Agri-Food and Biosciences Institute

AFBI Hillsborough

Feeder choice for weaned pigs

Report prepared for: UFU and PPDC Committees

Niamh E O'Connell, R Norman Weatherup
and Violet E Beattie

April 1999

www.afbini.gov.uk

TABLE OF CONTENTS

INDEX OF TABLES

INDEX OF FIGURES

ACKNOWLEDGEMENTS

The work presented in this paper, conducted at the Agricultural Research Institute, was funded by the Northern Ireland Pig Producer Research Levy and the Department of Agriculture for Northern Ireland.

1. EXECUTIVE SUMMARY

In the week prior to weaning piglets can grow up to 300 g/day. However, directly after weaning growth rates can fall to as little as 100 g/day. The main limiting factor of performance is feed intake. Post weaning feed intake can suffer due to the number of abrupt and stressful changes in both diet and environment at weaning. One possible way to encourage pigs to eat is to optimise the way feed is presented to them, e.g. via feeder type. With several feeder types being commercially available the aim of the study was to determine the optimum feeder type for post weaning pigs. A total of 1120 Landrace x Large White 4-week old pigs were used in groups of 20 per pen. Five feeder types were tested – dry multi-space, wet and dry multi-space, Maximat, Lean Machine and Verba. Performance and behaviour of the pigs were monitored from 4 to 11 weeks of age.

Growth rate did not differ significantly between treatments, however there was a trend towards improved growth rates with dry and wet and dry multi-space feeders. This was due to higher levels of feed intake with multi-space than with the competitive feeders (i.e. 897 and 951 g/day for dry and wet and dry feeders vs 863, 839 and 824 g/day for Maximat, Lean Machine and Verba feeders. However, feed conversion was poorer with wet and dry multi-space than with dry multi-space feeders, resulting in a 58 p/pig higher feed cost between 4 and 11 weeks of age. In addition, wet and dry multi-space feeders were more difficult to manage. The results also suggest there may be welfare benefits in selecting dry multi-space feeders over competitive feeder types in that feeding behaviour is facilitated among all members of the group and pigs are able to perform more natural feeding patterns.

In conclusion, based on economics and performance the dry multi-space feeder is optimum for post weaned pigs.

2. INTRODUCTION

Post-weaning ‘growth check’ in pigs continues to pose a problem for commercial producers. In the week prior to weaning piglets can gain up to 300 g/day, however after weaning growth rates can fall to as little as 100 g/day. Growth rate in the immediate post weaning period has been shown to affect lifetime performance and also has important implications for carcass quality (Hutton, 1989). In addition, reduced growth rates in weaned pigs increases the length of time they spend in expensive weaner accommodation and delays physiological development which means that pigs are more susceptible to disease for a longer period of time (Partridge, 1989).

The main factor which limits the performance of weaned pigs is feed intake. At weaning pigs suffer a number of abrupt and stressful changes in both their diet and surroundings which result in low levels of feed intake. For example, the move from a mainly liquid to a solid diet means that pigs must adapt to changes in both nutrient supply and feeding method. Added to this are the stresses of separation from dam and littermates, exposure to unfamiliar animals at mixing and relocation to a new environment, all of which contribute to low feeding intakes in weaned pigs.

A possible way of encouraging intake in weaners is through manipulating the way in which feed is presented to them. A wide range of feeder types have become available over the last decade all of which are aimed at maximising intake. Feeders such as the Lean Machine and Maximat, which consist of circular or rectangular troughs, are based on the concept of social facilitation during feeding i.e. when one pig eats, others are encouraged to join in. However encouraging pigs to feed simultaneously from the same trough often results in competition for feeding spaces and aggressive behaviour (Baxter, 1989). This means that subordinate animals within the group may have difficulty gaining access to the trough and so receive less feed (Baxter, 1983).

In contrast, single-space feeders such as the Verba allow only one animal to feed at a time and the side partitions mean that the head is enclosed in the feeder. This ability to protect the head while feeding means that animals are less vulnerable to attack and, as a consequence, are less likely to be displaced from the feeder (Baxter, 1989). Multi-space feeders combine elements of both 'competitive' and 'single-space' feeders in that animals are encouraged to eat alongside one another, however the head is placed partially within the feeder so that some degree of protection from penmates is provided.

The aim of this study was to determine the optimum commercially-available feeder type for weaned pigs. In determining the optimum feeder type, both the performance and behaviour of the pigs, and also the ease of management of the feeder, were assessed.

3. MATERIALS AND METHODS

3.1 Pre experimental treatment

All piglets were born to Landrace x Large White dams housed in crated farrowing accommodation. A commercially available creep feed was offered to the piglets from 10 days of age in a forward creep area. Piglets were weaned at 4 weeks of age and allocated to the experimental feeders.

