

Institution: University of Edinburgh and SRUC, Scotland's Rural College
Unit of Assessment: 6
Title of case study: Loose-farrowing systems Improve the welfare of the sow whilst protecting the welfare of the piglet and have superseded the farrowing crate, now banned in three countries.
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Impact: Policy, Animal Health and Welfare: Improved sow and piglet welfare and recommendations and codes of practice for farrowing and lactation systems that better meet sow and piglet needs.</p> <p>Significance: Farrowing crates restrict sow movements interfering with natural sow behaviour and increasing psychological distress. Used predominantly to protect piglets, SRUC research demonstrated that piglet survival improved in loose-housed environments, undermining crate use.</p> <p>Beneficiaries: Farmers, sows and piglets, the general public</p> <p>Attribution: Drs Baxter and Jarvis, Professors Lawrence and Roehe (SRUC). Research collaboration was with Prof Sandra Edwards, University of Newcastle.</p> <p>Reach: International legislative bans on farrowing crates; voluntary industry uptake of non-crate systems; EU recommendations/legislation on housing at farrowing, guidelines for keeping pigs (e.g. RSPCA Freedom Food).</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The use of the farrowing crate, designed to minimise space requirements, protect piglets and make handling of sows easier produces a welfare dilemma. The sow, during the pre-farrowing period, is highly motivated to build a nest in preparation for birth. The restrictive nature of the farrowing crate and its fully slatted flooring constrains this behaviour by preventing provision of space and substrate. It persists as the predominant housing type because it provides protection for the piglets from crushing, which was the main reason it was introduced in the 1960s. However, SRUC research (Drs Baxter (Researcher, employed 2002-onwards), Jarvis (Behavioural Scientist, employed 1997-onwards), Profs. Lawrence (Group manager, employed 1984-onwards), and Roehe (Senior Animal Geneticist, employed 2004-onwards)) provided scientific evidence of welfare issues that exist for the farrowing sow in a restrictive system and related specific behaviours to physiological indicators of stress [3.1, 3.2, 3.3].</p> <p>Our programme of research (1993-onwards) took a systematic approach to tackling the dilemma: observing and documenting the domestic sow's species-specific behaviours in a natural environment and determining whether these behaviours continue to be displayed in farrowing crates. Then validating the behavioural evidence that farrowing crates thwart the physiologically triggered need to perform nest-building behaviours therefore causing psychological distress [3.1].</p> <p>This validation work represents the main inception point of the impact. To perform this validation we hypothesised that crating negatively affected various stress and parturition-related hormones (e.g. prolactin, oxytocin, vasopressin and plasma cortisol [3.1, 3.2]). By comparing animals housed in traditional farrowing crates with those housed loose in pens we confirmed our hypothesis showing that although parturition in itself triggered an increase in cortisol, the plasma levels were considerably higher in crated sows compared to loose sows, demonstrating a physiological stress effect of crating supporting the behavioural evidence [3.3].</p> <p>Our research also questioned the piglet protective nature of the crate by demonstrating that thwarting nest-building behaviour and disrupting hormonal patterns that should prepare the sow for farrowing results in increased negative maternal behaviours such as piglet-directed attacks by the sow (savaging; [3.4]).</p> <p>The next stage was to demonstrate that piglet survival could actually be improved in loose-farrowing systems [3.5, 3.6]. Importantly, we conducted detailed investigations to identify the key behavioural and physiological attributes that underpin piglet viability and survival in a range of</p>

Impact case study (REF3b)

farrowing systems, including outdoor loose-housed [3.5]. This work gathered phenotypic evidence that supported a large genetic selection experiment (involving collecting data on more than 20,000 piglets) that successfully demonstrated that it is possible to breed for improved piglet survival in loose farrowing systems [3.6]; within just one generation perinatal mortality was reduced by three percentage points.

This body of research has provided a fundamental platform of robust scientific evidence about the welfare detriments of crated sows whilst also working on solutions to improve piglet survival that are translated directly to the industry, thus advancing the welfare of both the sow and piglets.

