

Work time measurement by a real-time location system — accuracy of positioning in a farrowing barn

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Introduction

Work time measurement

- Crop farming: automatic data collection
 - Process data
 - GPS
- Animal husbandry: manual labour
 - Direct observations
 - Video recording
 - Work diary
 - A lot of time and manpower (expensive)



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Introduction

Work time measurement

- Animal husbandry:
 - Method of partially or fully automatic work time measurement:
 - indoor location systems:
 - real-time position of workers and tools

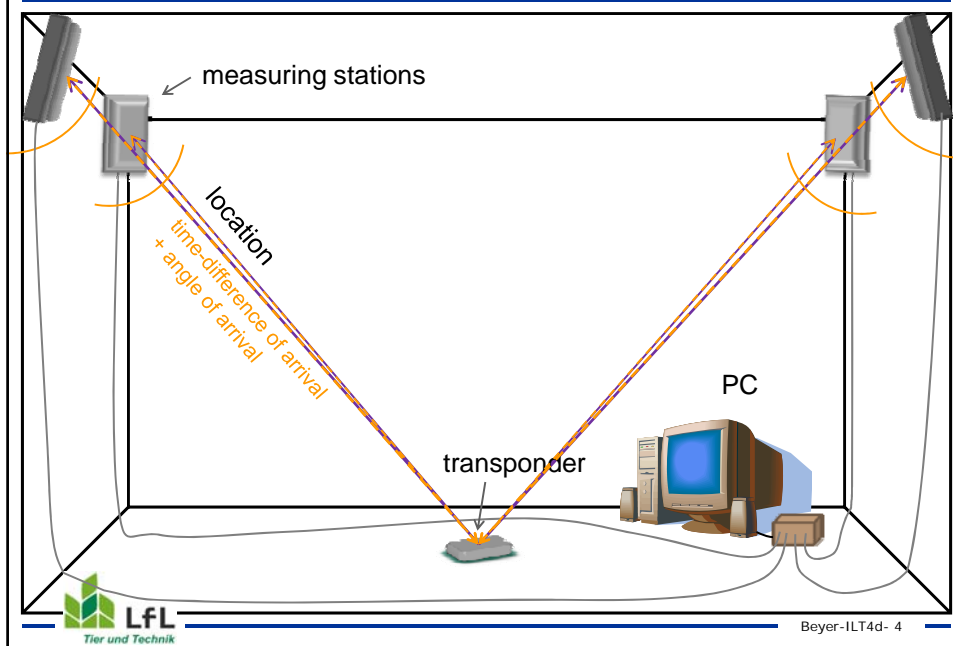
➤ GOAL OF THE STUDY:

