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Feeding pig production

Feeding systems and process engineering

For economical reasons and livestock and environmentally-specific grounds, modern feeding systems for slaughter pigs have high demands made of them. These expectations can be met in feeding pigs husbandry with the help of the best of technology and electronic control components supported through knowledge, ability and management.

Feeding systems have a key function in the planning and designing of pen forms and sizes in feeding pig units. This is why the form of the pen changed in earlier times, because of a reduction in capital intensive total floor areas, from the short wide pen to the long narrow form [1]. Out of this resulted a cross-trough housing system which made the best use of the available space in association with stationary automatic feed supply. Further investment reductions and simultaneous increases in housing quality regulations and recommendations from different expert groups on ways to make the most of the livestock genetic potential lead to production systems with large group pens for up to 50 animals apiece. These proved more correct on animal welfare grounds [2].

Table 1: Feeding technology for feeding pigs [4]

Technique	Group size >12 animal	Group size <12 animal	Type of feed dry	Type of feed wet-mash	Type of feed liquid	Regime rat./ ad lib	Site wall/ pen	Management
Trough (hand)		x	x			r/a	w	small
Dry-auto.	x	x	x			r/a	w	medium
Mash-auto	x	x	x	x	x	(r)/a	w/p	high
Mash tube auto.	x		x	x	(x)	r/a	w/p	medium
Round trough (sensor)	x		x	x	(x)	r/a	p	very high
Spotmix	x	x	x	x	x	r/a	w/p	very high
Long trough		x			x	r	w	high
Short trough (sensor)	x	x			x	r/a	w/p	very high

The choice, in each case, of the best possible feeding technique for feeding pigs is influenced by a series of parameters which must be worked out to suit the individual farm. Then the farmer himself has the possibility to test the choice criteria according to their influences on his farm in order to finally find and establish the optimum system including the appropriate feeding technique for slaughterpig production. Nowadays one can exercise a little pre-selection between eight different feeding systems. Basically, they differ in the way the feed is made available to the animal. An overview of the most common feeding systems is given in *table 1*.

Mash tube automatics more popular

Mash tube automatics are becoming increasingly popular in commercial units. They are suitable, above all, because they are easier to watch over, even for larger groups of pigs and therefore offer reduced investment costs per feeding pig place. In that two drinking points are present in mash tube automatics, up to 24 animals can be penned per feeding place. With tube feeders, the feed falling out of the tube lands on a plate in the trough from which the animals eat their ration. The drinkers and the feed are immediately adjacent to each other so that in this case the feed intake is made easier for the animals and, through this, speed of consumption increased. Mash tube feeders can be equipped so that restricted, as well as ad lib, feeding is possible.

Interval feeding

The round trough with sensor is a new feeding technique for dry rations. A sensor controls consumption and the system is described as interval feeding. With a recommended animal:feeding place ratio of 4:1 and sensor controlled feeding, 40 animals can be catered for with a single round trough, according to the pig welfare statutes. The feed rationing takes place similarly to liquid feeding systems. The sensors are fixed with an appropriate gap between sensor and trough bottom. The gap can be adjusted at any time to vary feed supply. No new feed is deposited in the trough as long as contact between sensor and feed in the trough is not broken. The round trough with sensor is similar in design to the mash tube automatic feeder and restricts, through an enveloping plastic housing, manure smell and moisture affecting feed. Thus a higher hygiene standard for the feed is easier to maintain. Through the wetting of the dry feed in the trough with the aid of time-controlled water spray nipples a mash-type substance is produced. This moist feed increases intake – an advantage of the mash tube automatic and the mash automatic.

Liquid feeding with cross trough

For years this has been regarded as the standard system in federal German slaughterpig production and has reached a very high technical and practical standard. Using it with groups of around 12 animals with rationed feeding, liquid feeding with cross trough continues to give very good performance. For over 20 years now, sensor-supported liquid feeding has been known. Through the changed genetics in feeding pigs, better knowledge over feeding regimes and better management, the application of this feeding technique has once again become economically practical. Liquid feeding sensors offer a series of notable advantages. First of all, the system allows relatively large groups of

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Keywords

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Table 2: Weight gain and meat quality of feeding pigs in different housing systems and feeding with mash automatic [5]

		Unit per animal	Ventilated	Plastic sheeting hut	Lightly-built		
			fully slatted	deep straw litter	part-slatting	deep straw	sloping floor
weight gain	feeding period	days	83,00	83,00	83,00	83,00	83,00
	weight	kg	96,03	80,94	83,56	83,56	85,46
	ø	kg	1,16	0,98	1,01	1,01	1,03
	max.	kg	1,52	1,18	1,33	1,33	1,22
	min.	kg	0,79	0,77	0,55	0,65	0,84
	standard error	kg	0,24	0,12	0,23	0,23	0,13
feed	ø	kg	3,13	3,03	3,21	3,21	3,18
	conversion ratio	1/x	2,71	3,10	3,10	3,19	3,09
product-	lean meat	%	54,03	52,36	52,35	52,35	52,46
quality	backfat	mm	18,74	20,39	21,79	21,79	20,29
	slaughterweight	kg	89,49	81,89	90,08	90,08	87,22
	slaughter-out	%	76,31	76,18	81,56	81,56	79,29
straw	ø	kg	0,00	0,92	0,01	0,98	0,24
water	ø	l	7,00	8,21	9,10	9,10	12,61

up to 50 animals to be more precisely rationed. Further, the animal:feeding place ratio of 6:1 makes a reduction of the trough length (= costs) possible. The feeding regime allows restricted as well as ad lib rationing, according to the farm plans as well as the genetic requirements of the pigs.

