PigFare: An Economic Model for Comparing Sow Housing Systems

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There is discussion in the Australian pig industry regarding alternative sow housing systems. To assist decision makers evaluate options, PigFare, a cost-benefit, spreadsheet-based simulation model, was designed to provide an indication of the possible net benefits of different sow housing systems. The purpose of this paper is to reveal PigFare and present results that provide an indication of how the model can be used to generate outcomes and how parameter values can be altered to indicate the sensitivity of the results to such changes.

The model can accommodate up to nine housing alternatives for sows in each of three stages: farrowing, mating or gestation. Where possible, variable and fixed costs and benefits associated with normal activities as well as welfare and reproductive efficiency are expressed as dollar values. To generate an example of the model output, biological data, industry-based figures or a proxy, if data was not available, was used to populate the model. Being a simulation model, there are many scenarios that could be generated to answer specific questions. Hence it is important to interpret the results presented in this paper as being relevant to just two scenarios.

The two examples of alternative sow-housing systems were: System 1, sows in stalls for each state of the piglet production cycle; System 2, sows in a mating stall, followed by a purpose built pen for 10 sows during gestation and then a Werribee farrowing pen (Cronin *et al.*, 2000). Most of the production data were taken from Jones *et al.* (2003) with data for the Werribee farrowing pen from Cronin *et al.* (2000). As facility is not provided in this model for piglets after weaning, it was assumed that they were then sold. It was also assumed that the number of piglets weaned/sow/year was 24 for both Systems and for the purpose of this analysis, the time period was assumed to be 20 years and the discount rate, 6%.

Table 1. *Economic criteria values generated by PigFare that allow comparison of two alternative sow housing systems, and the implications when price and weaning weight benefits are applied to System 2.*

Criteria	System 1[a]	System 2 [b]	System 2 + 10% price premium	System 2 + 10% gain in weaning weight
Piglet weaning weight (kg)	6.36	5.62	5.62	6.21
Cost/weaned piglet/yr ($/kg)	5.77	6.68	6.68	6.04
Internal rate of return (%)	12.28	4.82	12.28	12.34
Benefit:cost ratio	1.09	0.99	1.09	1.09

[a]System 1, sows in stalls or crates for each phase of the piglet production cycle; [b]System 2, sows in a mating stall, followed by a purpose built pen for 10 sows during gestation and then a Werribee farrowing pen.

Results contingent upon the input data suggested that System 1 was an economically viable option because the internal rate of return (IRR) was greater than the average medium-term bank interest rate and the benefit cost ratio (BCR) was greater than 1 (Table 1). The variable cost/weaned piglet/year for System 2 was around $1/kg more than that for System 1 and the IRR and BCR both indicated that System 2 was not economically viable. The economic viability of System 2 equated to that of System 1 if, for example, there was a price premium of 10% on pigs produced in the "welfare friendly" system or a 10% gain in weaning weight (from 5.6 to 6.2kg; Table 1). These results provide a snapshot of the potential output from the model: weaning weights were comparable to those of Jones *et al.* (2003); costs were in line with Dhuyvetter *et al.* (2011). However, they should be used with caution as a change in the assumptions (eg. daily piglet live weight gain) could alter the outcome. Running PigFare with specific data to answer specific questions will generate output that could be used to help decision makers in the Australian Pig Industry adjust from confined to loose housing systems for sows.

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Supported in part by Australian Pork Limited.