

Use of Farrowing Crates During Farrowing and Lactation

(Literature Review)

**USE OF FARROWING CRATES
DURING FARROWING AND LACTATION:
A LITERATURE REVIEW FOR THE
NEW ZEALAND PORK INDUSTRY**

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Executive Summary

- This review was commissioned to examine and summarise the scientific evidence regarding the use of farrowing crates to house lactating sows and piglets from an animal welfare perspective.

- Animal welfare reasons for the use of farrowing crates are:
 - To reduce the number of piglets that are killed by crushing, treading on, or over-lying by the sow.
 - To provide a separate, warm environment for piglets (in the form of a heated creep area), which aids in reducing piglet mortality from causes such as hypothermia and starvation, whilst also maintaining the sow at a temperature that is within her comfort range.
 - To reduce stress on the lactating sow by providing adequate feeding according to her individual requirements, which in turn helps ensure that she produces sufficient milk to feed her piglets.
 - To reduce the amount of disturbance, competition and fighting between the sows for feed and for nest sites, which can be features of some group farrowing systems.
 - To reduce the disturbance and fighting between piglets from different litters in early lactation, which can otherwise occur in group farrowing systems.
 - Any health problems and diseases in the sow or litter are more easily detected and treated.

- There are also important practical management and economic reasons why farrowing crates, with their associated creep area for the piglets, are used to house sows during birth and lactation. These include:
 - Protection of the stockperson from injuries that otherwise may be inflicted by aggressive sows when handling their piglets for routine management and health care procedures.
 - Improved utilisation of labour, feed and building space.

- Minimising the loss of income that would otherwise occur through preventable piglet mortalities.
- There is a wealth of scientific evidence that supports the use of farrowing crates in commercial production.
- Farrowing crates are widely used in commercial pork production throughout the world, including both in Australia and Canada, which are the source of the majority of pig meat imports into New Zealand.
- Based on the above evidence and reasoning, the New Zealand pork industry clearly sees the need to retain the option for producers to use sow farrowing crates throughout lactation up until weaning occurs, in each reproductive cycle.

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Introduction

Farrowing crates were introduced in the 1960's, primarily to reduce the problem of high piglet mortality. They achieve this by restricting sow movement sufficiently so that piglets have the opportunity to get out of her way when she stands up or lies down (McGlone, 1992; Cronin, 1998). While this restriction of the sow's movement undoubtedly confers welfare benefits to the piglets, it is seen by some as being at the expense of the welfare of the sow. These concerns have become more apparent in recent years, and have been one of the drivers behind the development of some alternative farrowing systems. Although similar results have been achieved between some of these alternatives and traditional farrowing crates (primarily under experimental conditions), in commercial farming situations worldwide the farrowing crate is still the most common form of housing for sows during farrowing and lactation, along with their suckling piglets. The New Zealand pork industry is no different in this regard, and wishes to retain the option of using farrowing crates for up to six weeks in each reproductive cycle.

This review therefore examines the current industry usage of farrowing crates in New Zealand and overseas; welfare issues for both piglets and sows in relation to the use of farrowing crates and the related management and economic considerations associated with using them as part of a modern pork production system.

Current Industry Practice

Sows are often moved from 'dry sow' to 'farrowing' accommodation three to seven days before the expected farrowing (birth) date, and are usually kept there throughout lactation until the piglets are weaned. Weaning times differ between farms, and so too, therefore, does the time that sows and piglets spend in the farrowing accommodation.

The time that sows spend in farrowing accommodation before they go into labour is to allow for an important "settling in" period before their piglets are born. The sow's natural behaviour at this time involves nest-making at their selected birth site. Once she has given birth, the sow will not generally move far from her birth site and prefers to live a relatively sedentary life during the period of early lactation. During this period her natural instinct is to be readily available to her piglets to provide warmth, nutrition, and in the wild, protection from predators (Curtis, 1995; Marchant, 1997). Hence, confinement of the sow during this period is consistent with natural behaviours.

