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Short communication

Development of a spreadsheet based financial model for pig producers considering high welfare farrowing systems

Y.M. Seddon *, P.J. Cain, J.H. Guy, S.A. Edwards

School of Agriculture, Food and Rural Development, Newcastle University, Newcastle Upon Tyne NE1 7RU, UK

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ABSTRACT

This technical note describes the development of a novel spreadsheet-based financial simulation model that estimates the cost of pig production in five free-farrowing systems in comparison to standard sow housing in a farrowing crate. The model was developed to address the recognised deficiency in financial information on free-farrowing systems, and assist pig producers in estimating the cost of producing pigs in such systems. The model is available online at http://www.ncl.ac.uk/afrd/research/project/4378. Users can select from eight different types of farrowing accommodation and four gestation housing systems, with additional variations on floor type and feeding system. Input data on herd size and productivity are entered into one active sheet and, using built-in data on housing and other input costs, the model computes the cost of producing a weaner pig (8 kg at 4 weeks of age) in each gestation/farrowing system combination selected. Sensitivities to input or output changes can also be evaluated by altering herd performance. The use of this model provides pig producers, policy makers and other stakeholders with a means to estimate the likely cost of pig production prior to any investment in a new housing system. An example of the applications of the model is given in this paper.

1. Introduction

The farrowing crate is the most widely used indoor housing system for parturition and lactation in major pig producing countries (EFSA, 2007). Confinement housing systems have generated some of the greatest concern for animal welfare (Fraser, 2011), and the restraint of sows during this important time in the breeding cycle has led to growing debate over the welfare of sows farrowed in crates. The European Food Safety Agency (EFSA) Scientific Opinion on sow housing and husbandry systems states that 'Housing of sows in farrowing crates severely restricts their freedom of movement which increases the risk of frustration' (EFSA, 2007). Although a number of alternative free-farrowing systems have been developed (see Baxter et al., 2012), few have been commercially viable due to high labour requirement or piglet mortality, and indeed many have not been subject to commercial-scale evaluation, and thus their impact on the cost of production is unknown (Baxter et al., 2012).

In the UK, the Defra-sponsored PigSAFE project has developed a higher welfare indoor free-farrowing pen that considers the biological requirements of both the sow and her litter (Edwards et al., 2012). Experimental development (greater than 100 farrowings on each of two sites) and commercial evaluation (300 farrowings across two sites) have demonstrated that the PigSAFE pen can achieve comparable production performance to that in crates (Edwards et al., 2012). The pen is now available for testing by commercial pig producers. Simultaneously, a number of other alternative indoor free-farrowing systems have become available. These include a Danish design (JLF10

* Correspondence to: Prairie Swine Centre, Box 21057, 2105 8th Street East, Saskatoon, Saskatchewan, Canada S7H 5N9. Tel.: +1 306 662 7442; fax: +1 306 955 2510.
E-mail addresses: yolande.seddon@usask.ca, yolandeseddon@hotmail.com (Y.M. Seddon).

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Jyden Bur Staldinventar, Denmark, similar to the PigSAFE pen but without a lockable sow feeding stall); the 360° farrower (Midland Pig Producers, UK, comprising a modified crate that opens allowing the sow to turn around 360°) and the arc on yard (Farm Animal Initiative, FAI, UK, an individual pen consisting of a small hut used for outdoor keeping of sows, located not on pasture but on a on an unroofed concrete pad). However, concerns about the level of productivity attainable along with capital and running costs is likely to limit large-scale commercial adoption of free-farrowing systems by the pig industry.

Previously, the cost of production in different UK sow housing systems has been calculated and presented in relation to the level of welfare offered by a system (Cain and Guy, 2006). However, this work contained a limited number of housing systems and no evaluation of free farrowing accommodation for indoor-housed sows. The PigFare model developed by Pluske et al. (2011), allows for comparison of the net benefits of up to nine different housing alternatives in each of gestation, breeding and farrowing stages. However, the model, in its current form does not contain information on the recently developed free-farrowing systems, nor does it appear there are any financial models available online for the wider public to use. This paper describes the development of a spreadsheet based financial simulation model, available online, for producers and industry professionals to evaluate the cost of producing a weaner pig in different free-farrowing systems, and to compare this with existing farrowing sow systems.

2. Methods

A survey of UK farms (DEFRA, 2010) was used to identify the sow housing systems currently existing in commercial production. A further four alternative indoor farrowing systems were selected, namely the PigSAFE pen and three others to give a total of eight farrowing (Table 1) and four gestation sow systems (Table 2). Depending on the particular floor and feed delivery method chosen within a system, 18 farrowing sow and 10 gestation sow systems are available, giving a total of 180 farrowing/gestating sow system combinations.

2.1. Data sources

Capital costs of construction for each system per sow place and estimated annual repair costs were derived from quotations from a number of UK farm building companies. Costs were estimated based on a theoretical pig unit housing 545 sows (the average UK herd size); (BPEX, 2010), with batches of 24 sows farrowing every week throughout the year. These initial capital costs were amortised, based on an interest rate of 8% (Nix, 2010), over their lifetime to provide an annualised charge (Table 3). For annual repair costs, survey data from pig

Table 2
Specifications and costs of gestation sow systems used in the model.

Gestation sow system[a]	Space/sow (m²)	Floor type[b]	Feeding	Cost/sow place (£)[c]
Yard	2.25	S	DF	754
Yard	2.25	S	SF	832
Yard	2.25	Deep S	ESF	767
Free access stalls	2.74	SF–S use	AF/HF	891
Free access stalls	2.74	FS	AF/HF	976
Kennelled yard	3.27	SF–S use	AF/HF[d]	1084
Outdoor	400	S	AF–Scatter fed	176

[a] Cost includes space for six boar pens per system.
[b] FS=fully slatted, SF=solid floor, S=straw bed, HF=hand fed, AF=automatic fed, WF=automatic wet feeding, DF=dump fed, SF=spin feeder, ESF=electronic sow feeder.
[c] Costs shown are for automatic feeding, except outdoor, in which tractor costs for scatter feeding are not included, but accounted for in working tractor hours.
[d] one individual feeder provided for each sow.

Table 1
Specification and capital cost of different farrowing and gestation sow housing systems used in the model (all are indoor systems apart from 'outdoor').

	Space/sow and litter (m²)	Floor type[a]	Feeding methods possible	Cost/sow place £
Existing farrowing system[b]				
Conventional farrowing crate	4.3	FS	HF/AF	3170
Conventional farrowing crate	4.3	PS	HF/AF	3170
Conventional farrowing crate[α]	4.5	SF	HF/AF	3207
Swing side crate	5.65	FS	HF/AF	3771
Floating floor (Nooyen)	4.3	FS	HF/AF	3450
Outdoor	526.3	S	HF	1197
Free farrowing system				
PigSAFE[¥c]	8.9	PS–Minimal S	HF/AF	4388
360° Farrower	4.3	FS	HF/AF	3670
Danish free pen[¥]	6	PS–Minimal S	HF/AF	3804
Arc on yard	18.3	S	HF	2127

[a] FS=fully slatted, PS=part slatted, SF=solid floor, S=straw bedding, HF=hand fed, and AF=automatic fed.
[b] Although all indoor systems can be provided with one or two access passageways, in this model two access passageways were specified.
[c] ¥=Specified with one access passageway, α=Forward creep (creep area situated in front of the sow's feeding trough, creating a larger pen area required for sow and litter).