3. References to the research (indicative maximum of six references)

- 3.1) Lawrence, A. B., Petherick, J. C., McLean, K., Deans, L., Chirnside, J., Vaughan, A., Clutton, E. and Terlouw, E. M. C. 1994. The effect of environment on behaviour, plasma cortisol and prolactin in parturient sows. *Applied Animal Behavioural Science*. 39: 313-33. [http://dx.doi.org/10.1016/0168-1591\(94\)90165-1](http://dx.doi.org/10.1016/0168-1591(94)90165-1)
- 3.2) Lawrence, A. B., Petherick, J. C., Mclean, K. A., Deans, L., Chirnside, J., Vaughan, A., Gilbert, C. L., Forsling, M. L. and Russell, J. A. 1995. The effects of chronic environmental stress on parturition and on oxytocin and vasopressin secretion in the pig. *Animal Reproduction Science*. 38: 251-264. [http://dx.doi.org/10.1016/0378-4320\(94\)01361-O](http://dx.doi.org/10.1016/0378-4320(94)01361-O)
- 3.3) Jarvis, S., Lawrence, A. B., McLean, K. A., Deans, L. A., Chirnside, J., and Calvert, S. K. 1997. The effect of environment on behavioural activity, ACTH, b -endorphin and cortisol in pre-farrowing gilts. *Animal Science*. 65: 465-472. <http://dx.doi.org/10.1017/S1357729800008663>
- 3.4) Jarvis, S., Reed, B. T., Lawrence, A. B., Calvert, S. K. and Stevenson, J., 2004. Peri-natal environmental effects on maternal behaviour, pituitary and adrenal activation, and the progress of parturition in the primiparous sow. *Animal Welfare*. 13: 171-181. <http://tinyurl.com/qbzth3s>
- 3.5) Baxter, E. M., Jarvis, S., Sherwood, L., Robson, S. K., Ormandy, E., Farish, M., Smurthwaite, K. M., Roehe, R., Lawrence, A. B. and Edwards, S. A. 2009. Indicators of piglet survival in an outdoor farrowing system. *Livestock Science*. 124: 266-276. <http://dx.doi.org/10.1016/j.livsci.2009.02.008>
- 3.6) Roehe, R., Shrestha, N. P., Mekki, W., Baxter, E. M., Knap, P. W., Smurthwaite, K. M., Jarvis, S., Lawrence, A. B. and Edwards, S. A. 2009. Genetic analyses of piglet survival and individual birth weight on first generation data of a selection experiment for piglet survival under outdoor conditions. *Livestock Science*. 121: 173-181. <http://dx.doi.org/10.1016/j.livsci.2008.06.010>

4. Details of the impact (indicative maximum 750 words)

Impact on Policy

To date, three countries (Sweden, Switzerland and Norway) have banned farrowing crate use completely and at least one other (Austria) has initiated a phasing out of crates. In addition, there is voluntary industry uptake of loose-farrowing alternatives (e.g. UK, Denmark, and Australia).

SRUC research on stress physiology of the farrowing sow has been used by European veterinary committees and working groups as a basis for recommendations for legislation which affects how all farmers in the EU raise, house, and manage their livestock/pigs as well as in developing guidelines for the keeping of pigs (e.g. Defra Welfare Codes, RSPCA welfare standards for pigs). Although there is no full EU ban on crates, the EU council directive 2008/120/EC says "...sows and gilts must be given suitable nesting material in sufficient quantity unless it is not technically feasible for the slurry system used in the establishment..." This recognition that nest-building is an intrinsic need stems from the scientific evidence reported and cited (SVC, 1997). Higher welfare standards such as those laid down by the RSPCA for their Freedom Food label (<http://www.freedomfood.co.uk/media/9318/pigs.pdf>) ensures substrate provision and has placed an imminent ban on crates (by 2014). Recently, the British Pig Executive (BPEX), in a document outlining their vision for 2020, stated that they would "...continue to focus on finding solutions that

allow sow freedom around farrowing..." (http://www.bpex.org.uk/articles/301937/2020_Pig_Health_and_Welfare_Strategy.aspx). This acknowledgement of the welfare issues has also been voiced by the Danish Pig Industry who committed to ensuring 10% of their breeding herd (equivalent to ~120,000 sows) would be loose-farrowing by 2020. Our scientific evidence showing the unequivocal welfare detriments to sows housed in farrowing crates and not permitted substrate for nest-building is used repeatedly to support such decisions.

