



Schothorst Feed Research

Swine facilities at Schothorst Feed Research - Facts & Figures -

1. Sow unit (gestation)

- Individual pen: 2.35 x 0.65 m
- Number of pens: 188 pens
- Total animal capacity: 188 sows
- Ambient temperature: minimum 19 °C
- Feeding capacity: restricted, 6 silos, computer-assisted
- Free access to water



2. Farrowing unit

- Farrowing pen: 2.10 x 1.30 m
- Floor heating (piglets): 1.20 x 0.5 m
- Number of rooms: 8 rooms
- Number of pens per room: 8 farrowing pens
- Total animal capacity: 64 sows with piglets
- Ambient temperature: 24 °C at farrowing, computer-assisted decline to 20 °C over two weeks time
- Floor heating pad: 40 °C at farrowing, computer-assisted decline to 30 °C over three weeks time
- Feeding capacity: non-restricted, bulk / sack storage
- Free access to water





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3. Piglet battery

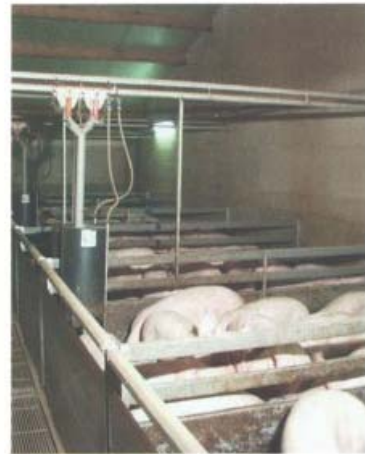
- Pen (6 piglets): 2.00 x 1.13 m
- Number of rooms: 8 rooms
- Number of pens per room: 10 pens
- Total animal capacity: 480 weaned piglets
- Ambient temperature: 26 °C at weaning for 4 days, computer-assisted decline to 20 °C over three weeks time
- Feeding capacity: non-restricted, bulk / sack storage
- Free access to water

4. Growing finishing unit (group housing)

- Pen (6 pigs): 2.05 x 2.20 m
- Number of rooms: 6 rooms
- Number of pens per room: 8 pens
- Total animal capacity: 288 pigs
- Ambient temperature: 20 °C
- Feeding capacity: restricted or ad libitum, 12 silos, computer-assisted
- Free access to water

5. Growing finishing unit (practical scale)

- Pen (10 pigs)
- Number of rooms: 18 rooms
- Number of pens per room: 8 pens
- Total animal capacity: 1440 pigs
- Ambient temperature: 20 °C
- Feeding capacity: restricted, 12 silos, computer-assisted
- Free access to water





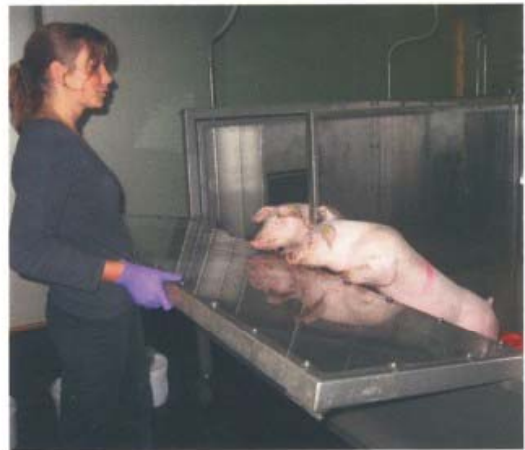
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6. Individual housing growing finishing pigs

- Individual pen: 1.80 x 1.00 m
- Number of individual pens: 48
- Total animal capacity: 48 individually housed pigs
- Ambient temperature: 20 °C
- Feeding capacity: restricted, 12 silos, computer-assisted
- Free access to water