3.2 Feeders

The following feeders were used in the experiment:

1.	Dry multi-space (Etra Feeders)	Traditional design with feed hopper connected directly to the trough with an adjustable aperture to regulate feed flow. The trough (90 x 17 cm) was divided into four feeding spaces.
2.	Wet and dry multi-space (Etra Feeders)	Similar to dry multi-space except with smaller trough (70 x 13 cm) which was divided into three sections. One nipple drinker was located at the back of each of these sections.
3.	Maximat (Echberg)	Tube type feeder with aperture of feeder hopper situated directly above the trough. Feed is dispensed straight into the rectangular trough (60 x 37 cm). Feed flow is controlled by means of a lever which

		adjusts the size of the aperture. One nipple drinker is situated on either side of the aperture.
4.	Lean Machine (Big Dutchman)	Tube type feeder with aperture of feeder hopper situated approximately 10 cm above trough. Feed is dispensed on an operant basis by the pig pushing levers at the base of the aperture. Two nipple drinkers are situated beneath the aperture. Feed is dispensed into a circular trough (41 cm in diameter).
5.	Verba (Verbakel)	Single-space feeder with feed hopper and trough partially enclosed by side partitions. Hopper dispenses controlled amounts of feed into the trough (21 x 23 cm). Feed is dispensed by the pig pushing a panel at the back of the feeder. One nipple drinker is located beside the panel.

3.3 Animals and feeding regime

One thousand, one hundred and twenty pigs sired by Landrace boars were used in this experiment. Pigs were housed in groups of 20 (balanced for weight and gender and randomised over litters) after weaning at 4 weeks of age. The average weaning weight was approximately 9.4 kg. Pigs were retained on the respective feeders until the end of stage 2, at 11 weeks of age, when the average weight across treatments was approximately 37.5 kg.

Diets offered between five and seven weeks of age consisted of commercial starter and stage 1 feeds in pelleted form (2-3 mm pellet size). From eight to eleven weeks of age the pigs were offered a pelleted cereal/soya-based diet *ad libitum* (5 mm pellet size). This contained 14.2 MJ DE/kg and 22% crude protein and was manufactured at the Agricultural Research Institute of Northern Ireland. Pigs had *ad libitum* access to water through drinkers incorporated into all feeders except the dry multi-space feeder, where a separate water bowl was attached to the wall.

3.4 Housing

Pigs were housed in combined Stage 1/Stage 2 accommodation with plastic slatted floors, thermostatically controlled ventilation and a space allowance of 0.38 m^2 per pig (Figure 1). Lean Machines and Maximats were fitted in the dividing wall between two pens and therefore two groups of twenty pigs were allocated to each of these feeders. In the Verba treatment, two feeders were placed side by side in the pen to provide enough feeding spaces for 20 pigs.

