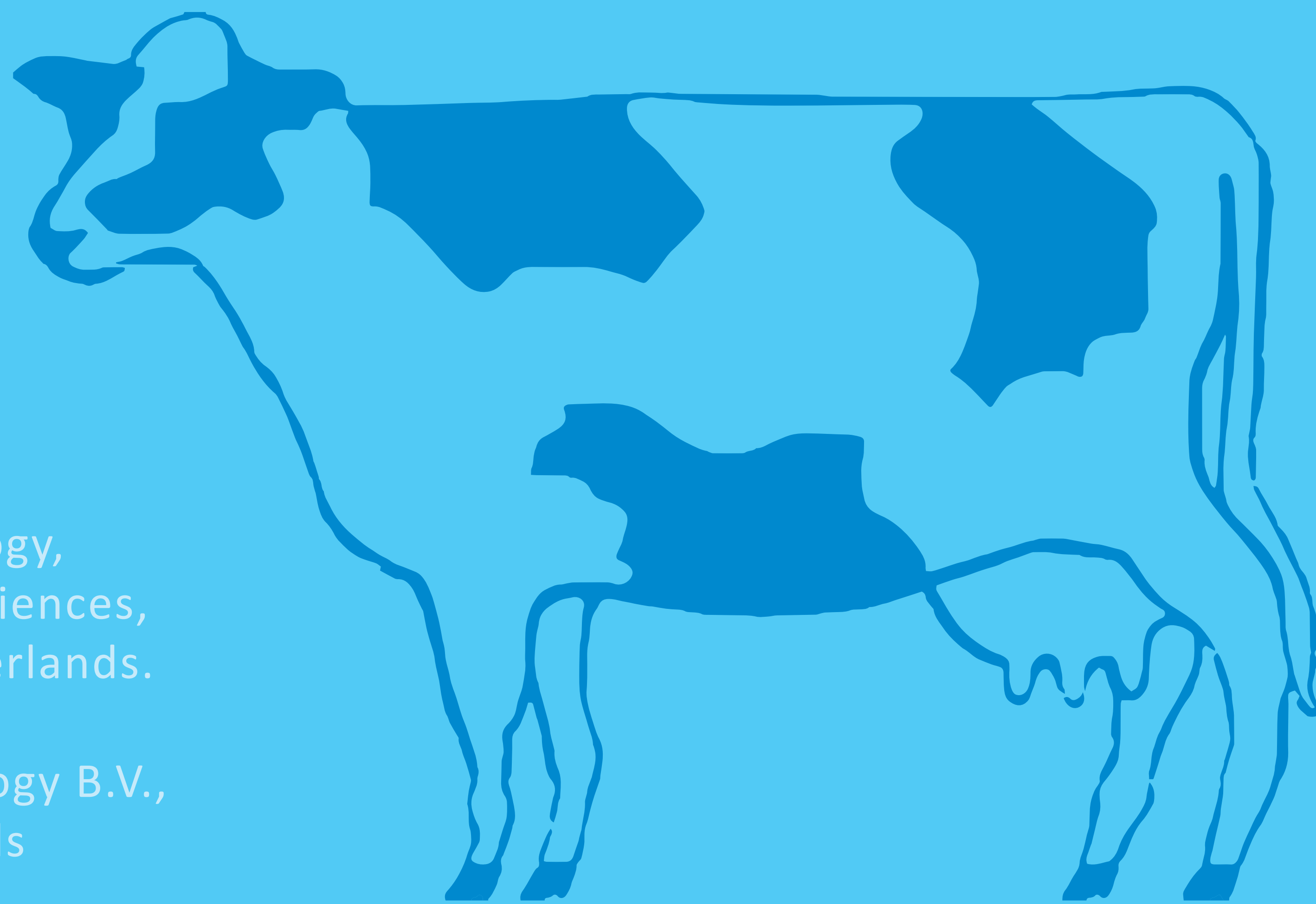


# WHAT DOES THE COW SAY?

## sound analysis of dairy cattle

G.H. Meen<sup>1</sup>,  
M.A. Schellekens<sup>1</sup>,  
M.H.M. Slegers<sup>1</sup>,  
N.L.G. Leenders<sup>1</sup>,  
E. van Erp-van der Kooij<sup>1</sup> and  
L.P.J.J. Noldus<sup>2</sup>

<sup>1</sup>Department of Applied Biology,  
HAS University of Applied Sciences,  
's-Hertogenbosch, the Netherlands.  
<sup>1</sup>L.vErp@has.nl  
<sup>2</sup>Noldus Information Technology B.V.,  
Wageningen, the Netherlands



### 1 INTRODUCTION

Due to the growing number of livestock per farm, farmer-livestock interaction is decreasing. Precision Livestock Farming (PLF) supports the farmer in managing his livestock. PLF can combine continuously measured information with automated analysis tools, which can be used to control, monitor and model the health and behaviour of animals and their biological responses. Monitoring by PLF can be based upon parameters such as activity or vocalisation. Sound analysis with the use of PLF has already been studied in pigs. In our study, the possibility of the use of sound analysis in cattle was investigated. The goal of this study was to determine whether there was a correlation between specific calls and specific behaviour in cattle.

