SPACE ALLOWANCE FOR GROWER/FINISHER PIGS - EFFECTS ON WELFARE AND PERFORMANCE

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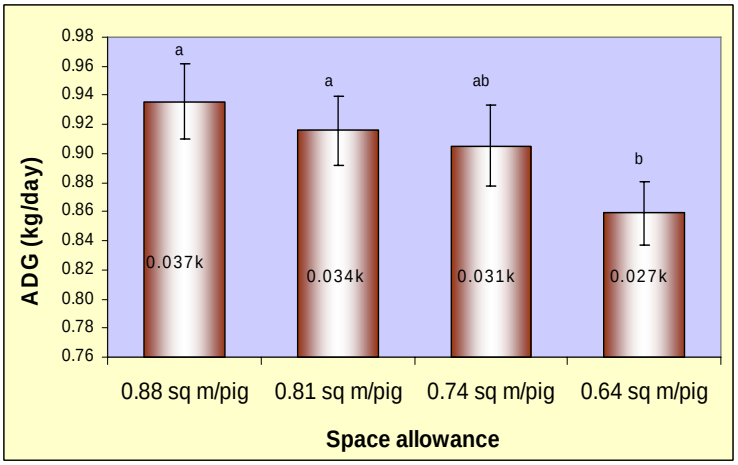
Although poor welfare of grow-finish pigs may be reflected in their performance, the converse may not be correct. Therefore, using both performance and welfare indicators to evaluate the effects stocking densities on grow-finish pigs may be more informative than the conventional method of employing only performance variables such as average daily gain (ADG). Most of the previous studies on the effect of stocking density have used body weight of the pig as the basis for calculation of space requirement. This method has an inherent limitation that, in any species, the animal and its physical dimensions are the primary determinants of space requirement. Body weight may not accurately predict the space need. This limitation can be overcome by using allometric method (considering size, shape and behavior of the pig) of space requirement calculation. In this method, the space needed for each weight group category of pigs is indicated using a constant "k". In simple terms, a higher 'k' means higher space allowance. A mathematical equation involving 'k', and body weight of the pig (Area in m^2 = k * body weight in $kg^{0.667}$) can indicate the static space requirement for that pig. However, additional space may be needed to perform different behaviors. Confounding of space allowance with group size has been another drawback in many previous studies. Further, most of the studies have not accounted for the effect of body weight composition in the group.

In the present study, welfare (behavior, injury levels and salivary stress hormone level) and performance (ADG and pen efficiency i.e. weight gain per unit area) of grow-finisher pigs were evaluated in groups of 19 barrows, at 4 levels of floor space allowances. These space allowances were calculated using 'k' values of, 0.027, 0.031, 0.034, and 0.037 for a final slaughter weight of 116 kg (256 lbs). The four space allowances corresponding to the four 'k' values were 0.64, 0.74, 0.81 and 0.88 m^2/pig (6.9, 8.0, 8.7 and 9.0 sq ft/pig respectively). The study also included 2 levels of weight group categories (pigs of uniform or varying body weights). The space inside the pen was kept constant. Incidence of diseases and mortality observed during the study period were recorded. The data were analyzed using appropriate statistical methods.

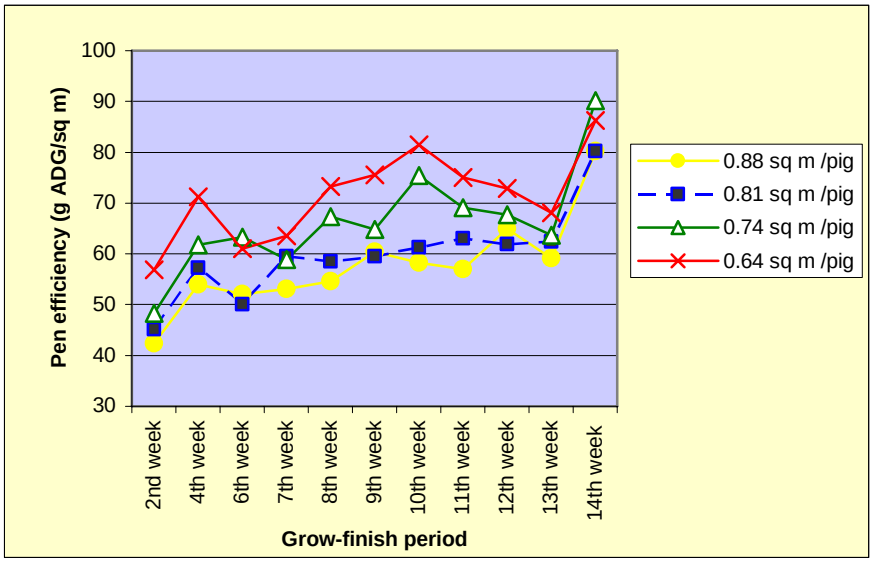
The pigs that received a space allowance of 0.64 m^2/pig had lower ADG than those receiving 0.88 and 0.81 m^2/pig, whereas pigs in the other two treatments did not differ in ADG (Figure 1).

