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GROUP HOUSING OF SOWS IN THE NETHERLANDS IN 2010

Herman Vermeer, Wageningen UR Livestock Research, NL

ABSTRACT

In Netherlands, 65% of sows are group housed, half of them in Free Access Stalls systems and half in Electronic Sow Feeding systems. Group housing from 4 days post insemination is an additional Dutch regulation. Between 1985 and 1995, only 5% of herds converted to group housing with electronic sow feeders, but farmers had problems with agression and lower performances. After the swine fever epidemic in 1997, government decided to make group housing compulsory towards 2008.

In litterature, few studies comparing the different group housing systems of pregnant sows have been performed and the results are not very conclusive, neither on fertility nor on leg problems or and longevity.

So, a study had been performed on 70 farms with early introduction, due to the Dutch regulation, to gain insight into the success and risk factors for group housing during early gestation. The study included telephone survey, farms visits and identification of factors influencing success. The most important conclusions are :

- the system of group housing is not determining the success: in each system, good results can be achieved.

- better results are obtained in farms with animal-directed approach, attention fot the needs of individual animal.

- adequate rearing of gilts influences success.

- pig's farmer management is an important success factor.

- more living space for sows during gestation improves performances.

- importance of preventing stress, especially in the second and third weeks of gestation.

RESUME

Aux Pays-Bas, 65 % des truies sont logées en groupe, la moitié d'entre elles en stalle libre accès et l'autre moitié au DAC. Le logement en groupe à partir de 4 jours PI est unbe exigence réglementaire hollandaise supplémentaire. Entre 1985 et 1995, seuls 5 % des élevages se sont convertis au logement de groupe avec DAC, mais les éleveurs ont rencontré des problèmes d'agression et de plus faibles performances. Après l'épidémie de peste porcine, le gouvernement a décidé de rendre obligatoire le logement de groupe d'ici à 2008.

Dans la littérature, peu d'études comparant les différents système de logement de groupe des truies gestantes ont été menées et les résultats ne sont pas très concluants, ni sur la fertilité ni sur les problèmes de boiteries et de longévité.

Ainsi, une étude a été menée sur 70 élevages, en raison de la réglementation hollandaise, pour avoir un aperçu des facteurs de risques et de succès pour le groupage des truies en début de gestation. L'étude était fondée sur une surveillance téléphonique, des visites d'élevage et l'indentification de facteurs influençant le succès. Les conclusions les plus importantes sont :

- le système de groupage n'est pas déterminant du succès : quel que soit le système, de bons résultats peuvent être obtenus.

- de meilleurs résultats sont obtenus dans les fermes avec une approche centrée sur l'animal, avec une attention aux besoins individuels des animaux.

- un élevage adéquat des cochettes influence le succès.

- l'éleveur est un facteur de succès important.

- un espace de vie plus grand pour les truies améliore les performances.

- la prévention du stress est importante, surtout dans les 2-3 premières semaines de gestation.

HISTORY OF GROUP HOUSING OF SOWS IN THE NETHERLANDS

The popularity of housing sows in groups in the Netherlands varied considerably in the last 25 years. Between 1985 and 1990 about 5% of the sow farms converted to group housing with electronic sow feeders (ESF). This development stopped because part of the farmers had problems managing the system with aggression, lameness and lower performance as a result. However after the swine fever epidemic in 1997 the Dutch government decided in 1998 to make group housing compulsory towards 2008. New and converted buildings should have group housing. Later the date of January 2013 became the harmonised EU-regulation.

Currently 65% of the pregnant sows in NL are group housed in a variety of systems. Group housing in the first weeks of pregnancy, from 4 days post insemination (early pregnancy) is an additional Dutch regulation and the most complex stage of pregnancy for group housed sows.