### 2 METHODS

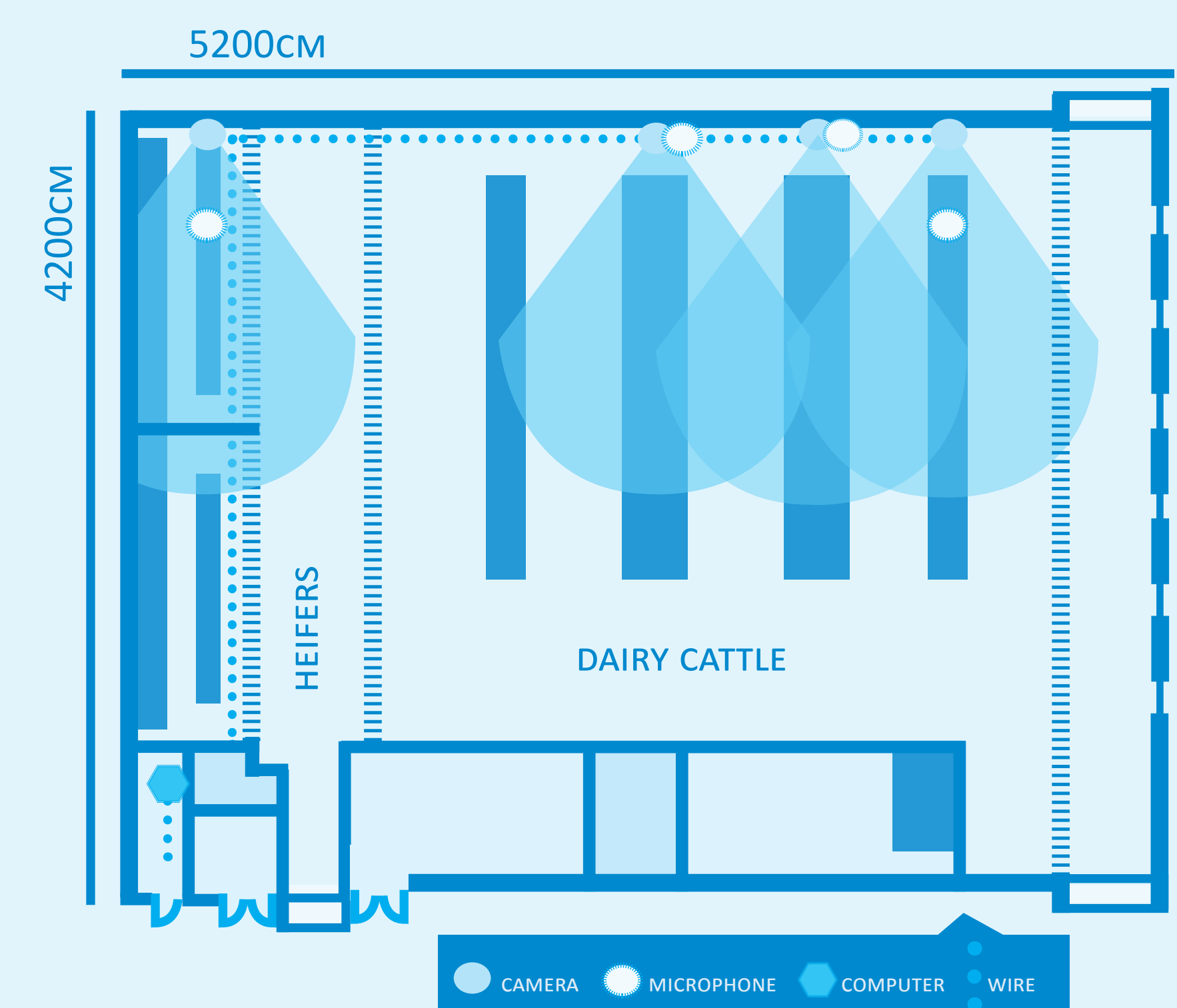
Two groups of Holstein Friesian cattle were used in this experiment: dairy cattle (N=95; age 2-14 years) and heifers (N=46; age 4-10 months). Both groups were housed in the same commercial farm, in different sides of the same building. Both groups had a loose housing with slatted floors and cubicles.

Four cameras and four microphones recorded behaviour and the uttered calls by both groups during 15 consecutive days 10 hours a day (07:00-17:00). Media Recorder 2.5\* processed and synchronized the recordings. Using The Observer XT 11.5\* calls were manually scored using a start-stop behavioural coding scheme.

