

Effect of Grouping Weaned Piglets by Weight Classes: Evidence from Zimbabwe

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Abstract

A study was carried out to determine the effect of sorting pigs in different weight classes on post weaning performance at a small scale pig farm in Zimbabwe. Twenty four purebred large white piglets were used for the study. After weaning at 4 weeks, piglets were each placed into four groups with 6 piglets each, 4.0-5.9 kg (low weight), 6.0-7.9 kg (moderate weight), 8.0-9.4 kg (heavy weight) and piglets greater than 9.5 kg (extremely heavy weight). Two piglets, a male and a female were randomly chosen from each of these groups to form a group comprising of piglets of mixed weights. Data on the average daily gain (ADG), live weight gain (LWG) and feed conversion ratio (FCR) was collected from week six until slaughter (week 18). Analysis of variance using the Restricted Maximum Likelihood (REML) method was performed with type of group nested within the different weight classes. The results showed that heavier weight pigs at weaning had better post weaning performance as compared to low weight pigs. However mixing different weight pigs affected FCR only with piglets in the mixed group having a better FCR than those in the uniform groups. In terms of LWG, there were no significant differences observed between uniform and mixed weight groups for the piglets greater than 6 kg at weaning. This study showed that raising piglets in mixed weight groups will have a negative effect on performance on low weight pigs (less than 6 kg at weaning). Farmers are therefore advised to raise such piglets in uniform weight classes.

Key words: growth performance, feed conversion ratio, pig grouping, weight gain, pigs

Introduction

Grouping of pigs is common practice in commercial pig production which is usually done directly after weaning (Royer et al., 2011). Pigs can be grouped according to their weight (Lewis and Wamnes, 2006), according to pig's litter of origin (Kerr et al., 2003) or on other criteria such as group size (Randolph et al., 1981; Schmolke et al., 2003). However, it is important to know how the practice of grouping influences the overall productivity of the pig herd. Previous studies have shown the effect of a particular grouping

strategy on the lifetime performance of a pig and hence on the profitability of the enterprise. Friend et al (1983) and Blackshaw et al. (1987) found that mixing of piglets from different litters without taking into account different weight classes did not have an overall effect on the growth rate of crossbred pigs. On the other hand, Stookey and Gonyou (1994) showed that familiarity (piglets coming from the same litter) affected pig performance positively and they recommended that pigs should not be regrouped till two weeks before

they reach market weight. In addition, the issue of grouping pigs according to their weight is debatable (Cottam and Morel, 2003), this is because Li and Johnston (2009) found out that weight variation did not affect pig performance in Yorkshire and Landrace crosses whilst on the other hand Lewis and Wamnes (2006), McGlone (1985), Milligan et al. (2001) and Rushen (1987) have reported the contrary suggesting that piglets in the mixed weight group will have a better performance than those in the uniform weight groups. The reasons put forward by these researchers is that in the mixed group the dominance hierarchy is quickly established and this has a tendency of reducing fighting amongst the pigs and hence performance will be improved. It is also important to note that these studies that have been carried out have involved large number of pigs that are typical of large scale commercial pig production. The implications of these results in small scale pig production systems still remains to be investigated. This study was therefore carried out to compare the effect of piglets grouped according to weight classes and grouping of piglets with mixed weight on post weaning performance under tropical conditions in a small scale pig farm using purebred Large White pigs.

Materials and Methods

Study area

This research was carried out at a small scale pig farm with 4 sow units at Rusape Town Council located in Makoni district in the Manicaland province of Zimbabwe. This area falls under the agro-ecological region IIb of Zimbabwe. This region is characterised by rainfall ranging from 750-1000 mm per annum with a common occurrence of mid-season droughts. This makes the area suitable for intensive cropping and livestock production. The

area experiences a sub-tropical climate with a mean annual temperature of 15-20°C and a relative humidity which ranges from 40-75%.

