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# The effect of shape, width and slope of a resting platform on the resting behaviour of and floor cleanliness for housed sheep

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ABSTRACT

The aim of this experiment was to investigate how the shape (U-shaped, L-shaped or platform, both in the front and back (FB-shaped) of the pen), width (0.5 m or 0.6 m) and slope (0% or 5%) of a solid wooden resting platform, together with the cleaning frequency (daily or every 2nd day) would affect the resting behaviour of ewes and floor cleanliness. The experiment was conducted in three different commercial farms in Norway, and within each herd, two of the factors were tested in a $2 \times 2$ factorial design using four experimental pens, while the effect of cleaning frequency (daily or every other day) was replicated within the herd using four additional experimental pens (eight experimental pens within each herd). Ewes were systematically rotated between pens within herds and the ewes' resting behaviour was scored for the last 6 days of each experimental period. The manure on the solid resting platforms was collected and weighed, while moisture on the surface of the resting platforms was scored for the 2 last days of each experimental period.

In all herds, significantly more sheep were observed resting in pens with FB-shaped resting platforms than in pens with U- or L-shaped platforms ($P < 0.0001$). A reduced amount of time on resting platforms was mainly compensated for an increase in the number of sheep lying on the slatted floor and partly by an increase in the number of sheep that was standing. An effective perimeter length (EPL) with a minimum of 0.9 m per ewe was needed to enable all sheep to rest simultaneously on the resting platform. Increasing the slope of the resting platform had no effect on resting behaviour, but decreasing the width of the platforms resulted in more ewes resting on the original pen floor ($P < 0.01$). A slope of 5% resulted in a significantly lower amount of manure ($P < 0.0001$) and a lower moisture score ($P < 0.0001$). In two of the herds, cleaning every 2nd day increased the amount of manure ($P < 0.01$), but not the moisture score.

In conclusion, FB-shaped resting platforms of solid wood may be a relatively cheap and convenient way of increasing the resting time and comfort of sheep housed in fully slatted floor pens, as long as there is a sufficient amount of effective perimeter length available.



## 1. Introduction

In Nordic countries (Robinson, 1981), Canada (Canada Plan Service, 1981) and parts of the USA (Outhouse, 1981), sheep are kept indoors during winter and then often housed in pens with fully slatted floors with a space allowance of 0.7–0.9 $m^2$ per animal (Bøe and Simensen, 2003). In contrast to conventional sheep production, the regulations for organic sheep farming (Council Regulation (EC) No. 1804/1999) demand a resting area with a solid floor. Earlier experiments have shown that unsheared sheep have no particular preference in floor type for resting (Bøe, 1990; Færevik et al., 2005), but that sheared sheep show a very clear preference for resting on flooring materials with a low heat conductivity (e.g., straw, solid wood or rubber mattresses) (Færevik et al., 2005). As the

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availability of bedding material is often scarce in some Nordic countries, installing resting platforms made of solid wood in the slatted floor pens can be a convenient and cheap alternative to help improve the animals' resting comfort. However, because of the low total space allowance in their pens, the available space for such resting platforms is limited.

Marsden and Wood-Gush (1986) found that after feed, limited lying space caused most of the displacement in sheep. A reduction in resting space from 1.0 $m^2$ to 0.5 $m^2$ per ewe not only resulted in an increased number of displacements, but total resting time and resting synchrony were also reduced (Bøe et al., 2006). Both sheep and goats have shown a clear preference for lying against a wall when resting (sheep: Marsden and Wood-Gush, 1986; Færevik et al., 2005; goats: Andersen and Bøe, 2007). Consequently, when considering the layout for resting platforms, maximizing perimeter length is important for ensuring an attractive lying space for the sheep. Both the size and shape of the pen affect the available wall perimeter (Bøe et al., 2006), and the ratio of perimeter to area decreases as group and pen size increases (Stricklin et al., 1995). In an effort to create not only a visual barrier, but also increase the accessible wall length to lie against when resting, Jørgensen et al. (2009) installed additional walls in the resting area for ewes (actually increasing the perimeter length). Nevertheless, this measure did not prove successful in increasing resting time, presumably because these walls also gave some individuals the possibility to block off access to the resting area.