The performed behaviour of the calling cow was determined with the use of an ethogram consisting of six behavioural groups. With the use of UltraVox 3.0\* the mean maximum frequency (Hz) of each call was determined. Using SPSS Statics 21.0 for Windows, the Repeated Measures analysis of variance (ANOVA) test was conducted to determine the correlation between the mean maximum frequency (Hz) and the behavioural groups.

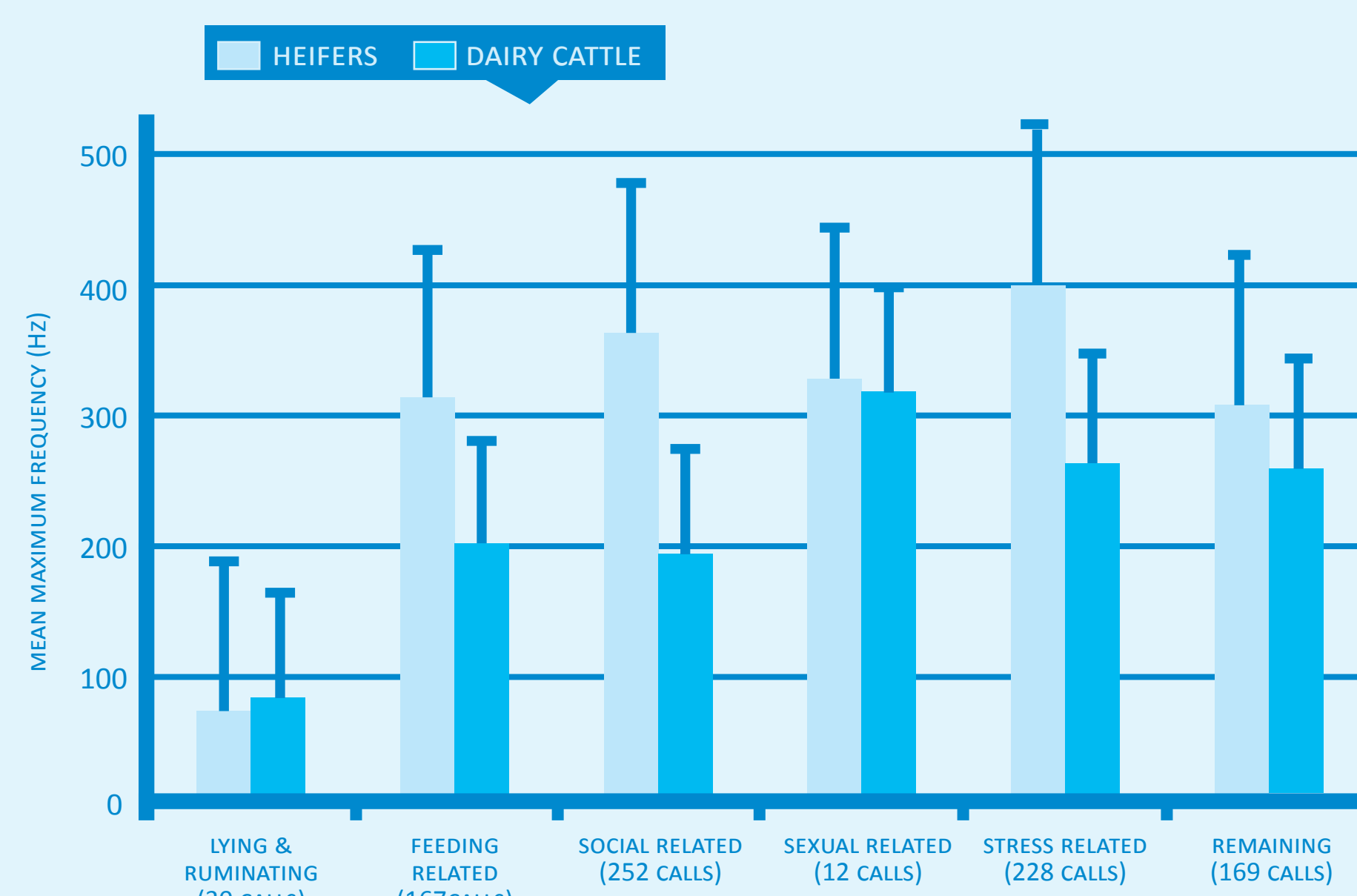
The difference in mean maximum frequency (Hz) between both groups was determined in the same way.

\*= products from Noldus Information Technology B.V.