Table 1. Group housing systems on Dutch sow farms in 2010

	% farms	N farms
Individual stalls	34.7	452
Electronic Sow Feeding (ESF) on Straw	7.9	103
ESF Concrete slatted	32.6	425
Free Access Stalls (FAS)	30.2	394
Trickle Feeding	0.8	10
Other...	2.8	37
Total	109.0	1304

(source: AgriDirect, specialist in Agrimarketing)

BASICS OF GROUP HOUSING

A crucial factor in group housing systems is the management around mixing of sows around group formation. In the Dutch Handbook Group housing of pregnant sows (2000) the simplest way to keep sows in groups with low risks is the use of static groups. This minimizes the number of mixing moments and related stress, skin lesions and lameness. Another point is that every sow should have the opportunity to eat her restricted ration without competition. That is one of the reasons that Free Access Stalls and Electronic Sow Feeding each have one third of the market in the Netherlands. The last third still has to convert to group housing (2010).

Electronic sow feeding offers an enriched environment, flexibility, individual feeding and but also some more competition around the entrance of the feeder. In Free Access Stalls the sows can be fed and inspected simultaneously, but freedom of movement is less and the smaller groups/pens offer less enrichment than in ESF. In the following text a review on system comparisons and an analysis of results on sow farms with early introduction in the group.

COMPARISON OF GROUP HOUSING SYSTEMS

There are substantial data in the scientific literature on the impact of individual versus group housing of pregnant sows on reproduction, animal well-being, management and injuries. Less literature is available on the comparison of different group housing systems for pregnant sows. Most studies reveal that reproductive performance in group housed sows is not as good as in individual kept sows (McGlone et al., 2004; Kongsted, 2004b). When it comes to leg injuries and claw lesions the results of investigations are less clear-cut. Barnett et al. (2001) state that housing sows individually without exercise results in less bone strength, less muscle mass and more joint damage. Moreover, a large scale investigation of sow claws at slaughter in the Netherlands established that group housed sows had less severe claw injuries than individually kept sows (Geudeke, 1992). Possible explanations are that group housed sows with leg injuries are more likely to be culled in an earlier stage of the problems than sows housed in individual stalls. It is also possible that a restricted space provides less opportunity for natural standing and lying movements, resulting in more lesions.

Backus et al. (1997) compared three housing systems: free access stalls with 10-14 sows per group, trickle feeding with 6-8 sows per group and electronic sow feeding (ESF) with 26 sows per static group. Sows were kept in groups from weaning until about one week before farrowing. Around heat sows were housed individually for a few days. Weaning to oestrus interval was 6.2 days in sows housed in free access stalls and 7.3 days in sows housed in ESF and trickle feeding ($P<0.05$). This is relatively long, and the difference is difficult to explain as many factors affect it. Non-return percentage and total number of piglets born were not affected by group housing system. The percentage of sows with locomotion disorders, claw lesions and skin lesions at the front of the body was higher in ESF and trickle feeding than in free access stalls. Skin and claw lesions were mainly caused by mixing sows and by aggressive interactions around feeding. Oral activity recorded for three hours after the start of the feeding cycle in ESF sows, and for 1.5 hours after feeding in the other treatments was lowest in sows housed with ESF. It was similar in sows housed in free access stalls and trickle feeding. This would suggest that average feeding motivation during these periods was lowest in ESF fed pigs (cf. Spoolder et al., 1995). However it should be noted that oral activities are triggered by feeding events, and in ESF systems these take place over a 24 hour period. The three hour recordings in ESF systems therefore may have underestimated the level of oral activity.

Van der Peet et al. (2003) compared two group housing systems for pregnant sows: free access stalls with 12 sows per group and ESF with 25 sows per static group. Sows were kept in groups from weaning until Day 105 of gestation. Around heat sows were housed individually for a few days. The number of sows that returned to oestrus after first insemination was higher in sows housed in ESF than in sows housed in free access stalls. The authors suggest this might be explained by a higher level of aggression in sows housed in ESF than in sows housed in free access stalls (similar to Backus et al., 1997). Weaning to Oestrus and total number of piglets born were not influenced by group housing system. Body weight and back fat gain during pregnancy were lower in pregnant gilts housed in ESF than those housed in free access stalls (Van der Peet et al., 2003). This was due to a lower feed intake. In free access stalls sows were fed twice a day and feed refusals were hardly noticed. In ESF, gilts and sows were free to consume their daily ration all at once or to divide it in more portions. Especially in gilts, the daily amount of feed was often not consumed in one meal. However, gilts did not return to the ESF for a second time to eat the rest of their daily ration. In parity 2, back fat gain during pregnancy was higher in sows housed in ESF. This is in agreement with the results of Backus et al. (1997) and suggests that sows housed in ESF use their feed more efficiently than sows housed in free access stalls. This presumably can be explained by a reduced physical activity, or improved thermoregulation

