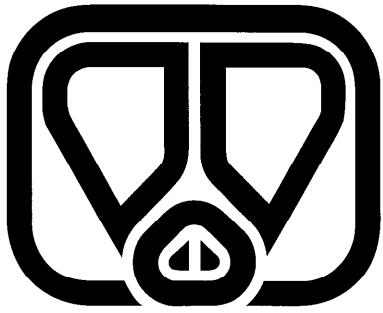


ir. H.M. Vermeer
ing. G.P. Binnendijk

A raised soft farrowing mat during lactation



Research Institute for Pig Husbandry

Site:
Research Institute for Pig
Husbandry
P.O. Box 83
5240 AB Rosmalen
The Netherlands
Phone: (+31) 73 528 65 55
Fax: (+31) 73 521 82 14

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SUMMARY

The effect which a raised, soft farrowing mat in the farrowing pen had on the technical results and health of sows and piglets was examined in 108 litters. A raised area beneath the sow can improve the accessibility of the udder for the piglets, resulting in an improved weight gain. The soft back part of the mat provides the sow with more grip for the hind legs and can lead to fewer piglets being crushed.

The experiment was carried out in two farrowing rooms, each containing six pens. The sows and litters were housed on a partly slatted tribar floor with a diagonally placed farrowing crate. A raised, soft farrowing mat (Productive Comfort) was installed in half of the pens, combined with a piglet mat.

Results were collected from 52 farrowing mat litters and 56 control litters.

There was no difference in the daily weight gain of the piglets in the control and the farrowing mat treatment (respectively 220 and 219 g/d, ns). Mortality of liveborn piglets was

higher in the control treatment than in the farrowing mat treatment, mainly caused by a reduction in crushing (mortality respectively 12.4 and 8.0%, $P < 0.05$; crushing 5.0 and 2.4%, $P < 0.05$). Less injuries were caused to the udders and teats of the sows in the farrowing mat group than the control group. There was no difference in the number of piglets with injuries to the front legs, although more piglets had joint infections in the control treatment than in the farrowing mat treatment.

In conclusion the mat on a metal tribar floor has benefits which are seen as a higher survival rate of the piglets caused by less crushing and less injuries to the udder of the sow and less joint infections in the piglets. The farrowing mat should be attached to the floor in such a way that dirt and moisture cannot accumulate on or under the mat. The durability of the mat could not be assessed because of the short length of the experiment.

1 INTRODUCTION

In many European countries it is momentarily popular to raise the sow's area in the farrowing pen by 2 to 3 cm, in order to limit the number of piglets that are crushed. The raised area should improve the accessibility of the udder for the piglets and should prevent newly born piglets from lying down underneath the standing sow. Up until recently it was only possible to install a raised floor for the sow in stalls with a totally slatted floor. However, a Spanish company, Pemarsa S.A., has now brought the Productive Comfort farrowing mat onto the market. This is a soft, thick farrowing mat, whereby the sow lies on a raised area. It is to be expected that the growth of the piglets is improved and that the rate of mortality is decreased when using this mat. One can also anticipate that the mat will protect the

udder and teats of the sow from being injured on contact with the floor. The mat which has been studied in this research program should be suitable for all types of floor. It appears to be a particularly interesting option in the case of worn partly slatted floors.

The aim of the study was to compare the growth and mortality of piglets during the suckling period for sows housed on a partly slatted floor with or without the raised, soft farrowing mat.

In addition the level of injury incurred to the front legs of the piglets was studied.

Furthermore, attention was paid to whether there was a difference in the level of injury caused to the udders and teats of the sows and in the number of attempts the sows needed to stand up.

2 MATERIAL AND METHODS

2.1 Experimental design and treatments

The study was carried out on the experimental farm in Rosmalen between January 1996 and May 1997. The following experimental treatments were compared with one another: 1 A control group on a partly slatted floor.

The floor of the creep was solid (1.0 m) with under floor heating and the rest was a metal partly slatted tribar floor (1.2 m).