There are numerous farrowing systems used, but there has been a strong worldwide trend to individually house the sow in a crate during the farrowing and lactation period (Baxter, 1984; Phillips and Fraser, 1993). The area available for each sow in these farrowing systems is approximately 2.1-2.4 metres long by 0.6 metres wide. A variety of flooring material is used which is often partially slatted or meshed at the rear of the crate to allow for manure to fall through into a separate collection area, which is regularly flushed with water. A drinker and feeding trough are located at the front of the crate, with sows commonly being fed a diet of wet or dry feed two or three times a day. There is a separate area to either side of the sow (usually 0.3-0.45 metres wide on one side, and 0.6-0.75 metres wide on the other) into which the piglets can escape when the sow is standing up or lying down. In the larger of these two areas, there is normally a special 'creep' area for the piglets, which is provided with supplementary heat (via a hanging lamp or heat pad) and enclosed, in order to maintain the higher temperatures (at least 30°C) necessary for piglet welfare (Borell *et al.*, 1997).

Alternatives to the traditional farrowing crate systems include individual open pens and communal enclosures with provision for individual farrowing areas (multi-suckling groups).

Outdoor systems are also used in some areas of the country where the appropriate environmental conditions prevail, in which sows are housed either individually or in groups in paddocks, with the provision of individual arks or huts in which they can farrow. In multi-suckling groups and in outdoor systems where sows are kept in groups, the piglets are often confined to the farrowing enclosure or hut for the first few days after birth, after which they begin to mix with piglets of other litters.

Although some use is made of these alternative farrowing systems, a recent survey of sow accommodation used in New Zealand reported that 76 percent of the then estimated 46,000 sows farrowed in crates, and 68 percent were housed in crates until weaning (Gregory and Devine 1999). By comparison, 95 percent of Australia's 300,000 sows are assumed to farrow in crates (Barnett *et al.*, 2001). Hendriks *et al.* (1998) reported that 92 percent of the 3.1 million sows in 14 European countries were housed in farrowing crates during lactation. Similarly, Chambers (2001, pers. comm.) reported that approximately 99 percent of sows are housed in crates throughout lactation in Canada.

These survey results indicate that there is a significant investment in farrowing crates throughout the New Zealand pork industry, but that their use is comparatively less than in overseas countries such as Australia and Canada, which are the major source of pig meat imports into New Zealand.

Implications of using farrowing crates on welfare of piglets

The primary reason for the use of farrowing crates is to reduce piglet mortality. Survey reports indicate that 12–30 percent of piglets born alive die before weaning (English and Morrison 1984). In nearly all survey work carried out in different countries, 50 percent of pre-weaning deaths occurred within the first three days after parturition and 90 percent of deaths occurred within the first week of life (Varley, 1995; Edwards and Fraser, 1997). Overlaying appears to be the biggest cause of piglet death, with 5–6 percent of liveborn piglets being crushed or stood on by the sow during the first three days of life (Svendsen *et al.*, 1986; Fraser *et al.*, 1995; Weary *et al.*, 1998).

The effectiveness of farrowing crates in reducing piglet mortality compared to open pen systems is borne out by the results of comparison surveys. These have generally shown greater piglet survival where crates are used. Edwards and Fraser (1997) summarised much of the literature from the previous 30 years and reported wide variation in piglet losses between different surveys (Table 1).

Table 1. Comparison of piglet mortality levels in farrowing systems with crates and open pens.