In this study in the ESF group a higher number of sows returned to oestrus compared to sows housed in free access stalls. It is questionable whether this difference should be attributed to a higher level of aggression or to a lower feed intake. Probably it is the combination of these effects that counts. As in the study of Backus et al (1997), the group size in the ESF group in this study is rather small compared to the practice in Dutch sow farms.

Broom et al., (1995) compared two group housing systems for pregnant sows during four parities: groups of five sows with individual feeding stalls and a dynamic 38-sow group in ESF. First parity sows entered in week 7 of pregnancy, subsequent parities in the week following service. They found no differences in reproductive performance and in body weight gain between the sows in the two group housing systems. Sows in ESF showed more fighting, especially soon after mixing, but fewer total agonistic interactions than sows in groups of five during the first pregnancy. Oral stereotypies were slightly higher in small groups. By the fourth pregnancy there were few differences between sows in small groups and large groups. Sows in ESF were inactive for longer, spent more time interacting socially and less time rooting or chewing at the floor or straw than sows in small groups. However, with respect to reproduction, no major differences between the two housing systems were observed. The group size in the ESF system in this study was 38, which is closer to common practice.

Van der Peet et al. (2004) compared two group housing system for pregnant sows during three parities: 10-sow groups fed a diet with a high level of fermentable non-starch polysaccharides (NSP) ad libitum and 10-sows groups fed a conventional diet restrictedly in ESF. Sows were group housed from 7 days post insemination. Reproductive performance was similar in both systems. Sows that were fed ad libitum spent less time standing and more time eating than sows that were fed restrictedly. Skin lesions, recorded in weeks 6 and 12 of pregnancy, were observed less frequently in the ad libitum fed sows. The investigators compared two feeding systems with different feed in relatively small groups. They could not demonstrate differences in reproductive

performance.

Courboulay and Gaudré (2002) compared two group housing systems during four parities: groups of six sows fed simultaneously using six troughs and stable groups of 12 sows in ESF. Sows were group housed from weaning, and housed in their respective treatments from 1 week following service (until moving them to the farrowing unit). The number of live born piglets was lower in sows housed in ESF than in sows housed in groups of six and fed with troughs. Back fat gain during pregnancy was higher in sows housed in ESF. Sows in ESF were inactive for a longer time during the day than sows housed in groups of six and fed with troughs. Litter size appeared to be smaller in the ESF groups (10.68 and 10.22 piglets for groups of six and ESF respectively; P=0.07). There was no effect of housing treatment on the total number of piglets born. Again, the group size was smaller than it commonly is in commercial sow farms. Moreover, it is not obvious whether the registered effect is due to the housing system or to the feeding system. The observation that sows in ESF gain more back fat during pregnancy is consistent with the results of Van der Peet (2003). It is not apparent why this is accompanied by a smaller litter size.

A study by Van der Mheen et al. (2003) was designed to establish the most appropriate moment of introduction of sows into a group and the difference in performance between sows in small stable groups (13 sows) and large dynamic groups (50 sows). It appeared that sows in the large dynamic groups had more injuries of skin and claws, but this did not seem to have a disadvantageous effect on fertility. In fact the sows that were introduced shortly after insemination into the large dynamic group produced the largest litters (Van der Mheen et al., 2003), although the total number of piglets born did not differ significantly (see Table 3). It is possible that the extra available space in the dynamic system mitigated some of the stress associated with group formation: fighting occurred, but was perceived as less stressful because of escape (fleeing) opportunities. A complicating factor might be that the feeding system applied in the experiment (Fitmix®) is not commonly used, and at the time of introduction in this study the apparatus still required further development to reduce social interactions during feeding.