2 Farrowing mat (Productive Comfort from the firm Pemarsa S.A.) in the farrowing crate, placed on the existing partly slatted floor (with under floor heating). This mat was 90 cm broad, 140 cm long and approximately 4 cm high and 26 cm across in the thickest part (under the sow). The front of the mat consisted of a layer of hard plastic and the back consisted of a narrower and elevated area of soft plastic (photo). The surface of the mat had a tread so that the sow had more grip when trying to stand up or lie down. A black piglet mat made of soft plastic, made by the same firm, was also placed in the pens.

The temperature of the under floor heating was the same as that in the control group.

In two farrowing rooms, each with six farrowing pens, three of the pens per room were fitted with a farrowing mat. This mat was placed on the existing floor in the sow pen and was fastened in the front of the pen (under the trough). The choice of pens in which to lay the mats per farrowing room was made at random. In total 9 rounds, each with 12 sows and the accompanying piglets per round, were followed. The sows used were rotationally crossbred sows, consisting of the Dutch Landrace, Finnish Landrace and Large White pigs. The sows were placed in the farrowing pens at random approximately ten days before the expected date of farrowing. Both farrowing rooms were used at the same time. The size of the litter of pigs was standardised to 11 piglets within several days. The piglets were weaned at the age of approximately 28 days: the round was stopped on weaning.

2.2 Housing and climate

The two one row farrowing rooms each consisted of six farrowing pens with a partially slatted floor and a diagonally placed farrowing crate. The trough was placed at the front of the pen. The pens were 1.8 m wide and 2.2 m deep. The solid floor (1 m long) was made up of a epoxy concrete floor with under floor heating under the piglets area. Behind this was a metal slatted tribar floor of 1.2 m in length under which was a manure cellar, 0.5 m deep. The closed pen fencing was 0.6 m high.

The ventilation in the rooms was natural, whereby the inlet and outlet valves were operated using an ACNV (automatically corrective natural ventilation system). The air entered via the feeding alley (there was an air-inlet on both sides of the room) and was removed via the adjustable open ridge of the roof.

2.3 Feeding and the supply of water

The sows were fed a lactation diet (9.04 MJ NE) twice a day using a feeding schedule. The piglets were provided with an unlimited supply of piglet feed from the age of approximately 10 days. The sow and piglets had an unlimited supply of water.

2.4 Parameters measured

The following parameters were measured per sow: parity, date of birth, the number of piglets born alive and dead, the weight of the piglets at birth, the number of piglets produced, the mortality rate of the piglets with the reason for mortality, the veterinary treatments required by the sow and piglets, the weaning date and the weight of the piglets at weaning. At the same time the front legs of the piglets were inspected for injuries on day seven and twenty one, as were the udder and the teats of the sow. Injuries to the front legs were noted using the classes uninjured, irritated, open wound and crushed. A scale running from 0 to 5 was used

for the classification of the udders, with 0 = no injuries and 5 = very damaged. When assessing the teats, the number of clearly injured teats was noted. If sows were lying down at the moment of assessment the number of attempts required to get up were noted.

