The Voluntary Food Intake of Pigs
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OBSERVATIONS OF VOLUNTARY FOOD INTAKE AND WASTAGE FROM VARIOUS TYPES OF SELF-FEED HOPPER

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INTRODUCTION

Ad libitum feeding from hopper-type feeders has the attractions of low capital cost and simplicity of operation compared with automatic computerized controlled systems which can ration pens of pigs to pre-determined quantities. The series of eight experiments described here examined some of the factors which may influence voluntary food intake (VFI) and food wastage from hopper-type feeders.

MATERIAL AND METHODS

The experiments were carried out over 4 years involving 2800 crossbred boars and gilts mostly Landrace × (Large White × Landrace). Pigs were housed normally in groups of five boars plus five gilts, in fully slatted floor pens (1·9 m × 3·2 m) in a house with automatically controlled natural ventilation set to operate at 18°C 1·2 m above floor level. The experimental treatments were imposed from 35 kg to slaughter at 87 kg live weight. The pellets were extruded through a die with 4·5-mm diameter holes without the addition of steam. The food hoppers were observed daily and, if necessary, adjustments were made to aperture settings. The aim was to achieve a setting in which there was almost no food accumulating in the trough. Carcass weights and skin plus backfat thickness at the P2 position were measured in the normal grading process within 1 h of slaughter. The experiments were either randomized block or factorial designs and in six of the eight experiments there were comparisons of dry meal and pellets. In one of these six experiments, the usual system of siting feeders on the slatted floor was compared with feeders sited on a solid plinth 150 mm high which extended 300 mm in front of each feeder and with feeders placed on a solid sheet of glass fibre reinforced cement 20 mm thick and covering the slatted floor for 0·7 m in front of each feeder. In two experiments conventional hoppers were compared with hoppers incorporating water nipples. Brand 1 of the latter type was included in one experiment and brands 2 and 3 in the second. The conventional hoppers and brands 1 and 2 had food troughs approximately 1 m long while that of brand 3 was 0·6 m long. With these feeders the built-in drinkers were the only source of water. In the final experiment, six, eight or 10 pigs per pen were compared.

RESULTS

The results from six experiments in which meal and pellets were compared were pooled, weighting the means according to the numbers of pigs per treatment on each experiment. The standard errors given in Table 2 are typical of those in individual experiments. Pelleting reduced the apparent food intake but increased growth rate and improved food conversion on live weight and carcass weight bases by proportionately 0·085 and 0·11 respectively. All these effects were significant within experiments but backfat thickness was similar on both treatments. Within experiments the improvements in carcass food conversion due to pelleting ranged from 6·7 to 12·0. Metabolism studies indicated digestible energy contents of meal and pellets of 12·31 and 12·41 MJ respectively when adjusted to a common dry matter of

TABLE 1
Composition of diets used in experiments (g/kg)

	Stocking rate experiment	Other experiments
Barley meal	360	745
Ground wheat	365	
Soya-bean meal (extracted 50% CP)	200	190
Molasses	50	40
Minerals and vitamins	25	25
Calculated analysis		
Digestible energy (MJ/kg)	13·0	12·7
Lysine (g/kg)	8·8	8·7

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860 g/kg. The provision of a solid area in front of the hopper feeder either at floor level ('solid') or raised ('plinth') had no significant effect on performance neither when dry meal nor pellets were fed. Similarly there were no effects of stocking rate on any of the variables (Table 3). In the first experiment comparing hoppers with built-in water supply (brand 1) there were significant increases in food intake and growth rate. These effects were not repeated in the second experiment involving brands 2 and 3.

DISCUSSION

The greatest treatment effect in these studies was that of presenting the diet as meal or pellets on the efficiency of conversion into carcass weight. Part of this 10% difference may be explained by a small but non-significant improvement in the digestible energy content of the pellets used in these studies. The most likely explanation for the majority of the difference in efficiency about 9% units, is food spillage. Presumably there is also some spillage of the pelleted food so that the absolute quantity of meal lost is even greater. In total it apparently exceeds 140 kg per pen over the experimental period, an average loss of over 2 kg/day. This occurred even though the feeders were carefully controlled each day to avoid accumulation of food in the troughs although it was more difficult to achieve the optimum setting with meal than with pelleted diets. From a regression of live-weight gain on digestible energy (Agricultural Research Council (ARC), 1981) the difference in live-weight gain between meal and pellets suggests that 0·08 kg/day of the apparent voluntary food intake of the meal diet was not consumed. The reasons for spillage remain speculative; conflict between

TABLE 2

Effects of form of diet and siting of feeder on performance of pigs fed ad libitum *from 35 to 87 kg live weight*

	Form of diet†			Siting of feeder‡			
	Meal	Pellets	Approx. s.e.	Slats	Plinth	Solid	s.e.
No. of pigs	1078	1078		224	224	224	
Apparent voluntary food intake (kg/day)	2·29	2·17	0·015	2·24	2·20	2·19	0·02
Growth rate (g/day)	754	781	8	766	754	766	7·3
Food/gain (g/g)							
Live gain	3·06	2·82	0·03	2·97	2·96	2·90	0·025
Carcass gain	3·83	3·48	0·035	3·72	3·68	3·65	0·03
P2 backfat (mm)	14·5	14·4	0·3	14·4	14·4	14·4	0·18

† Means adjusted to a dietary DM of 860 g/kg.
‡ Means of dry meal and pelleted diets.

TABLE 3

The effects of stocking rate and of three brands of feeder with built-in water supply on performance of pigs fed ad libitum *from 35 to 87 kg live weight*

	Stocking rate (No. pigs per pen)			Experiment 1†		Experiment 2‡			
	6	8	10	Control	Brand 1	Control	Brand 2	Brand 3	Approx. s.e.
No. of pigs	72	96	120	184	184	110	110	110	
Apparent voluntary food intake (kg/day)	2·13	2·09	2·11	2·35	2·40	2·31	2·31	2·34	0·02
Growth rate (g/day)	750	758	748	754	808	765	775	784	12
Food/gain (g/g)									
Live gain	2·85	2·78	2·85	3·15	3·08	3·03	3·00	3·00	0·03
Carcass gain	3·66	3·60	3·67	3·91	3·81	3·76	3·77	3·73	0·04
P2 backfat (mm)	13·6	13·4	13·6	14·8	15·1	14·0	14·3	14·2	0·4

† Means of dry meal and pelleted diets.
‡ Dry meal only.

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pigs at the trough could occur as the feeders used here were not divided into individual feeding stalls. Journeys between feeder and drinker are likely to result in spillage and may be more frequent with meal diets than pellets. However, there is no strong support for the latter point from the feeders with built-in drinkers, only one of which improved food efficiency and by only 2·5%. Any spillage which may have occurred immediately in front of the feeder did not appear to be consumed when a solid floor was provided.

Assuming an overall apparent voluntary food intake of 2·25 kg/day for meal and pelleted diets and a mean wastage of 4·5% the intake of digestible energy (MJ) is calculated as $2{\cdot}05\,M^{0{\cdot}63}$ which is lower than the voluntary food intake given by ARC (1981) and for individually penned pigs (K. J. McCracken, personal communication). Reducing the number of pigs per pen in the present experiment had no effect on voluntary food intake and no effect on wastage of food suggesting that conflict between pigs at the feeder may have to be eliminated completely to influence these parameters.

CONCLUSIONS

Commercial designs of hopper feeder have not succeeded in reducing the high wastage component of apparent voluntary food intake when diets are offered in the form of dry meal.

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