In this association, trial results with mash automatics in different housing systems looking at daily liveweight gain (dlwg) and meat quality are very informative. In *table 2*, appropriate explanatory data is presented. Deutsche PIG barrows with the same genetics were investigated in five different housing systems. Feeding was all ad lib with mash automatics. The following average performances were achieved: In the fully slatted stall, Ø dlwg was 1160 g. Following this were the variants in lightly-built, part-slatted, deep straw and sloping floor stalls with in each case 1001 g or 1030 g dlwg. The worst performance here was by pigs on deep straw under plastic sheet housing with 980 g dlwg. However, notable in this case was feed conversion which, in the fully slatted pen, was excellent at 1:2.7, whereas in all the other variants conversion ratios ran from 1:3.1 to 1:3.2. In the same way, the lean meat proportion of carcasses – recognised as a further important parameter – from the fully slatted pen was two percentage points higher. In total, the performance difference in terms of earnings per feeding pig on fully slatted flooring was around + 20.00 DM over the compared variants. This result means that all investment costs and variable costs with the other variants must be between 20.00 DM and 15.00 DM per feeding pig cheaper in order to be able to reach the same, or similar, total result.

As the production costs in a slaughterpig unit are influenced to a major extent by the feed costs, these are also the main part of the balance in the economic evaluation. Real selection possibilities based on competitive evaluation are possible only through full cost calculations. In this case the individual costs of each feeding technique per slaughterpig are investigated. The compilation, and the resulting comparison possibilities, are presented in *table 3*. The five variants mentioned are presented alongside each other including technical equipment and again with the required investments. With the same floor area of buildings and the same building investments, around 80 feeding pig places less result with the standard liquid feeding system. Thus an around 60 DM higher investment per feeding place is required compared with all other systems. Because of the different feeding techniques and the associated variations in required housing, the feeding system related investment costs per place works out with a difference of around 21 DM between the variant standard liquid feeding and mash tube automatic. Also very economical here is the liquid feeding system with sensor at about 40 DM per feeding place. When comparing the fixed cost charges per place, a difference of 8.75 DM could be determined between the cheapest and the most expensive solution. Naturally, in the full evaluation of the technical equipment, the specific pig performance required for achievement of the decisive leading parameters has to be drawn into the calculation alongside key figures regarding investment and other costs. These are the weight gain from feed consumption and the associated feed conversion ratio. Thus, it was indicated, e.g., that higher dlwgs of 50 g per pig, a known-result where liquid feeding with sensor is used, brought an increase of 8.40 DM on income per pig. And this result was without reference to further advantages which could be exploited with the system such as the use of cheaper feed ingredients or food by-products, both of which can offer a substantially lower cost per 10 MJ of replaceable energy in feeds.

Briefly summarised, a feeding system for slaughterpigs should be able to fulfil the following roles [3]:

- feeding according to growth with single-sex regimes and all-in, all-out production systems as well as continuous feeding systems
- reduction of N- and P-emissions in manure and, with this, the ammonia emissions and also reduction in amount of slurry manure produced
- production according to hygiene requirements
- reduction of labour time
- increasing of working comfort
- improving the management of farm business and herd
- reduction of production costs

Literature

Books are signified with •

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	Mash automatic*	Mash tube automatic	Round trough sensor	Liquid standard	Liquid sensor
Stocking	1040	1040	1040	960	1040
area/animal** (m^2)	0,7	0,7	0,7	0,7	0,7
Building costs	730000	730000	730000	730000	730000
DM/place	701,92	701,92	701,92	760,42	701,92
Feeding technique DM/place***	48	36,50	57,00	58,00	39,50
Sum in DM	749,92	738,42	758,92	818,42	741,42
Building costs in DM (6,5 % write-off and maintenance 7 % of 1/2 new value)	70,19	70,19	70,19	76,04	70,19
Technology costs in DM (13,5 % write-off + rep****)	6,48	4,93	7,70	7,83	5,33
Fixed costs in DM	76,67	75,12	77,89	83,87	75,52
Difference/place in DM	-1,55	0,00	-2,77	-8,75	-0,41

Table 3: Fixed costs comparison in DM of different feeding techniques [3]

* With mash automatic + 1 drink nipple because SHV ** same gross space content per department *** acc. to Moll 1999 ****acc. to Spandau 1999