In addition to direct comparisons of housing systems in experimental studies, group housing systems have been studied using a more epidemiological approach. An analysis of a database of the Animal Health Service (AHS) in Deventer was carried out to identify possible risk factors within group housing during the first month of pregnancy (Geudeke, 2008). The database contains details of 96 farms, collected during farm visits in the years 2003 to 2007. A large number of these farms were visited because of poor reproductive results ('problem farms': 40 farms) but the database also contains information from farms without fertility problems ('controls': 56 farms). Of the 96 farms, 42 housed their sows in groups during early pregnancy (24 problem farms, 18 controls). In order to determine possible risk factors within group housed sows in early gestation, AHS retrospectively regarded the information as a case control study in which the cases are defined as farms with a high percentage of irregular returns to oestrus (e.g. >10% returns between 25 and 32 days after insemination), especially during autumn, which is considered to be caused by early embryonic death. The control group consists of farms with no reproductive problems whatsoever and farms with at least no signs indicating early embryonic losses.

The odds ratio of the risk on early embryonic losses in group housing was 3.2 ($P< 0.01$) compared to individual housing during at least the first month of gestation. The poorest reproductive results were found in systems where sows are introduced in groups between one and two weeks after insemination. Compared to farms with other moments of introduction in groups, these herds seemed to have a higher percentage of rebreeding (17.5% vs. 13.8%, $P<0.05$; unpublished data). This is consistent with results in other investigations (Van der Mheen, 2003).

Within group housing during early gestation not many potential risk factors appear to be statistically significant due to the relatively small number of sow herds involved (see Table 1). Nevertheless some aspects are interesting for further exploration. For instance the finding that housing in stable groups compared to large dynamic groups results in a higher risk of embryonic losses. Further more, within a system of stable groups it seems sensible to choose for ad libitum feeding during gestation (O.R. = 0.08; $P<0.10$). In such a system, however, special diets should be provided (high fibre, low energy) to avoid overfeeding. Further, straw bedding seems to have a protective effect regarding embryonic mortality. This is in agreement with the conclusion of e.g. Heinonen (2003) that providing bedding has a positive effect on pregnancy rate.

It should be noted that the factors mentioned are strongly correlated. E.g. group housing with straw bedding is almost always associated with a large, dynamic group and electronic sow feeding. This, plus the fact that the data are not from a well designed experiment, means the results of the analyses should be treated with caution.

As stated before, not much scientific work has been done to compare the effects of different group housing systems for sows during early gestation. Further more, the results of the few studies performed are not very conclusive, neither on fertility nor on leg problems and longevity of sows and some outcomes are even contradictory. Unfortunately, the experimental design of most studies only permitted the use of relatively small groups of sows. As a consequence, it is hard to draw any significant practical conclusions. Field data is also rare and due to their nature should be cautiously interpreted. Finally, a complicating aspect is that many factors of group housing are mutually related: feeding systems, bedding used, group size and group dynamics are often inextricably linked to each other (Edwards, 2000).

ANALYSIS ON 70 FARMS WITH EARLY INTRODUCTION

Wageningen UR Livestock Research is looking for solutions to the bottlenecks that occur in practice as to keeping gestating sows in groups within 4 days post-insemination. In 1998 animal welfare was laid down in Dutch legislation, which included that as of 1 January 2013 all sows need to be accommodated in group housing within 4 days post-insemination (European legislation states 4 weeks after insemination) until 1 week before farrowing. With newly built facilities or renovation before this date, the sow farmer already has to meet these requirements immediately.

The past few years many sow farmers have changed from individual housing to group housing during the gestation period. There were indications from practice that, despite many efforts, it was often not possible to apply group housing successfully, that is to say with good welfare and adequate reproductive performance. In 2005 the network of entrepreneurs 'group housing sows' listed the bottlenecks. The following impediments were mentioned:

- Reproductive performance in sows is often worse than the desired level.
- Measuring animal welfare, animal health and individual feed intake is difficult, especially in large groups.
- Leg and claw disorders due to aggression in the group.
- Skin lesions and vulva biting.