Research design

This experiment used 24 purebred piglets (Large White) from a herd of 4 sows. The animals were weaned at 28 days of age, weighed and tagged. The piglets were grouped in four groups of six animals each according to their weight: 4.0 – 5.9 kg (low weight) , 6.0-7.9 kg (moderate weight) (n=6), 8.0 – 9.4 kg (heavy weight) and piglets greater than 9.5 kg (extremely heavy weight). Out of each group with six piglets (three males and three females) two animals were randomly selected (one male, one female) to form a mixed weight group of eight animals. One week was allowed for acclimatization of the piglets.

Animal Management

Piglets were fed twice daily at 06:30 and at 14:30 hours. From week 3 to week 8 piglets were fed *ad-libitum* with commercial creep feed then from week 8 to week 12 feeding level was established at 1.5 kg per pig per day. From week 12 till slaughter, the pigs were given commercial grower's meal (Table 1 for nutrient composition of feeds). Water was always available *ad-libitum* from nipple drinkers. The experimental diets were bought as ready feed from the local feed manufacturer.

The piglets were housed in partially slatted pens of 2 m x 1.5 m from week 4 to week 8. Pigs were moved to grower accommodation from week 8 up to week 18 and housed in partially slatted pens of 2.0 m x 2.5 m. Pen size was similar in all the groups. In all cases, the pens were cleaned regularly and disinfected.

Table 1: Nutrient composition of pig feed offered during experimental period (Source: Manufacturer)

Nutrient Composition %	Creep Feed	Grower Meal
Crude Protein	18	16
Fat	6.5	4.3
Crude Fibre	3	5.9
Salt	0.85	0.5

Data Collection

The experiment took 98 days i.e. from week 4 to week 18 (slaughter week). The data collected and recorded included the live weight of piglets, average daily gain (ADG) and feed conversion ratio (FCR). The recordings were done every second week starting from week 6 till slaughter in week 18. The weight of the pigs was measured using an electronic digital scale and the live weight (LW) was calculated as the difference between the final weight of the pigs and the initial weight. The average daily gain (ADG) was calculated as the ratio of the total live weight gain to the total number of days under experimentation. The feed conversion ratio (FCR) was calculated from the proportion of feed consumed to the average weight gain of piglets (AFI/ADG). Average feed intake (AFI) is the average daily feed intake over the test period.

Data Analysis

Analysis of variance using the Restricted Maximum Likelihood (REML) method was carried out by the SAS software version 9.1.3 (Cary, NC: SAS Institute Inc., 2002-2004) was used to analyse the data using the following model:

$$Y_{ijkl} = \mu + C_j + N_{ij} + W_k + S_l + \beta_{space} + \varepsilon$$

Where;

Y_{ijkl} = response variable (LWG, FCR and ADG),

μ = overall mean

C_j = effect of the weight class,

N_{ij} = effect of the type of grouping nested within the different weight classes
 S_l = effect of sex of the pig

W_k = effect of the week in which data was collected,

β_{space} = effect of space per pig in the pen as a covariate,

ε = error term

Results

The results to be presented in this section are those which seek to answer the objectives of this paper that is to compare the post weaning performance of pigs placed in different weight classes. Hence the other results will just be mentioned and not presented.

The different weight classes and the week had significant effects on all the three dependent variables FCR, ADG and LWG ($p < 0.001$) during the study period. There was a generally increase of all the dependent variables with increase in weight of the pigs and time. The type of grouping nested within the different weight classes showed

significant effects on FCR and ADG ($p < 0.001$) but not on LWG ($p = 0.555$). Within the different weight classes, piglets placed in the mixed group had a lower FCR than those in the uniform groups while within the different weight classes, pigs raised in uniform weight groups had a higher ADG than those in the mixed group. They were no statistically differences on LWG within the weight classes between pigs raised in uniform weight and mixed weight groups. Sex had no effect on all the three dependent variables ($p > 0.05$). The covariate (space per pig) had a significant effect on FCR ($p < 0.001$) but not on LWG and ADG ($p = 0.148$ and $p = 0.786$ respectively).