Source	No. of litters	% mortality	
		Crates	Pens
Robertson <i>et al.</i> (1966)	150	18.7	26.6
Devilat <i>et al.</i> (1971)	46	10.2	13.5
Glastonbury (1976)	614	15.9	31.3
Nielsen (1980) ^a	>2000	5.5	8.4
Aherne (1982)	21	12.7	34.6
Svensden <i>et al.</i> (1986) ^a	702	4.4	6.5
McGlone and Morrow-Tesch (1990)	40	10.8	27.1
Grissom <i>et al.</i> (1990) ^a	162	6.3	13.5
Cronin and Smith (1992a)	64	10.5	16.5
Blackshaw <i>et al.</i> (1994)	16	14.0	32.0

^a % crushed

Based on the data of Edwards and Fraser (1997), the average piglet mortality for litters in crates was 10.9 percent compared to 21 percent for open pens. Similar piglet mortality results favouring use of crates have also been reported by Kunz and Ernst (1987), McGlone (1992), Vermeer *et al.* (1993), Thornton (1996), Weber (1997), Weary *et al.* (1998), and Bradshaw and Broom (1999). The results of these studies suggest that a narrow farrowing crate is the best protection for piglets. Blackshaw *et al.* (1994) observed that sows in farrowing crates were less than half as active as those in farrowing pens, giving less opportunity for piglets to be crushed, kicked, or rolled on. Additionally, the same authors found that suckling activity was significantly greater for the piglets of sows in the farrowing crate than those housed in the pen system, with the crate environment providing for stable suckling activity durations throughout all the periods whereas in the farrowing pen the durations fluctuated.

Similar results to those presented above have been observed from several studies comparing percentage mortality of liveborn pigs in farrowing systems with crates versus multi-suckling

group farrowing systems, with higher piglet survival rates found in farrowing crates (Rudd *et al.*, 1993; Boe, 1994; Kavanagh, 1995; Cronin *et al.*, 1996; PIC, 1996; Higgins and Edwards, 1996; Marchant, 1997). A recent Australian study has reported pre-weaning mortality of 22.8 percent in eco-shelters¹ with group farrowing areas (Payne, 1999).

The main problems encountered in multi-suckling farrowing systems are with pigs not choosing to farrow in one of the nests or huts provided, or choosing to share the same nest or hut as another sow or gilt. This increases the risk of chilling, starvation and crushing of piglets (Gadd, 1991; O'Keefe, 1998).

Another potential problem for piglets in multi-suckling lactation systems is cross-suckling, where dominant piglets from each litter move from sow to sow within the communal enclosure, getting a feed from each one. Newly grouped litters may experience major disruption of suckling, with an increased frequency of unsuccessful suckling, a high degree of cross-suckling, and an increased number of piglets at the udder of individual sows during any suckling attempt (Wattanakul *et al.*, 1997). This may cause a dramatic decrease of piglet growth rate, uneven growth rates, and an increase in mortality during the first few days after grouping, particularly in litters with a high average litter size (Marchant, 1997).

The surveys and studies listed above provide evidence that the use of farrowing crates can be beneficial by significantly reducing piglet mortality. A return to the conventional open pens of the past would result in more piglet deaths, lower economic returns, and lower overall well-being (especially for crushed piglets) (McGlone and Morrow-Tesch, 1990). Marchant (1997) concludes that piglet mortality is a welfare issue and it is not justifiable to improve the welfare of the sow if it results in an increase in the number of piglets killed before weaning.

¹ "Eco-shelters" are a type of low-cost building, which usually house animals on a litter of straw or sawdust.

Implications of using farrowing crates on welfare of sows

When evaluating the well-being of sows and piglets, it has to be recognised that physical, thermal, physiological, behavioural and social needs of sows and piglets are diverse. Their requirements are different to such an extent, that it has been suggested that it may be impossible to develop a housing system that maximises the welfare of sows and piglets simultaneously (Borrell *et al.*, 1997). For example, the extra space provided for sows in pen or group farrowing systems compared with crates may prove detrimental to piglet welfare: (i) if the sow does not farrow in the preferred location in the pen containing features to promote piglet survival, exposing them to increased risk from overlay and chilling (Edwards and Fraser, 1997), or (ii) the sow abandons the farrowing site or litter (Marchant, 1997), subjecting the piglets to starvation, chilling, disturbance from other sows, and illness from lack of colostrum intake. Consequently, a compromise must be struck between the degree of permissible freedom of movement and sow clumsiness to avoid crushing and chilling piglets (McGlone and Blecha, 1987). Commercial farrowing systems attempt to achieve this by having two micro-environments - one each for sows and piglets.

