided by NZPork. NAWAC also had an independent peer review by a prominent agricultural economist undertaken. Both industry representatives and the academic peer reviewer raised concerns about the MAFBNZ analysis, but the majority opinion of NAWAC was that the concerns were adequately addressed by additional discussion and sensitivity analysis undertaken by MAFBNZ.

Industry estimates indicated that any significant restriction on the use of sow stalls will increase labour and feed costs. Banning stalls altogether will have a further impact on variable costs, and also reduce productivity. These estimates indicated that banning sow stalls will increase feed costs by 7%, require one extra hour of labour per day per 200 sows, and reduce sow productivity by 7%. NAWAC believes the productivity loss may be limited as knowledge of non-stall management practices grows. In the opinion of the pig industry veterinary group allowing the use of mating stalls for 7-10 days should significantly reduce this productivity loss. In addition to the increases in variable costs outlined above, renovation and/or building to accommodate the new housing were expected to require a capital investment of approximately $126,000 per affected farm.

The impact on productivity is the biggest contributor to the cost of changing to group housing. MAFBNZ's analysis estimated that the impact on the pig meat market of banning sow stalls would be a 4.5% price increase and a 4.8% decrease in the quantity of pig meat produced and consumed. If, as NAWAC believes, the productivity loss is limited, the increase in price and decrease in quantity will be less.

Two estimates of the industry-wide impact of banning dry sow stalls were produced, one by MAFBNZ and the other by an industry-contracted research firm. When these estimates are expressed in comparable terms, they provide a range for the likely impact of a ban. Expressed as a net present value over an infinite time horizon, the MAFBNZ figure is approximately $56 million, and the industry-contracted figure is approximately $28 million.

The difference in the two estimates is due largely to assumptions made about the impact of the ban on farm-level prices, as well as the breadth of the analysis. The MAFBNZ analysis assumed that the farm-gate price of pig meat would rise in New Zealand as supply contracted after a ban on sow stalls. The price increase was recognized as a cost of the ban, which was ultimately borne by those who purchase pig meat. In this analysis consumers and farmers who currently use stalls bear the cost of the policy, although loss to producers is mitigated by the price increase. Producers who currently farm without stalls benefit from the price increase without bearing any additional cost. Because the price increase applies to all pig meat produced in New Zealand, the cost to consumers is considerable.

The industry-contracted analysis assumed that farm level prices would not increase after a ban on sow stalls, and the analysis focused primarily on producers who currently use stalls. Industry exit was predicted to be high after a ban was imposed, as finance for the required capital investment would be difficult to secure. Because the shortfall in supply was assumed to come from imports and a slight expansion in domestic production, prices did not increase so consumers and producers who do not use sow stalls were assumed to be largely unaffected in this analysis. Loss was therefore limited to a reduction in cash flow and/or loss in asset value for farmers who currently use stalls.

The distribution of the cost (between producers and consumers) depends critically on the extent to which price increases as a result of the ban. This will in turn depend on how significantly a ban influences production costs, sow productivity and industry exits – and whether any resulting shortfall in domestic production is met by imports (import substitution). In the absence of imports, any shift in domestic supply will increase the price of pig meat in NZ, and transfer some of the cost of the stall ban to consumers. Import substitution will limit the price increase so that producers bear most of the cost. Import substitution will also dictate the extent to which sow welfare is exported. The economic analyses indicate that imports are likely to increase by between 860 and 6,000 tonnes/year. This compares to the 48,000 tonnes of pig meat produced in New Zealand each year. NAWAC concluded that the likely level of imports will probably be somewhere in between these estimates.

The MAFBNZ analysis did not include any consideration of environmental enrichments for sows moving to group housing, and how these enrichments may affect the cost of production. Available literature suggests that moving sows to a more enriched environment with additional space and deep litter is likely to increase variable costs. Indications from Australia are that deep litter housing systems could increase labour costs by 20%, feed

costs by 7%, and require the purchase of approximately 2 kg of bedding per sow per day (Kruger et al., 2006). All of these factors combined could imply additional cost increases of approximately 12% for affected farms.