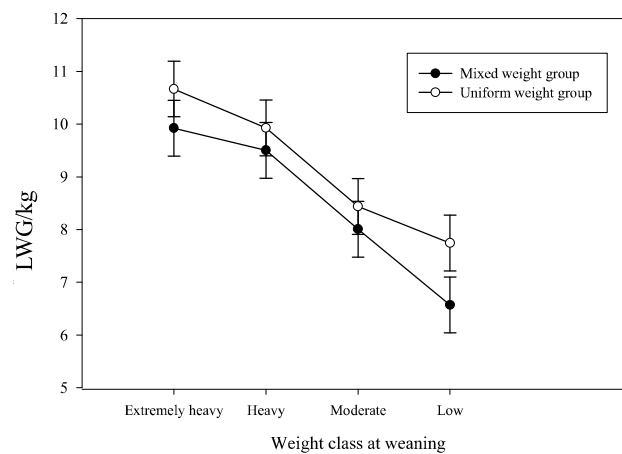


Figure 1: Average live weight gain of different weight classes of pigs from uniform and mixed groups

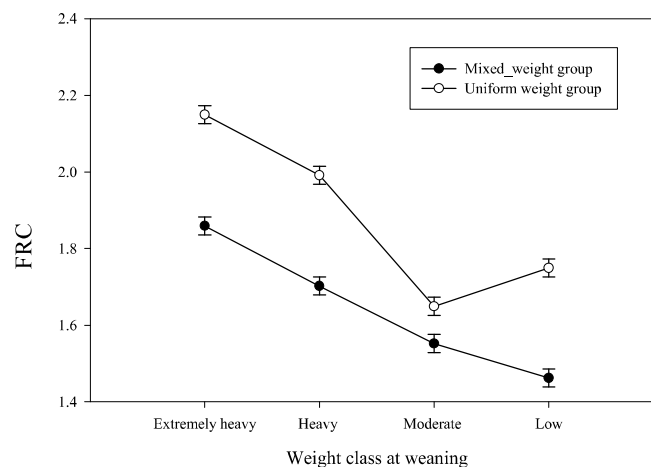


Figure 2: Average feed conversion ratio of different weight classes of pigs from uniform and mixed groups

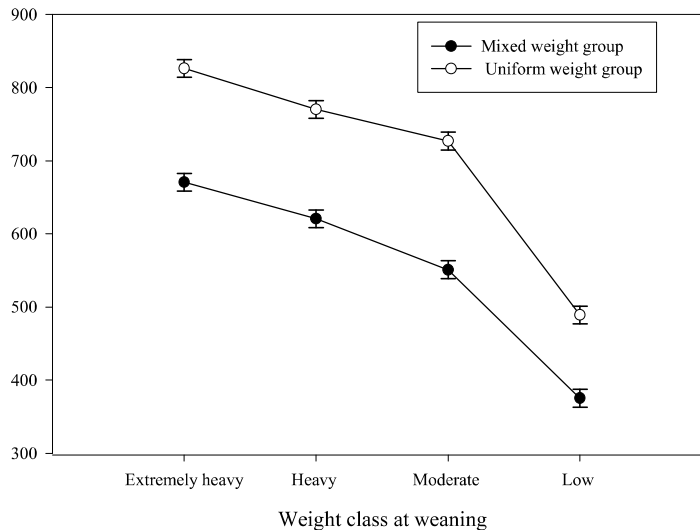


Figure 3: Average daily gain of different weight classes of pigs from uniform and mixed groups

Discussion

There are contrasting findings on the effect of sorting pigs according to uniform weight on post weaning performance. Stookey and Gonyou (1994) found that regrouping finishing pigs had a negative effect on ADG but not on FCR. O' Quinn et al. (2010) concluded that sorting pigs by weight did not improve performance in growing finishing pigs while Francis et al. (1996) showed that mixed groups had lower ADG than uniform groups. This present study was primarily done to investigate the effect of sorting pigs according to uniform weight and mixed weights on post weaning performance.