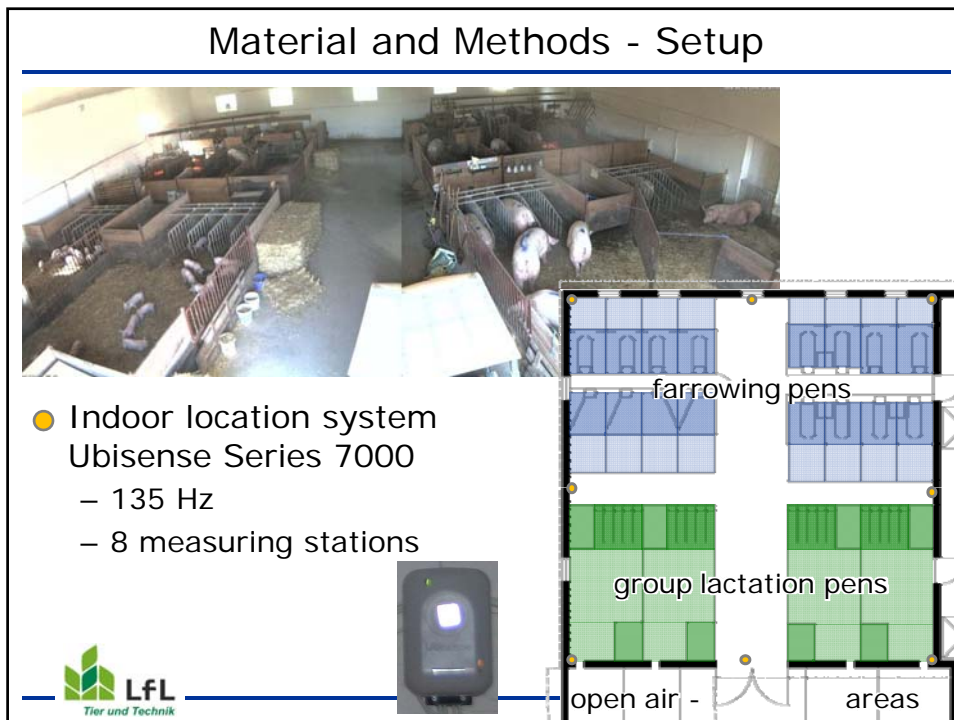
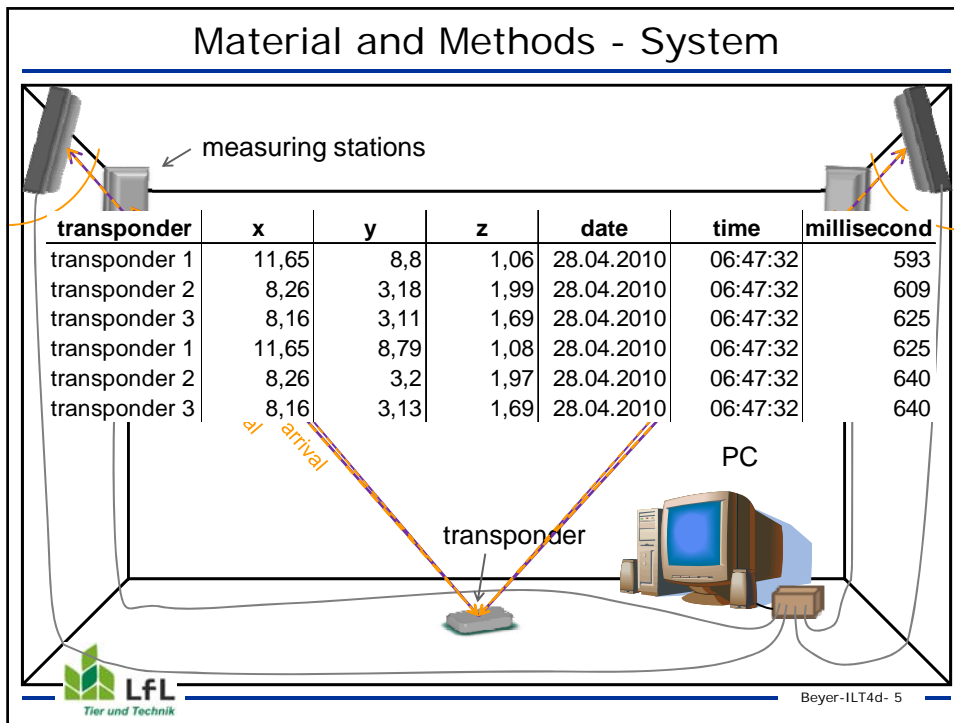
ACCURACY OF ONE OF THE LOCATION SYSTEMS
UNDER BARN-CONDITIONS
FOR WORK TIME MEASUREMENTS



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Material and Methods - System