These are all bottlenecks that are at the expense of the effectiveness, animal welfare and job satisfaction of the sow farmer.

Objective of the study was to gain insight into the success and risk factors for group housing during early gestation, so that in the near future, gestating sows are accommodated in stall systems for group housing, in which animal welfare is ensured and where the husbandry system is economically sustainable.

The study included the following steps:

1) Telephone survey with farms with group housing for sows
2) Farm visits
3) Identifying factors that influence successful group housing during early gestation and factors that still require further research.

Telephone survey

In 2007 a telephone survey was done with 900 farms with group housing. The objective was to gain insight into the systems that occur in the Netherlands, the year of starting, the moment of introducing the sows into

the group and the variance in farrowing rate. Over 80% of the farms responded. The average farrowing rate of first insemination on the farms was 87%. The highest rate was 96%, the lowest 70%.

From the farms that responded to the telephone survey, 75 farms were selected and visited for collecting additional data. The farms were selected on the basis of the following criteria: 1) sows and gilts were placed in the group within 4 days post-insemination, 2) farms had applied group housing since December 2004 or earlier, 3) no changes in the system of group housing had taken place in 2006 and 2007.

Farm visits

In 2008, farm were visited, during which questions were asked as to farm equipment and management. The questionnaires included seven parts: 1) general farm data and technical parameters 2005 and 2006, 2) animal characteristics, 3) characteristics of the farmer, 4) rearing gilts, 5) service stall, 6) gestation stall, and 7) farrowing stall. Moreover, the following measurements in animals were done:

- Skin lesions and vulva damage in ten sows in the first week after having been placed in the group and in ten sows in the last week in the gestation stall.
- Back fat, condition score and claw health in 5 gilts just before insemination, in 15 sows at introduction in the farrowing pen and in 15 sows at weaning.
- Behaviour test in 10 gestating sows per farm (fear for human).

Brief description of the farms visited

The 70 farms visited had the following systems of group housing: 34 farms with ESF without straw, 20 farms with ESF with straw, 6 farms with FAS, 7 farms with trough feeding, 2 farms with ad lib feeding and 1 farm with floor feeding. Farm size varied from 100 to 1700 sows. On 35 farms Topigs 20 were used as line of breeding; on the other 35, the sow lines differed. Table 1 lists some technical parameters of the farms and shows a wide range in the results.

Table 1 : Average technical parameters over 2005 and 2006 of the farms visited

	Average	Minimum	Maximum
Farrowing rate 1st insemination	85.9	77.2	93.0
Farrowing rate 1st insemination cycle 1	87.3	73.7	95.9
Weaned piglets/sow/ year	25.2	22.1	28.1
Removed sows cycle 1 (%)	5.2	0.8	16.6
Removed sows cycle 2 (%)	10.2	1.9	21.7

Results from the analyses

No effect could be found of system of group housing (ESF with straw, ESF without straw, FAS, trough feeding) on the reproduction, welfare and condition parameters measured. Each system produced very well-performing and less well-performing farms. None of the systems scored better than other systems as to reproduction, welfare and condition parameters, which means that with each system good performance can be achieved at introduction of sows into the group within 4 days post-insemination.

The results indicate that the following characteristics have a relationship with various available performance indicators and thus seem important for successful group housing for sows during early gestation:

1) farm optimisation and farm management;
2) rearing gilts: home-bred, quarantine, feeding, familiarising with feeding system, living space/animal, heat stimulation, way of introduction into the gestation stall;
3) living space/animal during gestation;
4) pen lay-out: location ESF, width of indoor exercise area in cubicles and length and width of the lying

area with FAS;

5) feeding gestation;
6) genotype;
7) farm size.

Results of the ten best and then ten worst performing farms for reproduction and welfare

The results for the ten farms with the best reproductive performance (highest farrowing% and lowest % of removal of cycle 1+2 sows) and the best score for animal welfare parameters measured (lowest % skin lesions early gestation and lowest % claw problems in ball area) in sows have been compared with the ten farms with the worst reproduction results and the worst score for welfare parameters measured in sows. The characteristics that differed significantly between the ten best and ten worst farms are presented in table 2.