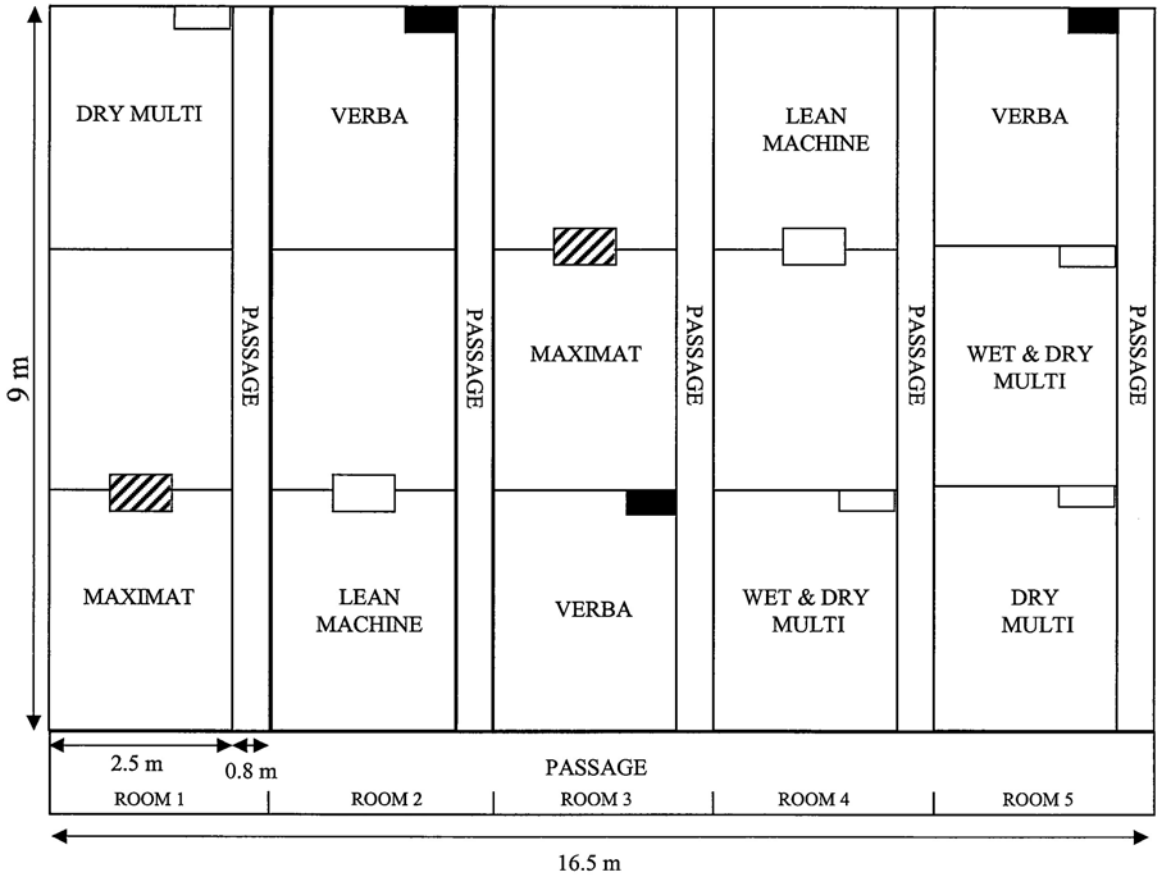

Figure 1 Layout and feeder placement in combined Stage 1/Stage 2 housing

3.5 Parameters measured

3.5.1 Production performance

Pigs were individually weighed at 5, 6, 7, 9 and 11 weeks of age and growth rates calculated. All pigs in each group were ranked by weight and arbitrarily divided into 3 categories, heavy, medium and light. The spread of weights at each weighing date was then calculated as the difference between the mean of the 7 heavy and the 7 light pigs in each group. These values were calculated using the spread of weights at weaning as a covariate and therefore any influence of the spread of weights at weaning on the subsequent spread of weights was removed. Feed intakes were also recorded and feed conversion ratios calculated.

3.5.2 Behavioural measures

The behaviour of pigs using each feeder was videotaped continually for a 24-hour period every week. Video tapes were later analysed to determine the number of pigs at the feeder at 20-minute intervals.

4. RESULTS AND DISCUSSION

4.1 Production performance

Production results are given in Table 1. Apparent mean daily feed intakes over Stage 1 and Stage 2 were significantly higher with wet and dry multi-space feeders

than with all other types of feeder (P<0.001). The term intake refers to the total amount of feed used and therefore includes both consumed and wasted feed. The lowest feed intakes were observed with Verba and Lean Machine feeders where pigs used over 100 g/day less feed than pigs with wet and dry multi-space feeders.

Table 1 Performance during Stage 1 (5 to 7 weeks) and Stage 2 (8 to 11 weeks)

Parameter	Dry multi-space	Wet & dry multi-space	Maximat	Lean Machine	Verba	Sem	P
Food intake (g/day)							
Stage 1	443^{a}	498^{b}	436^{a}	434^{a}	440^{a}	16.5	*
Stage 2	1221^{cd}	1274^{d}	1169^{bc}	1128^{ab}	1098^{a}	22.3	***
Mean	897^{b}	951^{c}	863^{ab}	839^{a}	824^{a}	17.6	***
DLWG (g/day)							
Stage 1	366	358	357	354	366	13.8	NS
Stage 2	764	781	733	727	724	18.3	NS
Mean	598	605	577	572	575	13.4	NS
FCR							
Stage 1	1.22^{a}	1.40^{b}	1.21^{a}	1.22^{a}	1.22^{a}	0.032	**
Stage 2	1.60^{b}	1.64^{b}	1.59^{b}	1.56^{ab}	1.49^{a}	0.029	*
Mean	1.50^{b}	1.58^{c}	1.49^{b}	1.47^{ab}	1.42^{a}	0.019	***

Mean daily liveweight gain (DLWG) did not differ significantly between pigs on different feeder types during Stage 1 and 2 combined. However, there was a non-significant trend towards improved performance with multi-space feeders. The mean DLWG of pigs with access to either wet and dry or dry multi-space feeders was more than 20 g greater than that of pigs with access to any of the other feeder types. Lean Machine, Maximat and Verba feeders all had similar effects on performance with pigs showing an average growth rate of 575 g/day.

Although pigs using wet and dry multi-space feeders did show an improvement in performance, this improvement was not as large as might be expected given the high levels of feed intake. This was reflected in the poor Feed Conversion Ratio (FCR) over Stage 1 and 2 associated with this feeder, which was significantly poorer than with all other types of feeder (P<0.001). The best feed conversion was shown by pigs using Verba feeders where conversion ratios over Stages 1 and 2 were significantly better than with all other feeders except the Lean Machine (P<0.001).