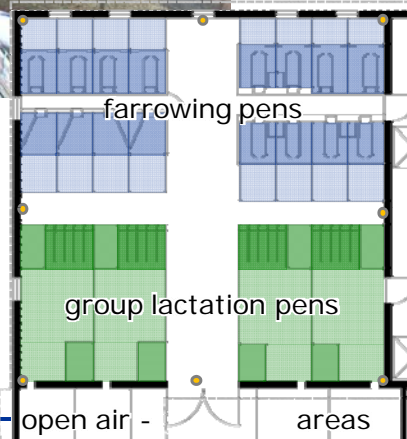




Material and Methods - Setup

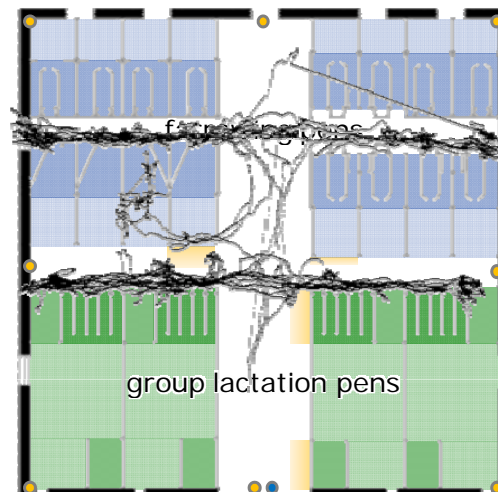


- Camera
Mobotix D12-DualDome
 - 2 x 60° -lenses
 - 1 fps



Material and Methods - Evaluated Periods

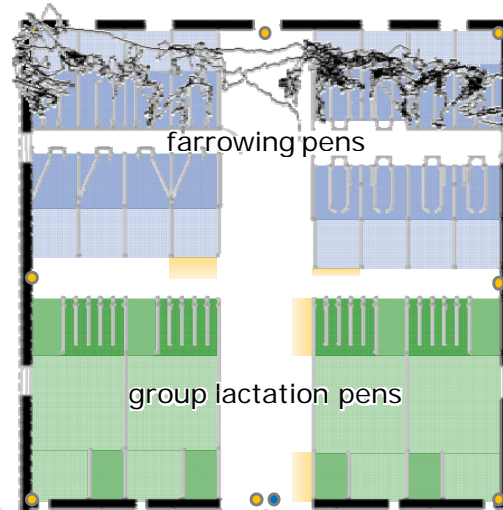
- Feeding:
 - 1 person - 28 min



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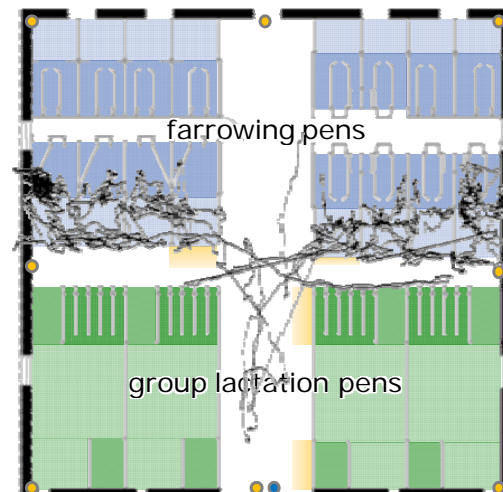
Material and Methods - Evaluated Periods

- Feeding:
 - 1 person - 28 min
- Manure removal:
 - 1 person - 11 min



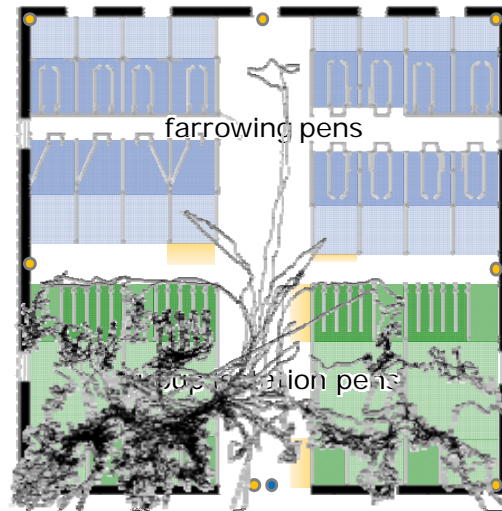
Material and Methods - Evaluated Periods

- Feeding:
 - 1 person - 28 min
- Manure removal:
 - 1 person - 11 min
 - + 15 min



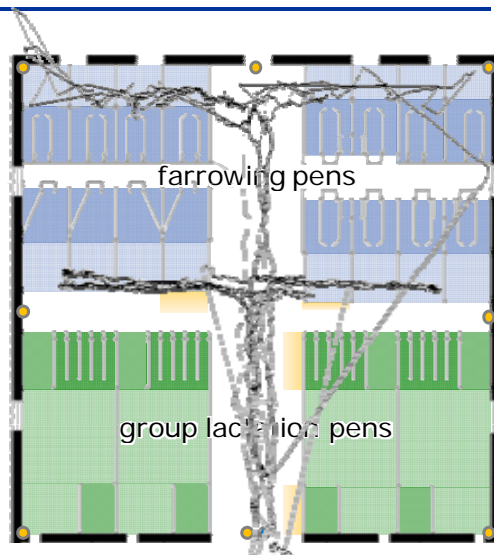
Material and Methods - Evaluated Periods

- Feeding:
 - 1 person - 28 min
- Manure removal:
 - 1 person - 11 min
+ 15 min
 - 1 person - 63 min