7. Laboratory facilities

- Possibility to perform balance, digestibility and challenge experiments
- Piglet cage: 0.975 x 1.00 m, growing finishing pig cage 0.975 x 2.00 m
- Number of cages: 36 piglets or 18 growing finishing pigs
- Ambient temperature: computer-assisted temperature control
- Feeding capacity: non-restricted, bulk / sack
- Free access to water





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Facilities piglet battery

Statistical characteristics of the experiments			
Number of rooms	10	10	10
Number of pens per room	8	8	8
Experimental unit	6 piglets / pen	6 piglets / pen	6 piglets / pen
Replicates per treatment	n=6	n=10	n=15
Number of treatments	2-6	2-6	2-6
Least Significant Difference*:		Week 1-2	
- total weight gain (g)	32	25	21
- total feed intake (g)	31	24	20
- feed conversion ratio	0.08	0.06	0.05
Least Significant Difference*:		Week 1-4	
- total weight gain (g)	42	33	27
- total feed intake (g)	33	25	21
- feed conversion ratio	0.05	0.04	0.03

* reliable estimates ($P \leq 0.05$), based on the average results of performed experiments 2007-2010

SPECIFIC FEATURES

- The piglet battery consists of eight compartments with semi-slatted floors and floor heating. Each compartment contains ten pens (2.00 x 1.13 m) with 6 piglets per pen.
- Piglets are weaned at 28 days of age.
- Average growth of piglets in piglet battery is approximately 480 g.
- The experiment starts immediately after weaning and will last for 4-6 weeks.
- Piglets will have free access to feed and drinking water.
- Recording of data per pen:
 - bodyweight at day 0 and 14 post weaning and at end of study
 - feed intake, daily gain and feed conversion ratio from day 0-14, 14-end post weaning and total period
 - faecal consistency is monitored visually twice a week on a scale from 1-10 (1=liquid faeces, 10=hard and dry faeces)
- Recording of data per piglet:
 - all health disorders and medical treatments



SFR FACILITIES PIGLETS



SPECIFIC ADVANTAGES

- Experimental diets are produced in a specialized production unit under GMP+ conditions.
- Both limited as well as *ad libitum* feeding is possible. The design of the pens ensures sufficient trough space per piglet in experiments with restricted feeding.
- The experiment is designed in such a way that in each compartment littermates from 6 litters are allotted equally to treatments, ensuring a uniform genetic background in each pen per block.
- Incidental period effects are excluded since replicates are repeated in time. As standard procedure each week a block of ten pens is started.
- The design of the experimental diets is based upon the mode of action of the tested products or –concepts in order to maximize animal response to the dietary factor investigated.
- Experimental unit is a pen with six piglets, but if required, individual body weight of piglets can be registered to measure effects on variation and homogeneity within pen.

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Research facilities for fattening pigs – Group housing

Statistical characteristics of the experiments		
Number of rooms	6	6
Number of pens per room	8	8
Replicates per treatment	n=6	n=12
Experimental unit	6 pigs / pen	6 pigs / pen
Number of treatments	4-8	4
Least Significant Difference*:		
- daily feed intake (g)	97	69
- daily gain (g)	40	28
- feed conversion ratio	0.1	0.08
- meat percentage (%)	1.1	0.8

* reliable estimates ($P \leq 0.05$), based on the average results of performed experiments 2007-2010

SPECIFIC FEATURES

- This trial accommodation is a small scale research facility and can be used for more detailed measurements. This facility consists of six rooms with eight pens (2.05 x 2.20 m) per room (288 pigs in total).
- Recording of data per pen:
 - Body weight at start, every two weeks during trial and at the end of experiment (approx. 115 kg).
 - Feed intake, daily gain and feed conversion ratio is calculated for every two weeks.
 - Faecal consistency is determined weekly by an experienced panel judging visually on a scale from 1-10 (1=liquid faeces, 10=hard and dry faeces).
- Recording data per pig:
 - All health disorders and medical treatments.
 - Carcass quality parameters: carcass weight, dressing percentage, meat percentage, thickness of muscle and backfat at slaughter, carcass classification (type AA, A or B).



