Animal welfare and economic optimisation of farrowing systems

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Abstract

In many countries, including the UK, the majority of domestic sows are housed in farrowing crates during the farrowing and lactation periods. Such systems raise welfare problems due to the close confinement of the sow. Despite the fact that many alternative housing systems have been developed, no commercially viable/feasible option has emerged for large scale units. Current scientific and practical knowledge of farrowing systems were reviewed in this study to identify alternative systems, their welfare and production potential. The aim was to establish acceptable trade-offs between profit and welfare within alternative farrowing systems. Linear programming (LP) was used to examine possible trade-offs and to support the design of welfare-friendly yet commercially viable alternatives. The objective of the LP was to optimise the economic performance of conventional crates, simple pens and designed pens subject to both managerial and animal welfare constraints. Quantitative values for constraints were derived from the literature. The potential effects of each welfare component on productivity were assessed by a group of animal welfare scientists and used in the model. The modelled welfare components (inputs) were extra space, substrate and temperature. Results showed that, when using piglet survival rate in the LP based on data drawn from the literature and incorporating costs of extra inputs in the model, the crates obtained the highest annual net margin and the designed pens and the pens were in second and third place, respectively. The designed pens and the pens were able to improve their annual net margin once alternative reference points, following expert-derived production functions, were used to adjust piglet survival rates in response to extra space, extra substrate and modified pen heating. The non-crate systems then provided higher welfare and higher net margin for sows and piglets than crates, implying the possibility of a win-win situation.

Keywords: alternative housing systems, animal welfare, economic optimisation, farrowing systems, linear programming, pig

Introduction

Farm animal housing systems have implications for animal welfare and health as well as for economic and technical performance. Intensive livestock production, with particular emphasis on high productivity and profit, imposes restrictive and in some instances controversial, if not unacceptable, housing conditions for production animals (Fraser 2008). Sow farrowing crates are an example of such systems, which continue to be a focus for public concern and debate. In 2008, approximately 427,000 sows and gilts were held in 6,100 breeding holdings across the UK (82% in England, 9% in Scotland and 9% in Northern Ireland) (BPEX 2009). The majority of UK indoor sows are farrowed in crates; despite a growing outdoor sector — it was reported that around 73% of all breeding sows farrowed in crates in 2006 (Defra 2007).

The major concerns about farrowing crates are related to the welfare of the sow, as her movement is highly restricted and natural nest-building behaviour severely suppressed within these systems (Lawrence et al 1994; Jarvis et al 1997; Damm et al 2002; Wischner et al 2009). Development of an alternative economical farrowing system that promotes high welfare for sows and piglets has been identified as beneficial for industry and the animals (Johnson & Marchant-Forde 2009). However, such an alternative system still requires further development to harmonise with large scale commercial production (Edwards & Fraser 1997). An ideal alternative system would maximise piglet survival, allow sows to perform their natural patterns of behaviour, reduce labour and provide a good working environment and incur lower capital requirements compared with conventional systems. Although many alternative housing systems have been developed in different countries, no commercially viable and feasible indoor option has emerged for large scale units. Cain and Guy (2006), who analysed the costs of producing weaner pigs under a range of housing systems with different levels of welfare for the sow, reported that pig production costs tend to be higher in systems which are judged to