The EU legislation (Council Directives 2001/88/EC and 2008/120/EC) from 1 January 2013, will limit the time pigs are kept in sow stalls to a maximum of 4 weeks during each gestation. Australia will limit the use of sow stalls to a maximum of 6 weeks from 2018. Since 1999, close confinement in individual stalls for non-lactating sows has been banned in the UK and 40 percent of sows are now managed in outdoor systems. In Sweden, sows and gilts are always housed in groups, except for farrowing sows and sows one week prior to farrowing. However, these countries do all import significant amounts of pork from neighbouring countries (more than 80% for the UK) with lower welfare standards, and some have very high levels of government support. From 2013 onwards, The Netherlands will allow a very short period of 4 days in stalls, and Switzerland, 10 days of confinement after mating. Dry sow stalls have also been banned by either referendum or legislation in three states in the USA, although none of them are significant producers of pork.

NAWAC recognises that in the presence of free-trade, relatively high animal welfare standards may lead to the loss of domestic production in favour of off-shore production in less welfare-concerned countries, and the subsequent import of their product (Grethe, 2007). In the absence of barriers to trade this takes place at the expense of local production and therefore represents a market substitution. Several policy approaches, used in different combinations and to varying degrees by a number of countries, have been identified to mitigate this ‘import substitution’ effect. Component policies may include:

- multilateral binding agreements
- government supported voluntary labelling of animal-friendly imports
- obligatory labelling of non-animal-friendly imports
- compensation of domestic producers through producer subsidies
- tariff differentiation according to product-specific animal welfare level within WTO tariff bounds
- tariff differentiation according to product-specific animal welfare level above WTO tariff bounds and
- import bans

While multilateral trade agreements and labelling have the potential to prevent the reallocation of production to nations with less stringent standards, empirical experience to date suggests that their success has been limited. Producer compensation has been effective at retaining animal welfare friendly production in the European countries. Compensatory payments do, however, have major drawbacks:

- they disadvantage third country producers that comply with equivalent standards and receive no payments;
- they distort domestic market prices and are therefore not compatible with the current WTO framework, and
- they are expensive to implement and potentially politically unpopular.

Both tariff discrimination and import bans would be effective in preventing relocation of animal enterprise, but they are not compatible with either current WTO legislation or New Zealand's position on international trade, and are therefore not a practical option for the near future. Another approach to the issue of import substitution is to accept some relocation of animal production rather than risk setting a minimum standard that is too low to reflect societies' ethical attitudes.

The impact of competition between New Zealand producers and international producers, coupled with differing welfare standards, may mean that retailers choose to buy more imported pork. NAWAC has specifically considered this issue and notes that it is possible that overall sow welfare could even reduce as a result of this problem. However, it is also possible that there could be quite large overall gains and our modelling suggests there will be some overall gains.

The market for fresh pork has historically not been subject to significant competition from overseas producers. For fresh pork, the increasing costs of farming as a result of higher animal welfare standards may be passed on to consumers if cost differentials are not great enough to prompt the import of fresh pig meat and/or if a premium can be obtained for the relatively welfare friendly New Zealand product. The extent to which domestic producers can gain from such a scenario will depend on relative production costs overseas (particularly in Australia), the cost of transport, and the ability of domestic producers to differentiate their product at the farm-gate level.

However, about 75% of the processed pig meat eaten in NZ is now imported. Further increasing the cost of producing pork within New Zealand through higher animal welfare standards could increase this further. Under these conditions, the price of pig meat in the processed market would not be expected to increase significantly for consumers. The price premium of the small proportion of "high welfare" processed pork currently sold in NZ should not be affected by substitution with imported pork, but potentially could be reduced if there is a large increase in local production. The cost of complying with a ban on dry sow stalls will clearly be borne by producers who currently use them. The net impact of a ban for producers, as well as the distribution of the cost of the ban between producers and consumers, will be influenced by the extent to which import substitution occurs.

NAWAC considered the issue of import substitution within the context of societal concerns about the use of stalls and of the welfare standards for pigs in New Zealand. NAWAC came to the majority view that, in spite of the risk of further import substitution, it could not ethically support the on-going use of dry sow stalls in New Zealand.

Because New Zealand is a net importer, some of the potential welfare gains for New Zealand pigs will be exported. The willingness to pay literature (e.g. Bennett and Larson, 1996; Bennett and Blaney, 2003; Lusk and Norwood, 2008, Tonsor et al., 2009) suggests that consumers do value animal welfare improvements, but vary in their willingness to pay for them. The group of consumers who place a high value on animal welfare improvements will benefit from phasing out the use of stalls. The net impact for consumers who place a lower monetary value on welfare improvements is uncertain, and will depend upon the price effect.