Table 2 : Average of the characteristics that differed significantly between the ten best and ten worst performing farms as to reproduction and welfare

	10 worst farms	10 best farms
Condition management[1]	36	57
Hygiene[1]	85	75
Farm optimisation[1]	39	59
Farm management[1]	55	75
Farms size (# of sows)	374	245
Human-directed behaviour (0-5)	3.5	4.4
Home-bred gilts (vs buying)[2]	50	0
Gilts: living space/animal (last accommodation before service))(m^2)	1.4	1.9
Limited feeding to gilts (vs ad lib)[2]	80	100
Gilts dry feed(vs liquid feeding)[2]	70	100
Age 1st insemination (days)	259	250
Gestation: width between slats (mm)	17.6	19.3
Gestation: living space/animal (m^2)	2.1	2.5
No passage round ESF without straw (vs with passage)[2]	0	57

[1] *Presented as a percentage of the maximum number of points to be gained (the higher the percentage, the better)*
[2] *Presented as a percentage of the farms*

Table 2 indicates that the ten best farms compared to the ten worst farms:

- score better on condition management, farm optimisation and farm management;
- score worse on hygiene;
- have a smaller farm size;
- score higher on human-directed behaviour of the sows;
- buy the gilts more often;
- accommodate the gilts with more living space/animal, feed gilts limitedly more often, giving dry feed more often and inseminate for the first time at a younger age;
- have more width between slats in gestation stall;

- provide more living space/sow during gestation;
- have passage round ESF less often (short passage is undesirable).

Success factors

The following factors prove to be important to make group housing a success:

1)Management

- *Farm management and farm optimisation*: it is important that entrepreneurs have good management (work plan, working accurately, measuring is knowing) and attention for farm optimisation (farm objective, work plan, evaluation). These farms have a higher farrowing rate, more weaned piglets/sow/ year, fewer claw problems in sows and a better condition of the sows.
- *Animal-directed management:* Farms with animal-directed management (attention for the needs of the individual animal) have fewer skin lesions and claw problems and better reproduction in sows. This is proved by, amongst others, the positive relationships with condition management, familiarisation of gilts with the feeding system during gestation, more human-directed sows and more living space during rearing and gestation.

2)Rearing gilts:

- *Living space*: on farms with more living space for gilts, the removal rate of cycle 1+2 sows is lower and sows have fewer skin lesions during gestation.
- *Feed during rearing*: Farms that feed gilts limitedly and/or give them dry feed have a higher farrowing rate, a lower removal rate and a higher number of weaned piglets.
- *Familiarisation with the feeding system during gestation period*: Familiarising gilts with the feeding system during gestation (particularly familiarisation prior to service) is positively related to reproduction and condition of the sows.

3)Gestation

- *Feeding management*: Too low a feed intake during early gestation can affect reproduction results negatively. In group housing with ESF, it is important to trace sows quickly by liquid feed. Farms that do not do this, have lower farrowing rates. Moreover, sows on farms with a lower feed ration during the entire gestation have a worse condition when placed in the farrowing stall.
- *Living space*: On farms with more living space/sow, the farrowing rate is higher and the removal rate of cycle 1+2 sows lower. More living space can possibly result in a higher profit.
- *Straw*: Using straw can positively affect welfare, because it can reduce claw disorders in situations of aggression. Moreover, straw offers animals the possibility of exerting explorative behaviour, which prevents development of stereotype behaviour.
- *FAS*: Farms with a wider indoor exercise area have a higher farrowing rate, lower sow removal rate and a better condition of sows when placed in the farrowing pen. Farms where sows are locked up during eating have a higher farrowing rate in cycle 1 and fewer claw problems.
- *ESF*: In designing stalls with ESF, make sure that sows that have already eaten cannot go to the entrance of the ESF again. Farms where this short 'passage' is possible have more skin lesions in sows. For farms that use straw, it is favourable for the farrowing rate to renew straw more than once a year. Furthermore, it was proved that farms with wider and/or deeper litter experienced fewer claw problems in sows.