In this study pigs raised in different uniform weight classes showed different ADG with low weight pigs showing lower ADG than heavier pigs. This could be attributed to the fact that a heavier pig at weaning would have a more developed digestive system and is better able to cope with post weaning diet transition than the low weight pigs, as

corroborated by Mahan and Lepine (1991). In this study it has been shown that mixing piglets lowered the ADG when compared to their counterparts in the uniform groups. This is in agreement with a study carried out by Francis et al. (1996) who concluded that uniform weight pigs had a better performance than pigs kept in heterogeneous groups. This could be due to the fact that uniform weight pigs will have the same opportunities for growth and hence uniform weight pigs will tend to have a better benefit (Francis et al. 1996). The other reason could be that for the mixed groups, they were eight pigs in a pen as compared to four animals in a pen for the uniform weight groups. This could have led to aggression and competition for food amongst the pigs in the mixed group. Subsequently this could have led to lower ADG and live weights in the mixed group as a result of greater energy expenditure through stress and increased physical activity (Ekkel et al., 1995).

This study supports the view that grouping pigs according to uniform weight has more opportunities for improved performance as compared to mixing piglets of different weights at weaning. However the authors recommend that for studies of this nature it will be important to note behavioral interactions amongst piglets in the different groups which was not done in this study. Also it will be important to increase the pen size in the mixed weight groups since they had a large number of pigs in a pen.

In this study it was also observed that FCR was higher in the uniform groups than in the mixed groups. This means that pigs in the uniform groups did not efficiently utilize feed as compared to the mixed groups. This is despite the high ADG and live weights in the uniform groups. For the mixed piglets FCR was low most likely because of the established social dominance hierarchy (although it was not measured) and hence most of the feed consumed could have been channeled towards weight gain and not fighting or competition with other pigs in the group (Lewis and Wamness, 2006). Despite this, live weight gain was slightly low in the mixed group largely due to a low average daily feed intake (Stender et al., 2012). This could be a result of increased competition for food compounded by the fact that they were eight piglets in a pen. There was also found an interaction effect between the group and the week on the FCR. Generally FCR is expected to increase as the age of the animal increases (Varley, 2009), this could be due to the fat deposition which is a process that requires more energy and hence feed efficiency is expected to decline. The efficient feed utilization in the mixed group could have resulted in the near similar live weight at slaughter between piglets in the uniform groups and their contemporaries in the mixed group.

Live weight gain was slightly higher in the uniform weight groups as compared to the contemporaries in the mixed groups although this was not statistically significant. These findings were also concluded by Li and Johnston (2009) and Royer et al. (2011). The low LWG in the mixed groups could be attributed to low voluntary feed intake in the mixed piglets. Low voluntary feed intake can limit the ability of the pig to reach their genetic potential for growth (Andersen et al., 2000). Furthermore according to O'Connell and Beattie (2007) increased variability in weight within a group has significant negative effects on feed intake and growth rate which was observed in the mixed group which had pigs with high weight variation. Friend et al (1983) however observed that mixing the animals did not have any effect on long term performance, in this study this could be seen in the near similar values of live weight at slaughter for the piglets greater than 6kg at weaning. Such a finding was also reported by O' Quinn et al. (2010) who showed that there was no difference in the final weights of large weight pigs in uniform and heterogeneous groups although differences were observed in lower weight pigs.

Conclusion

Mixing pigs from different weight classes has a negative effect on performance especially for low weight pigs whilst pigs that are of medium weight and above could be mixed and the effects on performance will be less than that when you mix with low weight pigs. Therefore farmers are advised not to mix low weight piglets with heavy weight piglets as this would have implications on performance. However for those piglets between 6-9.5kg these could be mixed as it is observed there is not much difference in the final live weights of the pigs in these groups.

Conflict of Interest

The authors declare that they were no conflict of interest influencing this research.

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