As sheep do not seem to have specific dunging areas, hygiene and cleanliness are a major challenge when introducing solid floor areas. Studies of cattle suggest that the design of the lying area influences the cleanliness of the animals (e.g., Herlin et al., 1994; Zurbrigg et al., 2005), and that cleanliness again affects claw (e.g., Bergsten and Pettersson, 1992) and udder health (e.g., Schreiner and Ruegg, 2003). Although cattle seem to actively avoid surfaces covered with excreta (Phillips and Morris, 2002), we do not know if sheep behave in a similar manner. A slope (between 2% and 5%) on a solid floor is both recommended and used in pigpens (e.g., Anonymous, 1993) and stalls for cattle (e.g., Anonymous, 2005) in order to drain off urine. Interestingly, there seems to be few scientific papers supporting these slope recommendations (Ye et al., 2007), and knowledge is thus needed on how different levels of slope affect floor cleanliness.

The aim of this experiment was to investigate how the shape (U-shaped, L-shaped or front and back (FB-shaped)), width (0.5 m or 0.6 m) and slope (0%, 5% or 10%) of a solid resting area, together with cleaning frequency (daily or every other day) would affect resting behaviour in ewes and floor cleanliness.

## 2. Materials and methods

### 2.1. Experimental design

This field experiment was conducted in three private farms involved in organic sheep production in the western region of Norway from January to March 2004.

The following factors were tested in our study:

1. Shape of the resting area (U-shaped (U), L-shaped (L) or both at the back and front of the pen (FB-shaped)).
2. Width of the resting platform (0.5 m or 0.6 m).

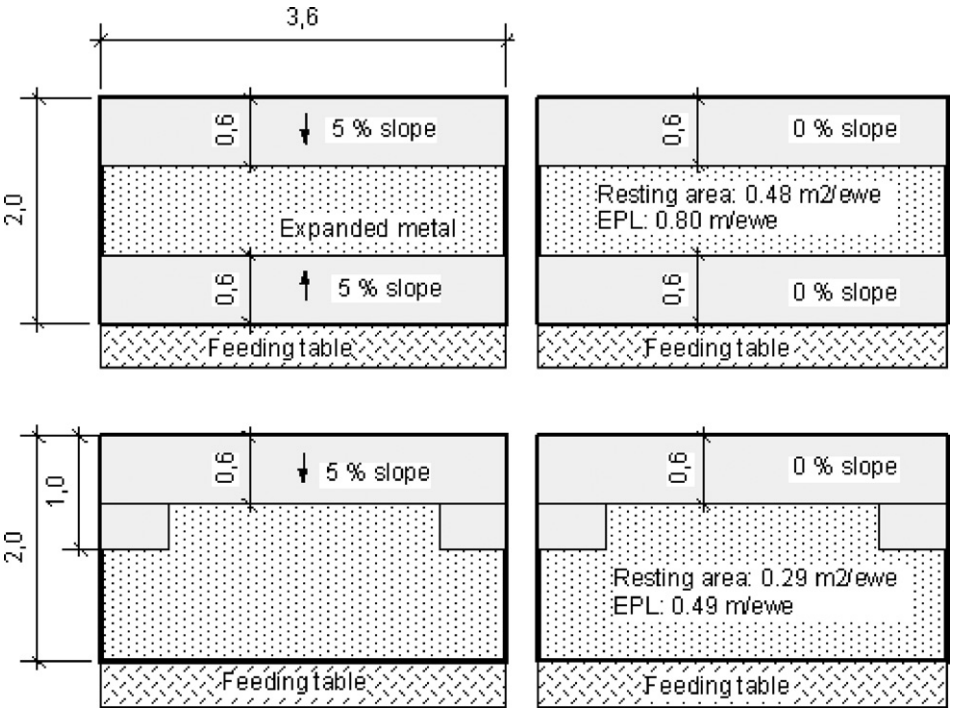


**Fig. 1.** Shape, slope and width of the solid resting area in herd A.