

MEASUREMENTS RELATIONSHIP AMONG COMPOST BEDDED PACK BARN FARMS IN SIX EUROPEAN COUNTRIES DURING THE WINTER AND SPRING SEASON

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Introduction

Compost-bedded pack barns (CBP) are an alternative housing system for dairy cows, which is known to potentially improve animal welfare compared with other conventional systems such as free stalls and straw yards (Bewley et al., 2017).

Cows in CBP are provided with a large open bedded area on which they can lie, stand and walk freely. Generally, the CBP system requires a large space per cow, and an adequate animal density is crucial to maintain sufficient pack hygienic conditions. In literature, suggested space allowances in CBP range from 7.4 to more than 15 m²/cow (considering just the bedded area) depending on climate, barn characteristics, bedding availability and pack management (Janni et al., 2007; Galama et al; 2011).

The bedded pack is aerated one or two times per day to promote evaporation and maintain a soft and hygienic surface for the cows (Leso et al., 2013). Pack moisture, in particular, seems to deeply affect animal welfare in CBP. High pack moisture has been related to poor cow cleanliness and increased risk of mastitis (Eckelkamp et al., 2016).

The aim of this paper is to present preliminary results to compose a diagnose of the situation and describe relationship among 20 CBP farms measurements (bedded area space per cow, air temperature and relative humidity, pack temperature and pack moisture) collected in six European countries (Italy, Germany, Austria, Sweden; Slovenia; The Netherlands), during winter and spring season (period between November 2017 and May 2018).

Material and Methods

Monitoring 22 CBP housing system farms for lactating cows throughout Europe:

- 6 farms in Italy
- 1 farm in Slovenia
- 3 farms in Austria
- 3 farms in Germany
- 5 farm in Netherlands
- 1 farm in Sweden

In each country, a local research team visited the farms twice (winter and summer) during the period between November 2017 and May 2018.

Measurements in each barn:

- air temperature and
- relative humidity.

The loggers were set to take one measure per hour of both parameters.

During each visit, pack temperature at 20-cm depth was measured using a hand-held data logger provided with a penetration thermometer. Each compost barn pack was subdivided in 9 equal areas in which pack temperature was measured.

Samples of bedding were collected from the same 9 areas and analysed to determine pack moisture. Samples were dried in a 100°C oven for 24 h and weighted before and after drying to determine pack moisture.

At the beginning of the experiment, farms were also surveyed to determine total bedded area in CBP. Number of cows in each barn was obtained from national DHI, which allowed calculating bedded area space per cow. All data were collected and shared using a dedicated web server.

Data was processed using Microsoft Excel. Results are presented as mean±SD.

Results and Discussion

Table 1. Bedded area space per cow measured in the compost-bedded pack barns included in the study grouped by country.

Country	Bedded space per cow (m ² /cow)		
	Min	Mean	Max
Italy	9.45	14.52	23.25
Germany	9.80	14.26	23.80
Austria	4.96	10.35	16.24
Sweden	11.41	11.68	11.94
Slovenia	12.00	12.25	12.50
The Netherlands	11.00	13.50	15.00

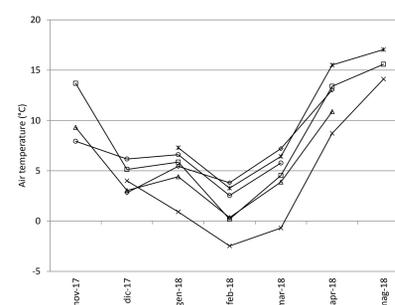


Figure 1. Mean month air temperature measured inside 20 compost-bedded pack barns grouped by country.

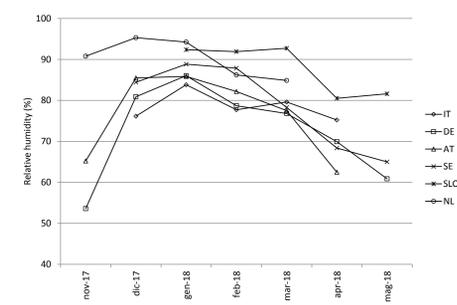


Figure 2. Mean month relative humidity measured inside 20 compost-bedded pack barns grouped by country.

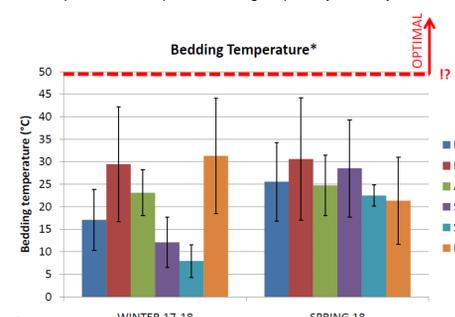


Figure 3. Mean±SD season pack temperature in 20 compost-bedded pack barns grouped by country

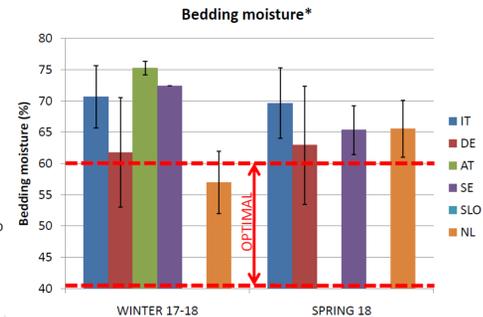


Figure 4. Mean±SD season pack moisture in 20 compost-bedded pack barns grouped by country.

(IT=Italy, DE=Germany, AT=Austria, SE=Sweden; SLO=Slovenia; NL=the Netherlands)

Conclusion

Maintaining adequate pack temperature and moisture in CBP may be challenging under European climatic conditions, even with relatively large space per cow. A high pack temperature may help keeping the bedding dry, especially during the winter period.

Results reported, however, are preliminary and represent just a limited part of the information that will be collected in the longer monitoring period planned for the project "FreeWalk", which will end in 2020. Further analysis will be performed to better understand bedded pack dynamics and help producers with CBP maintaining a dry and comfortable surface for the cows.

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