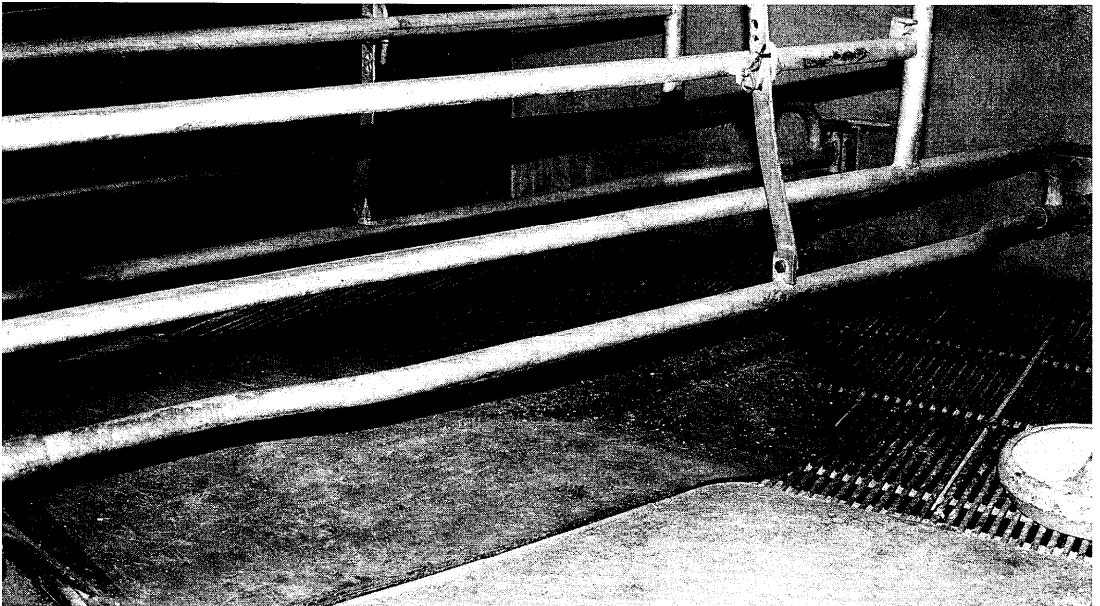
2.5 Data analysis

Parity of the sows varied from 1 to 11. To aid analysis four parity classes were defined: parity 1 or 2, parity 3 to 5, parity 6 or 7, parity 8 or higher.

The number of live born piglets was tested as a fraction of the total number of born piglets using binomial regression analysis, whereby the parity classes and effect of the round were taken into account. The birth weight of the live born piglets and the birth weight of the pigs after cross-fostering (= the number of piglets at the start) were tested using variance analysis, whereby the parity classes and the effect of the round were taken into account.

The number of piglets weaned, the mortality rate of the piglets and the mortality rate of the piglets per reason for death were tested as a fraction of the number of piglets at the start using binomial regression analysis, whereby the parity classes, the weight at birth and the round effect were taken into account. The weight at weaning and the growth of the piglets were tested using variance analysis, whereby the parity classes, the weight at birth and the number of piglets at the start, the length of the suckling period and the round effect were taken into account.

The number of piglets with injuries to their front legs on day seven and twenty one, and the number of sows with injuries to their udder and/or teats and the number of sows that required one or more attempts to stand as a fraction of the total number of animals assessed was tested using the chi squared test. Both the total number of sows and piglets requiring veterinary treatment and the reason for treatment were analysed using the chi square test.



The raised, soft farrowing mat Productive Comfort, produced by the firm Pemarsa S.A.: the front is equipped with a hard layer, while the back consists of a raised, soft area, on a level with the udder and back legs

3 RESULTS

3.1 Experiences with the farrowing mat

The mat caused some problems at the beginning of the experiment: because the top layer was too soft, the first version of the farrowing mat wore very rapidly. In the period between entry into the farrowing pen and producing the litter the farrowing mat was damaged so badly twice that it had to be removed just prior to or after farrowing. This led to two sows being added to the control group and removed from the farrowing mat group. New, improved mats were placed in the farrowing pens. The improvement was made to the surface layer below the head and front legs of the sow: these were clearly less prone to wear. No other alterations were made to the mats during the experiment. The mats were replaced after round 2, 4 and 7. It was not possible to

assess the durability of the improved, wear-proof mats because of the relatively short use of them.

3.2 Technical results

Table 1 gives the technical results of the sows and piglets housed in a farrowing pen with a partially slatted floor without (control group) or with a farrowing mat (and a mat for the piglets).

There was a 5% rate of piglets born dead for both the sows in the control group and those lying on a raised, soft farrowing mat. There was no perceivable difference in the birth weight of the live born piglets. After standardisation the size of the litter and the birth weight were similar in both experimental treatments. The number of weaned pigs was

Table 1: Technical results of sows and piglets housed on a partially slatted floor with or without a soft raised sow mat during lactation

	Control	Farrowing mat	SEM ¹	Significance ²
Number of litters	56	52		
Average number of litter	4.4	4.3		
Number born alive or dead	12.2	11.4		
Fraction born alive	0.95	0.95		n.s.
Birth weight of live births (kg)	1.38	1.43	0.026	n.s.
Number of piglets at start	11.1	11.1		
Weight at birth at onset (kg)	1.38	1.43	0.026	n.s.
Length of lactation (days)	27	28		
Number of piglets weaned	9.7	10.2		*
Weight at weaning (kg)	7.5	7.4	0.13	n.s.
Growth of the piglets (g/d)	220	219	4.5	n.s.
Mortality rate piglets	12.4	8.0		*
Reason for mortality (%)				
- too low weight at birth	2.3	2.0		n.s.
- crushing	5.0	2.4		
- deterioration	1.8	1.1		n.s.
- splay leg	0.8	0.6		n.s.
- diverse	2.5	1.9		n.s.