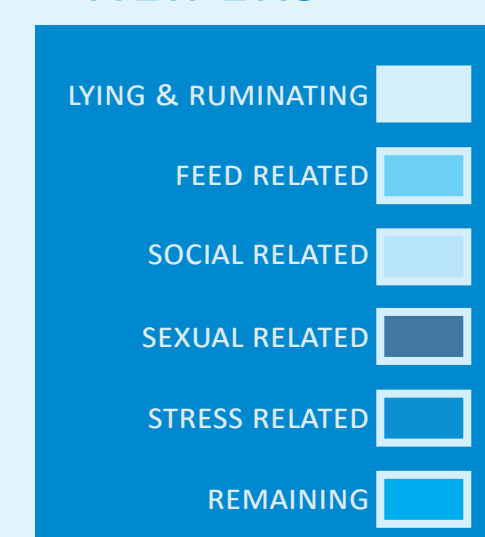


### 3 RESULTS

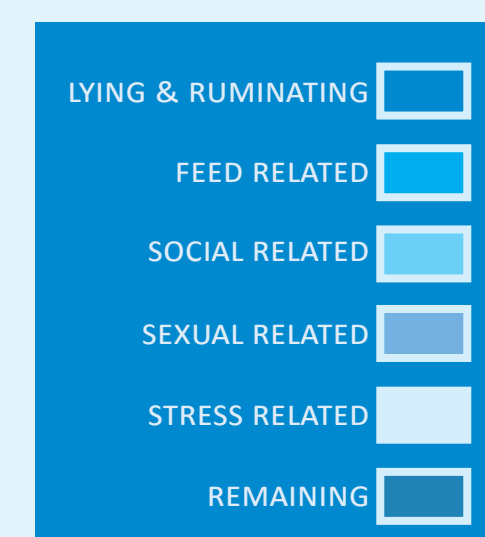
- In total 858 calls were linked with a behaviour, which equalled 20% of the total number of calls. From these calls, 541 calls were uttered by heifers and 317 calls were uttered by dairy cattle.
- The mean dominant frequency (Hz) differed significantly between the behavioural group 'lying & ruminating' and the other behavioural groups (79,43 Hz vs. 297,80 Hz or higher;  $P < 0.05$ ).
- Calls by heifers also had a significantly higher mean maximum frequency (Hz) than calls by dairy cattle ( $P < 0.05$ ).



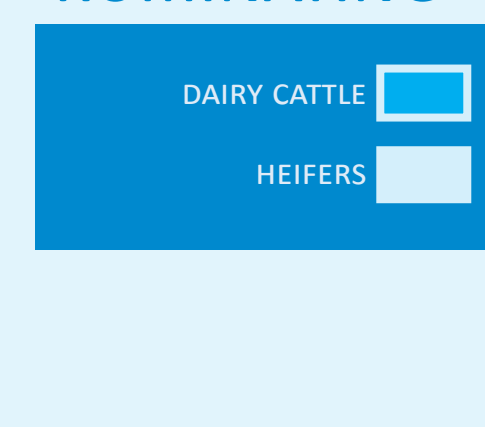
#### HEIFERS



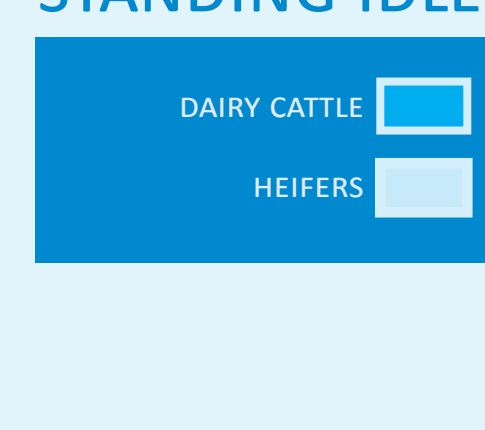
#### DAIRY CATTLE



#### LYING & RUMINATING



#### STANDING IDLE



### 4 DISCUSSION

Lying & ruminating behaviour is an indicator of good cattle welfare, since high productive cattle should spend 7 to 10 hours lying & ruminating each day. Lying & ruminating supports the milk production and is an important component in the daily life of cattle.

In this study heifers called more than dairy cattle, but dairy cattle had more calls related to lying & ruminating. Also the high number of stress related calls is remarkable, which was caused by cattle standing idle.

These findings suggest cattle at our farm spent more time standing idle instead of lying & ruminating due to a lack of comfort. The heifers had cubicles without any bedding, this could have withheld the heifers from lying down comfortably.

Dairy cattle produced calls with a significant lower mean maximum frequency than heifers did. This difference in frequency between young and adult animals is common and is explained by the growth of the larynx in maturing animals.

Most of the calls were simultaneously detected by all four of the microphones. The barn of our commercial farm did not have a clear overview. Because of this, cameras had limited coverage.

### 5 CONCLUSION

In this preliminary research calls of cattle based on their behaviour were analysed. Calls related to lying & ruminating had a significantly lower mean maximum frequency than calls related to the other behavioural groups. Further research is necessary to prove that sound analysis has the potential to be used as a PLF tool to measure welfare in cattle housings.