The high level of public ethical concern about practices related to pig farming was reflected in the submissions received. These indicate that New Zealand consumers do value

improvements, and are willing to pay for them. The available empirical evidence, however, suggests that New Zealand consumers, like those overseas, are price sensitive. The current market share of animal welfare friendly products such as free-range eggs and crate free pork in New Zealand is less than 5% of those products. Therefore the willingness of New Zealanders to pay increased prices for higher welfare pork products is largely unknown.

The availability of lower-priced imports in the processed market may mean that New Zealand consumers choose to buy more of the imported pork. In most cases imported pork will be produced to lower welfare standards than that produced in New Zealand. In this way, some of the welfare gains in New Zealand will be lost and global pig welfare may not be improved, at least until overseas producers have to comply with similar welfare regulations. This trade-off is obviously undesirable and although considered, NAWAC concluded its principal legislative and ethical concerns are to determine the future housing conditions for sows in New Zealand.

NAWAC considered what the appropriate time to phase out sows stalls should be. One of the main advantages of allowing more time before a ban was imposed would be to facilitate capital investment for farmers who decide to remain in business. An extended timeline may also allow learning, management adjustment, and more time for funding and resource consent requirements. Some NAWAC members also thought additional time may give non-stall farmers time to fill some of the gap in demand for pork. However, it was recognised that there still needs to be an economic incentive to increase production. It was also recognised that having an extended period beyond 2013, when sows stalls use is reduced to 4 weeks only, may be more disruptive to producers. That is that they may end up making investment decisions and systems changes twice rather than as one planned transition over a number of years. NAWAC therefore reached a majority position that the reduced use of sow stalls to one week, and that solely for mating, should occur five years after release of the code. NAWAC recognised there will be some loss of the welfare gain through import substitution and would like to minimise that, but has no relevant authority and its primary ethical and legislated concerns are about ensuring the welfare of New Zealand pigs.

29. **Weaning**

(a) ***From a welfare perspective what is the optimal weaning age?***

One example indicator in the public draft of the code suggested the range 18-33 days for weaning. Submissions requested that piglets should not be weaned before 28 days and 33 days. One submission noted that a reduction in weaning age to 21 days compromised the growth rate of the piglet and more animals had to be treated for sickness and mortality. Weaning at 18 days of age was also noted as being too early. One submission stated that pigs will naturally wean their piglets at 6-9 weeks and removing them early can cause the sow distress. Under natural conditions, piglets are weaned gradually and the process is completed, on average, by 17 weeks of age.

EU Directive 2001/93/EC states that no piglet shall be weaned from the sow at less than 28 days. The only exception is when the welfare or health of the dam would otherwise be adversely affected. In this case, piglets can be weaned at a minimum of 21 days of age with certain provisions.

Studies have shown that the earlier weaning is performed, the greater the amount of abnormal behaviour the animals will perform later in life. The amount of belly-nosing in piglets (rooting or nudging at the flanks of other piglets) has been shown to increase the earlier piglets are weaned (Weary et al., 1999; Worobec et al., 1999) and weaning before 3 weeks of age has been shown to increase restlessness, aggressive and belly-nosing behaviour in pigs (Jarvis et al., 2008).

The time of weaning also affects on piglet physiology and immunology. Piglets weaned prior to 28 days of age had reduced feed intake and body weight (Robert et al., 1999; Worobec et al., 1999) and a weakened immune response (Robert et al., 1999). Time of weaning also influences the rate of development and maturation of gut structure (Miller et al., 2007).

Based on the evidence above, NAWAC therefore recommends that piglets are weaned in a manner that minimises the degree of stress for both the sows and piglets. This could include keeping the piglets with the same littermates to reduce the stress of separation from the mother and this has been included as a recommended best practice. NAWAC has also changed the recommended minimum weaning age to 21 days in the example indicators.

Due to the potential negative health impacts in addition to the increased psychological impact that early weaning has on piglets, NAWAC has included a recommended best practice that weaning is performed when the piglet is a minimum of 28 days of age. If farrowing crates are used for farrowing and lactation NAWAC has allowed them to be used for 28 days post farrowing to ensure the health of the piglets and ensure they receive sufficient nutrients from the sow prior to weaning at 28 days of age.