¹ SEM = pooled standard error of the average (gives an indication of the accuracy of the estimation of the measured variable)

² Significance: n.s. = not significant (P > 0.10); * = (P < 0.05)

clearly higher in sows belonging to the farrowing mat group and the level of mortality was clearly lower. The difference in mortality was mainly caused by a clear difference in mortality caused by crushing; the percentage of piglets crushed was twice as high in the control group as in the farrowing mat group. The weight at weaning and rate of growth of the piglets were the same in both groups.

3.3 Injuries to sows and piglets

Table 2 shows the results of the assessment of the udder and teats of the sows on day 7 after farrowing. In Table 3 the results are given for day 21 after farrowing. The number of attempts required for sows to stand up after lying down is also given.

On day 7 after farrowing there was a clear difference in the number of sows without udder and/or teat injuries between the control group and the farrowing mat group. The sows lying on the raised, soft farrowing mat

clearly had fewer udder and teat injuries. There were no perceivable differences in the seriousness of the udder injuries between the two groups. This was also the case with respect to the gravity of the teat injuries on day 7.

On day 7 there was no difference in the number of attempts needed to stand up between sows in both groups. One sow in the farrowing mat group required an extra attempt.

On day 21 there were also clearly more sows with udder and teat injuries in the control group than in the farrowing mat group. There was no difference in the gravity of the udder and teat injuries between the two groups.

On day 21 there was a tendency ($P = 0.10$) for sows in the control group to have more trouble standing up (one extra attempt was required in four cases and two extra attempts were required in one case).

Table 2: Injuries to the udder and teats of sows and the number of attempts required to stand up on day 7 after farrowing

	Control	Farrowing mat	Significance ¹
Number of sows assessed	552	52	
Percentage without udder injuries	61.8	92.4	***
Level of injury to the udder (no. sows)			n.s.
- 1 injury	13	2	
- 2 injuries	7	2	
- 3 or 4 injuries	1	0	
- more than 4 injuries	0	0	
Percentage without injuries to the teats	52.8	82.7	**
Level of injury to the teats (no. sows)			n.s.
- 1 injured teat	16	6	
- 2 injured teats	4	2	
- 3 injured teats	1	1	
- 4 or more injured teats	2	0	
Number of sows assessed on attempts to stand up	32	31	
% sows that stood up in 1 go	100.0	96.8	n.s.

¹Significance: n.s. = not significant ($P > 0.10$); ** = ($P < 0.01$); *** = ($P < 0.001$)

²One sow too aggressive to assess

Table 3: Injuries to the udder and teats of sows and the number of attempts required to stand up

	Control	Farrowing mat	Significance
Number of sows assessed	532 ³	503	
Percentage without udder injuries	52.8	72.0	*
Level of injury to the udder (no. sows)			n.s.
- 1 injury	16	14	
- 2 injuries	6	11	
- 3 or 4 injuries	0	3	
- more than 4 injuries	3	0	
Percentage without injuries to the teats	39.6	60.0	*
Level of injury to the teats (no. sows)			n.s.
- 1 injured teat	17	11	
- 2 injured teats	6	5	
- 3 injured teats	6	2	
- 4 or more injured teats	3	2	
Number of sows assessed on attempts to stand up	39	36	
% sows that stood up in 1 go	87.2	97.2	#

¹Significance: n.s. = not significant ($P > 0.10$); # = ($P < 0.10$); * = ($P < 0.05$)