SFR FACILITIES GROUP HOUSING OF GROWING FINISHING PIGS



SPECIFIC ADVANTAGES

- In this facility additional measurements can be performed e.g. more frequent monitoring of body weight and feed intake, ultrasonic backfat thickness at different stages in order to estimate fat and lean development, blood samples to measure hormone or metabolite levels.
- Experimental unit is pen with six pigs, but individual body weight of pigs is registered to measure effects on variation and homogeneity within pens.
- Both restricted and ad lib feeding is possible.
- Experimental diets are produced in a specialized production unit under GMP+ conditions.

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Fattening pig research – practical farm

Technical characteristics of the experiments		
Number of rooms	18	18
Number of pens per room	8	8
Experimental unit	10 pigs / pen	10 pigs / pen
Number of treatments	2-6	2-6
Number of replicates	n=12	n=18
Least Significant Difference*:		
- daily feed intake (g)	63	52
- daily gain (g)	20	17
- feed conversion ratio	0.07	0.06
- meat percentage (%)	0.7	0.5

**reliable estimates ($P \leq 0.05$), based on the average results of earlier performed experiments*

SPECIFIC FEATURES

- Research on a practical scale making results comparable to practice and easily implementable on commercial farms.
- This accommodation consists of 18 rooms of 8 pens (total animal capacity 1440 pigs).
- Average performance data: daily gain 845 gram, EW-conversion 2.90, meat percentage 56.0%.
- Choice of two up to six treatments.
- Feeding according to a feeding scheme or *ad libitum*.
- Recording data per pen: feed intake, daily gain and feed conversion ratio.



SFR FACILITIES PRACTICAL SCALE



SPECIFIC ADVANTAGES

- Possibility of mixing and blending of basal experimental diets before delivering to the pens.
- Experimental diets can be 'home-made' feeds and delivered by the customer or can be manufactured in a specialized production unit under GMP* conditions. In the first option details of feed composition are not required.
- High statistical power resulting in low LSD values (see technical data).
- Additional experimental data except feed intake, daily gain and feed conversion:
 - Graphical presentation of actual daily feed intake per treatment during whole fattening period.
 - Carcass quality parameters of individual pigs: carcass weight, dressing percentage, meat percentage, thickness of muscle and backfat at slaughter, carcass classification (type AA, A or B).
 - All health disorders and medical treatments are monitored per individual animal.

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Digestibility experiments – PIGS