30. **Elective Husbandry Procedures**

(a) ***Why should elective husbandry procedures be carried out on a routine basis?***

A number of submissions about elective procedures opposed the performance of elective husbandry procedures. Doubts were expressed about the perceived necessity of some of these procedures and concerns were raised in relation to the potential for them to cause short and long term pain. Some submissions requested the use of anaesthesia when performing these procedures in an animal of any age or the use of alternative methods (e.g. electronic ear tags rather than ear notching in pigs).

Following the principles set out in the Painful Husbandry Procedures Code of Welfare 2005, NAWAC has included a minimum standard that all elective husbandry procedures must only be carried out where they are justifiable to prevent undesirable consequences that could result in animal suffering. Prior to performing an elective husbandry procedure, the welfare costs to the individual animal should be carefully weighed against the welfare benefits. Justification for performing a procedure should also consider current scientific knowledge, available technology and the predictability of the technique to be used.

It is generally believed that painful husbandry procedures are best performed on young animals due a number of factors including the ease of handling, the smaller amount of tissue affected upon performance of the procedure and the potential for the affected site to heal more quickly. There is also some evidence that young animals may experience pain to

a lesser degree than older animals due to the incomplete formation of the pain pathways in animals of a very young age. However, NAWAC believes that pain is experienced by younger animals undergoing elective husbandry procedures and recommends as best practice that, irrespective of the age of the animal, pain relief should be provided wherever possible.

Castration

Some submissions justified performing castration to reduce/prevent the presence of 'boar taint'. Boar taint can occur in a small number of pigs if they are slaughtered after they have reached puberty and it can cause an offensive odour upon preparing the meat, thus affecting the final quality of pigmeat. However, it is only found in a small number of pigs and the same outcome can be achieved using other techniques (e.g. immunocastration). Other submissions emphasised that this is a painful procedures and shouldn't be conducted.

EU legislation states that castration in male pigs must be carried out using a technique that does not involve tearing of the tissues as studies have shown that the pulling and severing of the spermatic cords are the most painful components of castration (Taylor and Weary, 2000). Castration must be performed by a veterinarian or person trained and experienced to specific standards and must be performed under hygienic conditions. If castration is performed when piglets are more than 7 days old, anaesthetic and analgesia must be used. In Denmark, castration is only allowed on pigs 2 to 7 days old.

The Code includes a minimum standard that states a non-veterinarian can only perform castration on piglets under 7 days of age. It is still likely that, even at this age, piglets will feel pain when this procedure is performed, but piglets at that age are likely to experience less pain than older piglets. Piglets showed a stronger and longer lasting response to castration at 7-8 weeks of age than did pre-weaned animals at less than 20 days of age (reviewed by Weary and Fraser, 2004). However, in a separate study, pre-weaned piglets responded strongly to castration performed at 3, 10 or 17 days of age (reviewed by Weary and Fraser, 2004). Piglets castrated with the aid of a local anaesthetic had lower heart rates and vocalized less than piglets that were castrated without the use of an anaesthetic, suggesting that the use of an anaesthetic reduces the stressfulness of castration (White et al., 1995). NAWAC has therefore included a minimum standard that surgical castration, if performed when the pig is over 7 days of age, must be performed by a veterinarian and has also included a recommended best practice that castration not be performed at all.

Teeth Clipping

Piglets are born with sharp needle teeth. Needle teeth are generally used to establish dominance and can cause considerable damage to the faces of littermates. In addition, they may also damage the udder of the sow during suckling. To prevent damage, the sharp tips of the needle teeth are clipped off. This procedure is generally performed shortly after birth on piglets housed in indoor systems. One study suggested that the sows with litters with unclipped teeth did not try to avoid suckling attempts from their piglets (Brown et al., 1996). There is debate about the necessity of teeth clipping in outdoor systems. As pigs housed outdoors are not as used to the presence of humans, performing this procedure could lead to a disruption in maternal behaviour which could have more serious consequences than leaving teeth unclipped. Leaving teeth unclipped has been shown not to affect piglet weight gain or survival (Brown et al., 1996).