² One sow was too aggressive to assess

³ Two sows were already weaned

Table 4: Injuries to front legs of piglets on day 7 and day 21 after birth

	Control	Farrowing mat	Significance ¹
On day 7:			
number of litters assessed	55 ²	52	
percentage piglets with			
- uninjured front legs	30.7	29.9	n.s.
- irritated front legs	12.9	3.5	
- open wounds	15.7	6.9	
- crusts	40.7	59.7	
On day 21:			
number of litters assessed	52 ^{2,3}	503	
percentage piglets with			
- uninjured front legs	79.0	81.9	n.s.
- irritated front legs	2.1	1.8	
- open wounds	2.5	0.6	
- crusts	16.4	15.7	

¹Significance: n.s. = not significant ($P > 0.10$)

² One sow was too aggressive to assess

³ Two litters were already weaned

Table 4 shows the level of gravity of the injuries to the front legs of the piglets on day 7 and day 21 after birth.

There was no difference in the number of piglets with injuries to the front legs in both treatments. On day 21 the percentage of piglets with uninjured front legs was much higher than on day 7. The percentage of piglets with uninjured front legs in the last two rounds, when the latest version of the farrowing mat was used, was the same as the average over all nine rounds.

3.4 Veterinary treatments

Table 5 shows the veterinary treatments required by individually treated sows and piglets.

There tended ($P = 0.06$) to be more sows requiring treatments in the farrowing mat group. However it was not possible to ana-

lyse these results further because the number of sows per veterinary treatment was too small. More piglets were treated belonging to the control group than belonging to the farrowing mat group. This was due to the larger number of piglets that were treated for arthritis. Only a few piglets were treated for other reasons. Twice the whole litter of piglets from the sows in the farrowing mat group was treated for diarrhoea and once a litter was treated for arthritis. Once a whole litter belonging to a sow from the control group was treated for diarrhoea. When treating a litter, part of the treatment is curative while the rest is preventative. Therefore it is not known how many piglets are treated curatively and the piglets receiving a litter treatment have not been included with the individually curatively treated animals. The number of litter treatments was so small in both groups that it was not possible to discuss differences between the groups.

Table 5: Number of sows and piglets requiring veterinary treatment, housed on a partially slatted floor with or without a farrowing mat

	Control	Farrowing mat	Significance ¹
Number of sows	56	52	
Number of sows treated	2	7	#
Number per reason of treatment			
- not eating	1	3	2
- birth assistance	0	2	2
- diverse	1	2	2
Number of piglets at beginning	624	578	
Number of piglets treated	25	6	***
Number per reason:			
- arthritis	21	4	**
- leg problems	0	2	2
- deterioration	1	0	2
- diverse	2	0	2

¹Significance: # = ($P < 0.10$); ** = ($P < 0.01$); *** = ($P < 0.001$)

² Number too low to form conclusions

4 DISCUSSION

4.1 Technical results

No differences in the piglets rate of growth and weight at weaning were found in this study. A difference in growth had been expected, especially because of the improved accessibility of the lower row of teats. However the raised position of the sow did not appear to have a clear effect on the accessibility of the lowest row of teats. No observations of the accessibility of the udder were made, which implies that it is difficult to state this with any certainty. The quality of the floor of the pens of the control group was good (not worn or very rough), which could be a reason why the expected difference in growth was not demonstrated. The worse the quality of the floor, the larger the effect of the use of a mat for the piglets and a soft mat under the sow will be. There is a greater chance of injuries to especially the front legs when the floor is rough, which leads to a greater chance of infection and less rapid growth.

The pre-weaning mortality rate of piglets was clearly lower for sows lying on a soft, raised farrowing mat than for those in the control group, who were housed on a partially slatted floor with metal tribar slats. This was mainly caused by the large difference (2.4% versus 5.0%) in percentage of crushed piglets. The effect of the raised position of the mat on the level of crushing is unclear. The piglets may actually lie against the edge of the mat instead of on top of it. This could become a point of attention in follow-up research on a raised floor underneath the sow. The chance of crushing may be decreased because the piglets lay against or under the sow less often, since the surface of the mat is not flat or because of the presence of a mat in the piglet creep. The surface of the mat was soft and provided with a profile, which implies that the sow had more grip when attempting to stand up or lie down than on metal tribar slats. This could have also led to fewer piglets being crushed.