The balance of this compromise is a contentious issue, with criticisms of the farrowing crates generally focussing on sow welfare rather than piglet welfare. Some of the issues important for sow welfare in farrowing/lactation accommodation are: (i) the degree of physical confinement imposed on a sow; (ii) the need for bedding/nesting material for sows in the pre-farrowing period; (iii) the duration of confinement; (iv) restricted social contact of individually housed sows (Barnett *et al.*, 2001).

There have been a number of studies undertaken examining the extent to which these welfare concerns are justified. Several experiments have been conducted to measure the stress response (through measurement of cortisol²) of sows housed in crates without straw and in straw-bedded pens around parturition and during lactation (Cronin *et al.*, 1991; Lawrence *et al.*, 1994; Lawrence *et al.*, 1997; Jarvis *et al.*, 1998; McLean *et al.*, 1998). There was no evidence of chronic stress responses on the day of the actual delivery, on the day following parturition, or

² The hypothalamic-pituitary-adrenal (HPA) axis stimulated by stress responds by elevation of plasma cortisol.

during the first three weeks of lactation. Lawrence *et al.* (1997) note that it is difficult to determine the welfare consequences of an acute stress response found in gilts around parturition since parturition *per se* is associated with an increase in cortisol concentrations perhaps indicative of the unavoidable stress of giving birth. In a study by Biensen *et al.* (1996), it was found that similar periparturient behaviours were displayed by sows regardless of the farrowing environment. They found that cortisol concentrations decreased progressively during lactation and were not associated with litter weight gains or the interval between weaning and first oestrus.

In terms of the degree of physical confinement imposed on sows housed in farrowing crates, a study by Harris and Gonyou (1998) showed that increasing the available space and width of the farrowing crate did not facilitate postural changes or maternal responses in gilts. Increases in the size of farrowing crates also had no effect on duration of farrowing or incidence of stillbirths (Parry, 1986; McGlone and Blecha, 1987; Fraser *et al.*, 1988; Curtis *et al.*, 1989; Rohde Parfet *et al.*, 1989; Fraser *et al.*, 1997). Similarly, the results of a study conducted by Blackshaw *et al.* (1994) indicated that providing more freedom for the sow to move, did not necessarily ensure good welfare for the whole sow-piglet system. Likewise, Gilbert *et al.* (1997) found that parturition was not interrupted following space restriction of gilts. It was suggested that reducing maternal space allowance during parturition is not stressful when the process does not involve the movement of animals to novel surroundings. In agreement with the above, McGlone and Blecha (1987) found that sows returning to a familiar standard crate were less frustrated compared to sows moved to an unfamiliar alternative farrowing system. The same authors found that experienced sows showed higher levels of oral-manipulative behaviours, such as stereotypic bar biting and fence chewing, when placed in the pen environment than did gilts or sows placed in the standard farrowing crate.

In relation to the perceived need for bedding/nesting material, Edwards and Furniss (1988) are of the opinion that implied welfare risk for sows and piglets as a consequence of reduced opportunity for nest-building in a farrowing crate has not been demonstrated. Lending weight to this view is the data of Hutson (1988) and Arey (1992), which showed that sows were not prepared to work in order to gain access to straw in a box, and food appeared to be more important than straw to sows during the pre-parturition period. Also negating from the perceived

beneficial effects of straw is the fact that there are known problems with hygiene, disease, and effluent disposal associated with its use in alternative farrowing systems (Barnett *et al.*, 2001).