Impact on Piglet Mortality

The issue of piglet mortality continues to be a major welfare and economic concern in all farrowing systems. Total pre-weaning mortality in commercial piggeries ranges from 16-20% (cf. BPEX Pig Yearbook 2012), equating to approximately 2 million piglet deaths per annum in the UK alone. With every 0.5% increase in pre-weaning mortality, output is reduced by 10kg/sow/year, a significant loss of income to producers and a significant inefficiency within the supply chain. In order to reduce piglet mortality and ensure no rise in piglet mortality in loose farrowing systems, it was vital to identify the causes of death in different farrowing systems and thus identify what contributes to piglet survival [see reference 3.5 above]. A concern that piglet mortality is increased in loose farrowing systems slows progress in abolishing the farrowing crate. However, SRUC investigations into causes of piglet mortality and the genetics of piglet survival, within loose farrowing systems have led to a readily available breeding strategy to actually improve piglet survival. When applied nationally, this approach reduces piglet mortality rates by 3% equating to **60,000 fewer piglet deaths, saving the industry £2.7 million annually**. This work was conducted with breeding companies and farmers and therefore translated directly to industry by incorporating into breeding programmes.

This work has been distributed via the EU Welfare Quality programme factsheets (available in 5 different languages), as well as disseminated at invited presentations on improving piglet survival which include: 25 pig discussion groups, 2 industry workshops, 3 international conferences and many on-farm consultations.

5. Sources to corroborate the impact (indicative maximum of 10 references)

Sources 5.1, 5.2 and 5.3 all repeatedly cite our scientific research (see section 3 references 3.1-3.4) as evidence of the welfare detriments of the farrowing crates to both the sow (3.1, 3.2, 3.3) and the piglets (3.4). Source 5.4 cites our research on piglet survival (3.5, 3.6) as valuable evidence of the potential to breed for improved survival in loose systems. Sources 5.5, 5.6 and 5.7 are examples of the translation of our research into industry.

- 5.1) Evidence Deputy Director, Defra <http://tinyurl.com/nv35p67>
- 5.2) SVC, 1997. The welfare of intensively kept pigs. Report of the Scientific Veterinary Committee. Directorate General XXIV of the European Commission. Adopted 30th September 1997. Doc XXIV/ScVc/0005/97. Scientific Veterinary Committee, Animal Welfare Section, Brussels, Belgium. <http://tinyurl.com/pn2r6sl>
- 5.3) Informs the EU Council Directive 2008/120/EC lays down the minimum standards for the protection of pigs: <http://tinyurl.com/pfdv88w>
- 5.4) European Food Safety Authority 2007. Animal health and welfare aspects of different housing and husbandry systems for adult breeding boars, pregnant, farrowing sows and unweaned piglets [1] - Scientific Opinion of the Panel on Animal Health and Welfare, EFSA. pp.1-13 <http://tinyurl.com/oruhv9q>
- 5.5) European Food Safety Authority 2011. Scientific report updating the welfare of pigs. Report 1. Update of animal health and welfare aspects in relation to housing and husbandry of adult pigs and unweaned piglets, including castration. <http://tinyurl.com/qafmqan>
- 5.6) Improving piglet survival. Welfare Quality. <http://tinyurl.com/p6xjngb>
- 5.7) RSPCA welfare standards for PIGS. 2012. <http://tinyurl.com/pww526v>
- 5.8) BPEX - 20:20 Pig Health and Welfare Strategy <http://tinyurl.com/ntq5lmg>