During the experiment changes were only made to the surface of the mat underneath

the head and front legs of the sow. It was presumed that this alteration did not have an effect on the technical results and the level of injury incurred by the sow and piglets, since the positive results were expected to be caused by the back of the mat.

4.2 Injuries to sows and piglets and veterinary treatments

The udder and teats of the sow were clearly injured less frequently when the sows lay on a raised, soft farrowing mat. Since the middle of the mat narrowed as it passed under the udder of the sow, all of the udder and teats were protected from being chaffed by the solid floor or being chaffed by or trapped on the slatted floor. There was no difference in the seriousness of the injuries to the udder and/or teats of the sows in either experimental group.

It was striking that more piglets in the control group were treated for arthritis than in the farrowing mat group. However there was no difference in the number of injuries that piglets in either group incurred to their front legs on day 7 or on day 21 after birth. On day 7 only 30% of the piglets had uninjured front legs, on day 21 this was approximately 80%. The front legs of the piglets in the farrowing mat group were covered in crusts more often on day 7 than those of the control group. This may have led to a decreased chance of infection, which led to fewer cases of arthritis. It is unclear whether the presence of a mat in the piglet creep has an effect on the level of arthritis, especially since the use of a farrowing mat leads to the piglet creep being fouled more often.

There was a tendency towards a larger number of sows being able to stand up in one attempt on day 21 after farrowing in the farrowing mat group than in the control group. However it was not possible to draw any conclusions, since the number of sows to be assessed on their ability to stand up and the number of sows requiring one or more attempt to stand up was too small.

4.3 Economic evaluation

An estimation of the economical perspectives linked to the use of farrowing mats in the farrowing pen has been made based on the investment costs and the benefits of a lower piglet mortality rate. The mat costs approximately Dfl 200.- (Dfl = Dutch guilders) (summer 1997). If the investment can be written off in 5 years and the interest rate is 7%, the annual costs per farrowing pen will be Dfl 47.-, or Dfl 12.- per year per sow present. The most important difference in the technical results was a 4.4% lower piglet mortality rate in the farrowing mat group. This amounts to one weaned piglet per sow per year by an average of 23 weaned piglets per sow per year. This is a profit of Dfl 45.- per sow present. If the Dfl 12.- for extra costs are subtracted, it can be said that the use of a farrowing mat leads to a profit of Dfl 33.- per year compared with a pen without a farrowing mat. Even if the mats wear after only two years there will still be a profit of Dfl 18.- per sow present.

4.4 Experiences on use

The upper layer of the first farrowing mats to be supplied was too soft and the sows damaged them rapidly. The latest version seems far less prone to wear. However it is not possible to draw any conclusions on the durability of the mats because of the relatively short length of time that they were in use.

Since the farrowing mat was attached diagonally under the trough, an indentation was created under the trough. When sows spilt water or food, this often tended to remain in this indentation. The lack of suitable drainage means of especially spilt water often led to the farrowing mat becoming wet and slippery and sometimes dirty. The mat also remained in the pen. It is possible to prevent dirt collecting under the mat by gluing the whole mat instead of attaching only the front end.

5 CONCLUSIONS

The mortality rate of piglets was lower when a raised soft farrowing mat was used than when they were housed in a partially slatted metal tribar floor. This was mainly due to fewer piglets being crushed. The weight of the weaners and their rate of growth was not different in the pens with or without a farrowing mat.

Fewer udder and teat injuries occur in sows lying on a raised soft farrowing mat. Fewer piglets were treated for arthritis in the group

with the raised, soft farrowing mat. However there was no difference in the number of piglets with injured front legs.

A profit of between Dfl 18.- and Dfl 33.- can be made per sow per year when using a farrowing mat in the farrowing pen, depending on the longevity of the mat.

Attention should be paid to the placing and attachment of the mat from a hygienic point of view.

PUBLISHED RESEARCH REPORTS

Report P5.1
Comparison of four housing systems for non-lactating sows. G.B.C. Backus et al., February 1997

Report P5.2
Spray-dried blood plasma and spray-dried blood cells in diets of weaned piglets. C.M.C. van der Peet-Schwering and Binnen-dijk, G.P. March 1997.

Report P5.3
Research Reports 1996. May 1997

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