One of the advantages of using farrowing crates is the ability to feed lactating sows to their individual requirements during a time of high nutrient demand. The amount of feed required during lactation is much higher than during other production periods and varies significantly between sows. Farrowing crates allow feed intake of each individual sow to be maximised, permit each sow to eat in peace and quiet; and eliminate aggression which is common around feeding in pens of group-housed farrowing sows (Svendsen and Svendsen, 1997). The elimination of this aggression between group housed sows is particularly important during the crucial period of pre-parturition and lactation, because of the possible occurrence of injuries both to sows and piglets during physical contact, and the stress that can arise from low social rank and unresolved interactions (Vessuer *et al.*, 1994). Sows in semi-natural conditions isolate themselves before farrowing (Jensen, 1986), and when penned together, they show increased aggression towards other animals (Arey *et al.*, 1992; Svendsen and Svendsen, 1997).

From the above studies it can be seen that the common criticisms of farrowing crates in relation to the welfare of sows are not necessarily supported by scientific evidence. The above studies found no evidence of any significant increase in stress responses of lactating sows housed in farrowing crates, emphasised the benefits of using farrowing crates to maximise feed intakes and eliminate aggression among sows, and suggested that providing extra space for sows does not necessarily ensure good welfare for the whole sow-piglet system.

Implications of using farrowing crates on management

Modern farrowing crate designs permit improved management and safe working access to the piglets, automation of manure removal, improved hygiene, and better protection for the stockperson from any aggression that may be displayed by the sow when handling piglets to carry out routine management procedures (Curtis, 1995; Cronin, 1998). A major drawback with alternative farrowing systems is difficulty of management. Without any way of restraining the

sow or shutting the sow away from her piglets, carrying out routine husbandry and health care procedures can be difficult and dangerous for the stockperson (Marchant, 1997).

One of the important factors affecting the welfare of pigs is the stockperson-animal relationship. Research has shown that these relationships can directly affect the productivity and welfare of farm animals (Hemsworth and Coleman, 1998). The routine use of the modern farrowing crates systems can help to facilitate these good relationships through attracting and retaining high quality staff, and allowing for positive interactions between these staff and animals (such as patting, stroking and talking to stock).

Alternative farrowing systems require greater stock management skills than more confined systems. The use of alternative systems by commercial farmers, without an understanding of pig behaviour, has led to problems of poor pen hygiene, farrowing in inappropriate locations, and increased piglet mortality (Edwards and Fraser, 1997; Marchant, 1997). Whilst systems can perform well under development on an experimental unit with high levels of technical staff input, very disappointing results are often obtained under commercial conditions. Some of these alternative systems might be unsuitable on units where stockpersons are uncomfortable working around less restrained sows (English, 1993). Thus, no single technology or production system is likely to suit, or be appropriate for, all users.

Peet (1991) concluded that guidelines or regulations on management are likely to be more effective than prohibiting or controlling housing methods.

Economic considerations for use of farrowing crates

When considering introducing alternative farrowing systems into the intensive pig production system, such considerations cannot be divorced from production economics and their effect on the reduction of output, increase of capital and running costs, higher management input and increased manual labour for cleaning, and subsequent reduction of net margin (Peet, 1991; Edwards and Fraser, 1996 and 1997).

In terms of capital costs, almost all intensive indoor pig production enterprises have farrowing crates that cannot easily be removed and replaced with alternatives that have different spatial requirements and dimensions. The use of modern farrowing and piglet management systems has allowed for the efficient utilisation of building space. Moving back to alternative housing systems involving farrowing pens would double the building space required to house sows and their piglets and would result in significant increases in capital expenses (Barnett *et al.*, 2001).

Conclusions

This review has summarised the implications of using farrowing crates on piglet and sow welfare, farm management, and economics. The reviewed scientific evidence supports the use of farrowing crates in commercial production. The evidence clearly shows the modern farrowing crate and its associated creep space for piglets is the best system yet devised for minimising piglet deaths and providing all round ease of management. The practice of using farrowing crates is very common throughout the world, including both Australia and Canada, which are the source of the majority of pig meat imports into New Zealand. Piglet mortality in many alternative farrowing systems exceeds the industry average of 10–13 percent for farrowing crates and needs to be consistently equivalent to levels achieved for farrowing crates, for these alternative systems to be considered viable and thus recommended.

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