There is some evidence that grinding teeth causes less tooth cracking than clipping (Heinritziet et al., 1994) and is it likely that less long term pain is caused when grinding, rather than clipping, teeth. The Scientific Veterinary Committee (1997) considers that the benefits of tooth clipping are inconclusive, and therefore tooth clipping should not be carried out as a routine procedure and only be performed where there is evidence that injury to sows teats or to other pigs' ears or tails has occurred. Before carrying out teeth clipping, other measures must be taken to prevent tail biting and other vices, taking into account environment and stocking densities. Teeth clipping must be performed by a veterinarian or person trained and experienced to specific standards (Commission Directive 2001/93/EC) and it must be performed under hygienic conditions. In Denmark clipping of teeth is forbidden, and grinding is only allowed in the first 4 days.

NAWAC have included a minimum standard that restricts the performance of this procedure to occasions when it is justifiable for the purposes of animal welfare and then, only on piglets to under 5 days of age. NAWAC have included a recommended best practice that this procedure is performed using teeth grinding, rather than clipping.

Tail docking

A number of submissions suggested that tail biting is a behaviour that occurs in situations where pigs are experiencing poor welfare. The causes of a tail biting outbreak can be diverse, but in general anything which 'arouses' the animals in the group (draughts, change of diet, change of group composition, etc) and makes them more active, will increase the amount of exploration behaviour of their environment. In the absence of a suitable substrate or manipulative materials to investigate, this motivation to explore may be directed to the tails of pen mates (Zonderland, 2010). Tail biting contributes to a range of pathological changes ranging from spinal abscesses to pyaemia in different parts of the body. A reduction in tail biting can be achieved using improvements in management including the provision of straw, food that satisfies the appetite and additional space in which the pig can perform more positive behaviours. The presence and amount of straw that is provided (more being better for reducing tail biting), and its form (long straw being more effective than chopped) is also of importance in controlling this behaviour (EFSA, 2007b).

In the indoor farming situation, tail biting is often reduced by removing the tail. Tail docking is likely to be acutely painful when performed and docking may also cause long lasting pain due to the formation of neuromas. Tail docking reduces the frequency of tail biting, but does not completely eliminate it under conditions where the animals are experiencing poor welfare (EFSA, 2007b). Furthermore, although docking the tail of pigs reduces the incidence of tail biting (and the associated impact on welfare), it does not address the underlying motivation for the performance of this behaviour (i.e. redirected exploratory behaviour in the absence of a suitable substrate or manipulatory materials).

NAWAC have included a minimum standard stating that tail docking of piglets, if justified, must be performed when they are under 7 days of age and have included a recommended best practice that it is performed when the piglets are less than 72 hours old. The adverse welfare effects of tail removal to the piglet are often increased as the more of the tail that is removed and so a recommended best practice has been included that only one one-third to one-half of the tail is removed. NAWAC supports the approach taken by the EU, that tail

docking must not be carried out routinely, and has recommended, as best practice, the use of alternative methods to reduce tail biting, rather than simply docking the tail.

Nose Rings

Nose rings are applied to the nose of pigs to reduce the amount of rooting that pigs perform, for the purpose of reducing damage to pasture. The rings make it painful for the pigs to press their snout against the ground, in addition to preventing pigs rooting and finding food (Horrell et al., 2001). The act of fixing the rings will also cause significant pain to the pigs. NAWAC has included a recommended best practice that if nose rings are fitted, they are placed through the cartilage at the top of the snout or in the tissue separating the nostrils, and not at the bottom of the snout where they would cause additional discomfort for the pig as it pushes its snout against the ground.

Other issues considered by NAWAC

31. NAWAC has considered how the Code aligns with other relevant codes and regulations both in New Zealand and internationally. NAWAC is not aware of any examples where the Code deviates significantly from these documents.

The nature of any significant differences

32. All significant differences of opinion about the Code, or any of its provisions, have been set out above or in NAWAC's response to submissions.

33. Two significant differences of opinion about the Code, or any of its provisions, were recorded within NAWAC. As noted earlier in the report, NAWAC was divided on whether or not sow stalls should be phased out. There was consensus to bring forward the date to 2013 when sows would only be allowed in dry sows stalls for 4 weeks post-mating. There was also consensus that for sow welfare one week in mating stalls should continue to be allowed. After careful deliberation regarding whether beyond 2013, a total of 1 week or 5 weeks in sow stalls for mating and post-mating should be recommended, NAWAC reached a majority decision on the recommendations set out in the draft code and in Section 28 above. NAWAC also reached a majority position that the use of sow stalls be reduced to one week, for mating only, from five years after release of the code.

Dr John Hellström
Chairman, National Animal Welfare Advisory Committee
20 October 2010

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