In terms of choosing the optimum feeder, both the wet and dry and dry multi-space feeder resulted in similar high levels of performance. However a major drawback with the wet and dry multi-space feeder was the poor feed conversion which is likely to reflect greater wastage of feed. Based on total feed consumption, costs were 58 p

per pig higher than the wet and dry multi-space feeder than the dry multi-space feeder. On a 200 sow unit producing 22 piglets/sow/year this would be equivalent to a difference of £2,552 per annum in feed costs. Therefore, opting for a dry multi-space feeder in preference to a wet and dry multi-space feeder for weaned pigs may result in substantial reductions in feed costs.

4.1.1 Variation in weights

In addition to producing high levels of performance, the dry multi-space feeder also resulted in the least variation in body weight within groups (Table 2). Variation in weight was calculated by subtracting the mean weight of the 7 lightest pigs from the mean weight of the 7 heaviest pigs in each group and using the spread of weights at weaning as a covariate. This difference in weight between heavy and light pigs became much greater over time with all feeder types except the dry multi-space feeder where it remained similar.

Table 2 Differences in weight (kg) between 7 heaviest and 7 lightest pigs in pen with variation within groups at weaning standardized to 3.4 kg

	Weeks post weaning				
	1	**2**	**3**	**5**	**7**
Dry multi-space	2.9	3.3	3.5	4.5	4.9
Wet & dry multi-space	3.1	3.4	4.2	5.6	6.5
Maximat	3.2	3.9	4.4	5.5	6.4
Lean Machine	3.4	4.4	4.9	6.3	7.5
Verba	3.4	4.0	4.4	6.0	7.4

An increase in the spread of weights within groups may indicate greater levels of competition at the feeder. Research at this Institute has shown that if pigs are forced to compete for food then larger animals have the competitive advantage over smaller animals (O'Connell and Beattie, 1999). This leads to an increase over time in the difference in weight between small and large animals. An interesting finding was that a large increase in the spread of weights was shown with Verba feeders. This suggests that pigs had to compete to gain access to the feeders and may mean that one Verba feeder per 10 pigs is inadequate for young pigs. Studies carried out at this Institute suggest that this problem may have been eased if the feeder had been placed 2 m apart rather than side by side (Walker *et al.,* 1993). This reduces swapping between different feeders and therefore makes it more difficult for larger animals to dominate both feeding spaces at the same time.

Reducing pen variability at the end of stage 2 has important implications at slaughter. Previous studies at this Institute have shown that a 3 kg spread at the end of stage 2 (35 kg live weight) resulted in a spread of 15 kg at slaughter (a difference of approximately 10 kg in carcass weight). If pigs are slaughtered weekly at a target slaughter weight, reducing pen variability reduces the period over which

pigs are slaughtered and therefore makes more efficient use of finishing accommodation. If pigs are slaughtered on an 'All In/All Out' basis, carcass weights will fall within a narrower range if variability is reduced. In turn, uniform pre-packs of meat of similar size and weight can be produced more easily. For example, Beattie *et al.* (1999) have shown that eye muscle area was increased by 15% and the weight of 4 chops was increased by 17% (260 g) when carcass weight was increased by 10 kg. At present, processors will accept carcasses over a considerable weight range. However, the issue of pen variability will assume a much greater significance if there are financial penalties for pigs outside a specified weight range.

4.2 Behaviour

4.2.1 Occupancy of feeder

Video observations over 24-hour periods showed that the average number of pigs occupying the feeder at any given time was significantly higher with Lean Machine, Maximat and Verba feeders (1.9%, 1.8% and 1.9% of the group, respectively) than with other feeder types ($P<0.05$). Wet and dry multi-space feeders showed an intermediate number of pigs at the feeder (1.5% of the group), while the lowest average number of pigs at the feeder was seen with the dry multi-space feeder (1.2% of the group) ($P<0.05$) (Figure 2).

The higher percentage of pigs at Lean machine, Maximat and Verba feeders may indicate that pigs had to compete to get access to these feeders. Research has shown that overall occupation of the feeder increases significantly when pigs have to compete for feeding spaces (Walker, 1991). With Lean Machine and Maximat feeders this competition may have occurred because the pigs were encouraged to feed from the same trough and the more dominant pigs may have been able to monopolise the resource to the disadvantage of subordinate pigs (O'Connell and Beattie, 1999). Competition may have occurred with Verba feeders because of inadequate feeding spaces. The increase in the spread of weights associated with these feeders suggests that although there may have been more pigs gathered around the feeder at a given time, a proportion of the group did not obtain sufficient feed. In contrast, there were fewer animals feeding from the dry multi-space at a given time and the spread of weights within groups increased very little over time. This suggests that all animals could gain easy access to the feeder. This may have been associated with the fact that the feeder did not supply water and pigs had to go to a separate water bowl to drink hence providing frequent and regular access for all the pigs in the group.