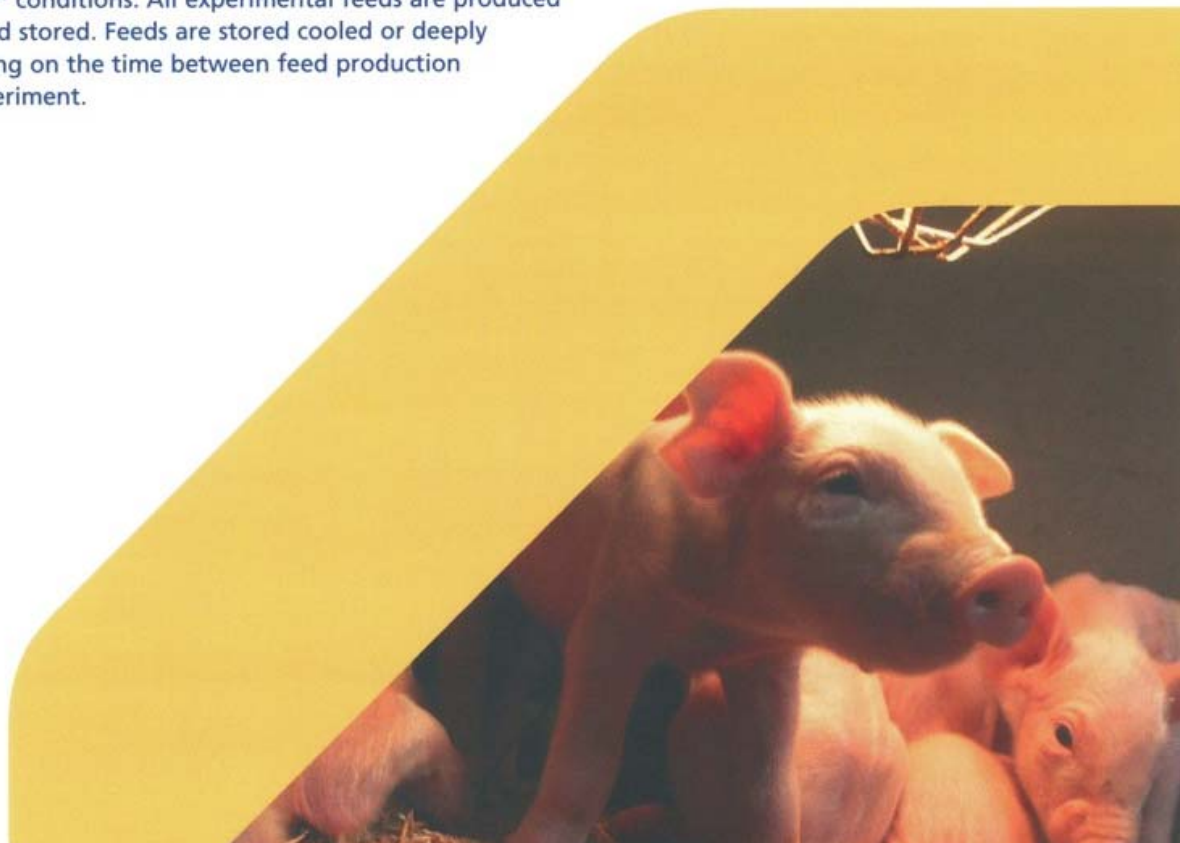
Technical characteristics of the facilities	
Total number of animals	48
Experimental unit	1 pig / pen
Number of experimental units	48
Number of treatments	2-8*
Replicates per treatment	6-8*
Standard deviation (SD)**:	
- DC (faecal) organic matter	0.5
- DC (faecal) crude protein	1.3
- DC (faecal) crude fat	1.8
- DC (faecal) NSP	0.5
- Calculated DE or NE, MJ/kg	0.5

* Number is dependent on experimental design. Trial can be replicated over time.

** SD values are reliable estimates for digestibility coefficients of complete experimental diets (based on 8 replicates)

GENERAL INFORMATION

- Faecal digestibility experiments with growing-finishing pigs are performed with a maximum of 48 individually housed pigs. Pen size 1.00 x 1.80 m.
- The applied protocol for digestibility trials is based on the standard CVB protocol for digestibility studies in pigs.
- For determination of faecal digestibility, HCl insoluble ash (3.0% Diamol) respectively Cr_2O_3 (0.3%) are used as markers.
- The experimental feeds are produced in a specialized production unit under GMP* conditions. All experimental feeds are produced in one batch and stored. Feeds are stored cooled or deeply frozen depending on the time between feed production and end of experiment.



SFR FACILITIES DIGESTIBILITY EXPERIMENTS



BRIEF DESCRIPTION PROTOCOL

- Actual collection period of faeces starts after an adaptation period of minimum two weeks in which experimental diets are fed.
- During the faecal collection period faeces samples are collected twice daily by grab-sampling (after rectal stimulation if necessary). This procedure is performed during three consecutive days.
- All samples are stored cool during the faeces collection period. After collection period, samples are homogenised, pooled per individual pig and freeze dried for further analysis.
- Throughout the weight range of 50-110 kg a maximum of four faeces collection periods can be applied.