Factors that require further research

1)Management

- *Farm management and optimisation*: adequate management and attention for farm optimisation are positive for condition, claw health and reproduction in sows. A positive attitude towards the individual animal is favourable for reproduction and animal welfare. Are these two factors conflicting? Can a farmer pay attention to the entire farm and at the same time to the individual animal? Can the farmer's attitude towards these two aspects be improved and if so, in what way?

2) Gilt rearing

- *Living space*: how much living space is desirable during rearing for an optimal development of the legs and social skills, so that gilts can maintain themselves in group housing during gestation?
- *Social skills*: what is the best way to teach gilts more 'social skills' before they go to the gestation stall? In what way can gilts be taught to handle aggression during gestation?
- *Familiarisation with feeding scheme and introduction into gestation stall:* what is the best familiarisation strategy for the feeding system during gestation? How should gilts be housed prior to introduction into the gestation stall, from which time should gilts be familiarised with the feeding scheme during gestation, how are gilts to be introduced into the gestation stall (via separate rooms or simultaneously)?

3) Gestation

- *Feeding individually*: what is the importance of individually directed feeding in relation to reproduction, welfare and condition?
- *Living space*: more living space/sow during gestation is positively related to reproduction. Do sows in small groups with little room for escaping behaviour need more living space/sow than sows in large groups?
- *Composition of the group*: need young and older sows be housed together or separately? Is the ideal composition of the group different for the different systems of group housing?

Conclusions

The most important conclusions from the study are:

System of group housing

- A very important finding from the farm visits was that the system of group housing is not determining in the success of group housing for sows within 4 days post-insemination, because no effect could be seen of group housing during gestation on reproduction, welfare and condition parameters. With each system of group housing (ESF with straw, ESF without straw, FAS, trough feeding) there are farms with very good results and with less good results. This means that with each system of group housing, good results can be achieved at introduction of sows into the group within 4 days post-insemination.

Animal-directed approach

- Farms with an animal-directed approach, that is to say with attention for the needs of the individual animal, experience fewer skin lesions and claw disorders and a better reproduction rate in sows. This is shown by, among other things, better results on farms that pay more attention to condition management of the sows, apply limited feeding to gilts, familiarise gilts with the feeding system during gestation, where gilts and sows have more space and where sows are less afraid of people. An animal-directed approach is thus an important success factor for group housing for sows.

Rearing gilts

- Various aspects of gilt rearing, such as sufficient living space, limited feeding and familiarisation with the feeding system during gestation are important success factors for group housing for sows within 4 days post-insemination.
- Extra requirements as to living in group housing for rearing gilts apply as compared to individual housing. These requirements particularly focus on learning social skills by the animals (because of the correct contact/competition with older, heavier sows in the group), development of legs (because

of hierarchy fights in the group) and familiarisation with the feeding system in the gestation stall. At the moment it is not clear what the living space during rearing should be for an optimal development of the legs, what the best way is to teach gilts more social skills and what the best familiarisation strategy is as to the feeding system in the gestation stall.

Farm management and farm optimisation

- Good farm management (fixed work plan, working accurately, measuring is knowing) and attention for farm optimisation (concrete farm objective, action plan, evaluation of farm objective), in other words the pig farmer's management, are important success factors for group housing for sows during early gestation.

Design gestation stall

- The success of group housing during early gestation seems to be less dependent on specific details of pen design and stall equipment during gestation.
- What seems important, however, is the living space for sows during gestation. On farms with more living space/sow during gestation, farrowing rate is higher and removal rate of cycle 1+2 sows is lower. This is likely to relate to the possibility of avoiding fights.
- It is not clear whether the success of group housing depends on group size.

Rest and routine

- For successful group housing for sows within 4 days post-insemination, rest and routine (i.e., preventing stress) are extremely important. Factors that cause stress and/or a low feed intake can negatively affect reproductive performance. The most vulnerable period are the second and third weeks of gestation.

Conclusion: with each system of group housing good reproduction results and adequate animal welfare in sows can be achieved at introduction of sows into the group 4 days post-insemination. An animal-directed approach, attention for farm management and farm optimisation, in other words the pig farmer's management and an adequate rearing of gilts are important success factors.