Figure 1: Effect of 4 space allowances on ADG of grow-finish pigs



Pigs receiving 0.64 m^2/pig had higher overall pen efficiency (71.4 g daily gain/ m^2 space) than those in other groups. Pen efficiencies were not different among the space allowance treatments during the final three weeks (Figure 2). Pigs in pens with 0.88 and 0.81 m^2/pig space allowance in both uniform and varying groups did not differ in coefficient of variation of body weight at market weight.

Figure 2: Effect of 4 space allowances on pen efficiency during grow-finish period



Pigs receiving space at the rate of 0.64 m^2/pig had higher total injury scores than those receiving 0.88 or 0.81 m^2/pig. Cortisol concentrations did not differ with space allowance treatments or weight. Average number of aggressive interactions was higher among the pens with 0.64 m^2/pig compared to that with 0.88 and 0.81 m^2/pig. Pigs in pens with 0.64 m^2/pig space allowance spent a lower proportion of time lying in preferred areas (body supported on side walls of the pen rather than at the central area or near the feeder) than pigs getting a space allowance of 0.88 or 0.81 m^2/pig. Pigs in the varying weight group spent higher proportion of time lying in preferred area than pigs in the uniform weight group. In pens with a space allowance of 0.74 and 0.64 m^2/pig, pigs spent lower proportion of time lying isolated than those in pens with 0.81m^2/pig. Pigs of uniform weight group showed more exploratory behavior than pigs in varying weight group. Mortality rate observed was 3.45 %.

A linear regression model was fitted to assess the association of ADG with body weight (kg), weight categories (uniform and variable), 'k' categories (5 levels), Paylean (fed or not) and barns (barn-1 and barn-2). ADG had a positive association ($P<0.05$) with body weight and use of Paylean. The category k1 had a negative effect ($P<0.0001$) on ADG (R^2 0.38) (Table 1).

Table 1: Association of ADG with calculated 'k' values of $\leq$ 0.030 (k1), 0.0301-0.0320 (k2), 0.0321-0.0340 (k3), 0.0341-0.0360 (k4) and >0.036 (k5), body weight, weight categories barn and Paylean feeding.

Variables	Parameter estimate	SE	P
Intercept	0.59140	0.03622	<0.0001
Body weight (kg)	0.00352	0.00046012	<0.0001
Uniform weight category	0.01494	0.01568	0.3411
k1	-0.15632	0.03646	<0.0001
k2	-0.01935	0.03494	0.5800
k3	-0.04813	0.03228	0.1369
k4	-0.04813	0.02913	0.1366
Barn-1	0.01152	0.01569	0.4635
Paylean	0.20760	0.03205	<0.0001

Base parameters: k5, barn-2, variable weight group and no Paylean feeding.

A lower ($P<0.05$) ADG of 0.865$\pm$0.0103 was observed for k5 than other k categories with the exception of k1. The ADG's for k2 (1.011$\pm$0.042), k3 (0.973$\pm$0.043), k4 (1.043$\pm$0.034) and k1 (0.918$\pm$0.038) were not different ($P>0.05$).

The results indicated benefit in terms of performance and welfare at higher space allowance. However, further studies are needed to assess whether the trend is truly linear. The study also indicated that increasing space allowance does not necessarily take away the economic benefits.

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