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T-cannulation piglets and growing finishing pigs

Statistical characteristics of the experiments	Piglets	Growing finishing pigs
Total number of animals	36	18
Number of treatments	2-6	2-6
Replicates per treatment	4-8	4-8
Standard Deviation (SD):		
- DC(ileal) dry matter	1.5	5.8
- DC(ileal) crude protein	3.3	5.4

GENERAL INFORMATION

- The applied protocol for digestibility trials is based on the standard CVB protocol for digestibility studies in pigs.
- For determination of faecal digestibility, HCl insoluble ash (3.0% Diamol) respectively Cr_2O_3 (0.3%) are used as markers.
- The experimental feeds are produced in a specialized production unit under GMP+ conditions. All experimental feeds are produced in one batch and stored. Feeds are stored cooled or deeply frozen depending on the time between feed production and end of experiment.



SFR FACILITIES DIGESTIBILITY CAGES T-CANNULATED PIGS



BRIEF DESCRIPTION PROTOCOL

T-cannulated pig(lets) are used for ileal and faecal digestibility experiments

- Pigs with initial body weight of 25 kg are provided with T-cannula and individually housed in cages (0.975 x 2.0 m) in a laboratory facility. A maximum of 18 pigs can be used.
- Actual collection period of faeces starts after an adaptation period of minimum two weeks in which experimental diets are fed.
- During the faecal collection period faeces samples are collected twice daily by grab-sampling (after rectal stimulation if necessary). This procedure is performed during three consecutive days.
- All samples are stored cool during the faeces collection period. After collection period, samples are homogenised, pooled per individual pig and freeze dried for further analysis.
- After faecal collection, ileal content is collected at two consecutive days during six hours per day. All samples are stored cool during the ileal collection period. After collection period, samples are homogenised, pooled per individual pig and freeze dried for further analysis.
- Throughout the weight range 25-100 kg a maximum of three faeces and ileal content collection rounds can be applied.
- Digestibility experiments in this facility can be extended easily with additional measurements e.g. challenge trials with pathogens or in-depth gut studies to investigate intestinal tissue morphology, passage rate, gut microflora etc.
- Study can be performed with weaned piglets as well.

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In vitro digestibility of feeds or feedstuffs for pigs

An economical quick screening method to estimate the nutritional impact of feed processing in diets of pigs

Determining the ileal digestibility of (individual) feedstuffs in animals is a tedious and costly process. Moreover, purpose is often to have a quick check of the effect of technological treatments (grinding, pelleting, expanding or extruding) or processing settings (fineness, temperature, pressure) on nutritional quality of feed. Schothorst Feed Research has developed an *in vitro* system to estimate ileal organic matter, crude protein, and starch digestibility of feedstuffs and compound feeds for pigs. Besides that a gas production test is developed to estimate, in combination with the *in vitro* ileal digestibility, faecal digestibility.

Methodology and precision

The Boisen-based method involves a two step enzymatic digestion, simulating digestion in stomach (pepsin at low pH) and small intestine (pancreas enzymes at high pH).

Validation of the method showed a strong relationship between the *in vitro* and *in vivo* starch ($r^2 = 0.66$, $p < 0.0001$) and organic matter ($r^2 = 0.73$, $p < 0.0001$) digestibility. The correlation of protein is less strong because production of endogenous protein by the animal is dependent of many nutritional and animal related factors that can not be simulated in an *in vitro* assay.

The gas production test involves a one step digestion, simulating digestion in large intestine (fresh faecal samples of pigs provide bacterial inoculum). Fermentation gases produced are measured.

Although correlation between actual digestibility and *in vitro* digestibility characteristics are important, major application of *in vitro* methods is the ability to predict changes in digestibility characteristics after e.g. technological treatments or changes in feedstuff quality.



SFR IN VITRO TEST SET UP



Applications

- 1 Evaluating and fine tuning *in house* technological treatments.
- 2 Optimizing cost/benefit ratio of treating of complete feeds or feedstuffs.
- 3 Quality control of purchased (treated) feedstuffs and supplier selection.
- 4 Standardizing end products within or between plants in order to ensure consistent and predictable animal performances.

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