Material and Methods - Evaluated Periods

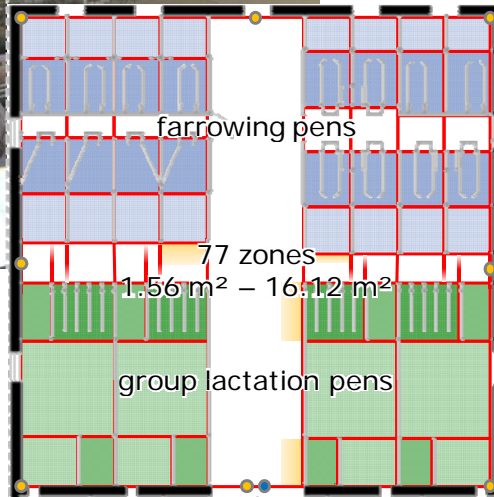
- Feeding:
 - 1 person - 28 min
- Manure removal:
 - 1 person - 11 min
+ 15 min
 - 1 person - 63 min
 - Yard loader - 90 min
(41 min)



Material and Methods - Evaluation



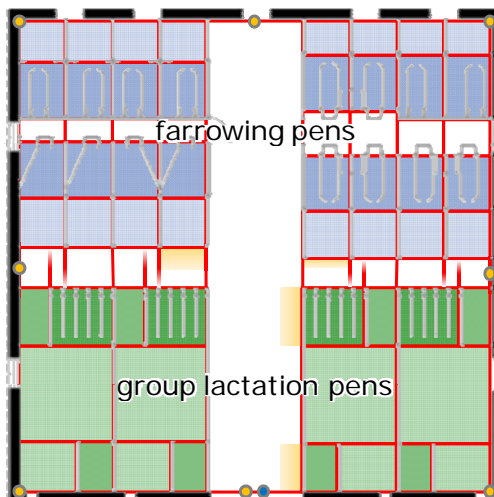
- Border of zones



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Material and Methods - Evaluation

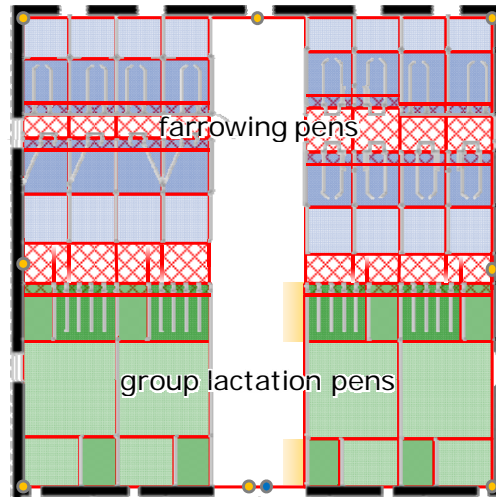
1. Exactly in zones



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Material and Methods - Evaluation

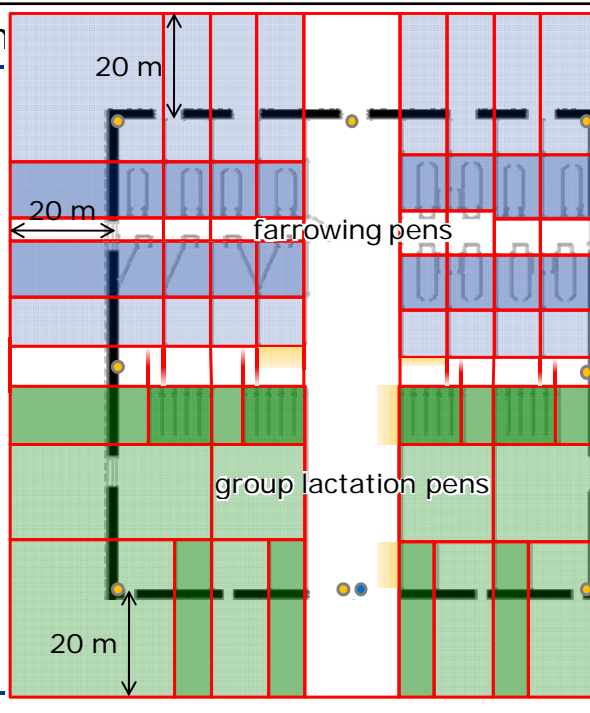
1. Exactly in zones
2. Corridors overlap troughs 0.5 m

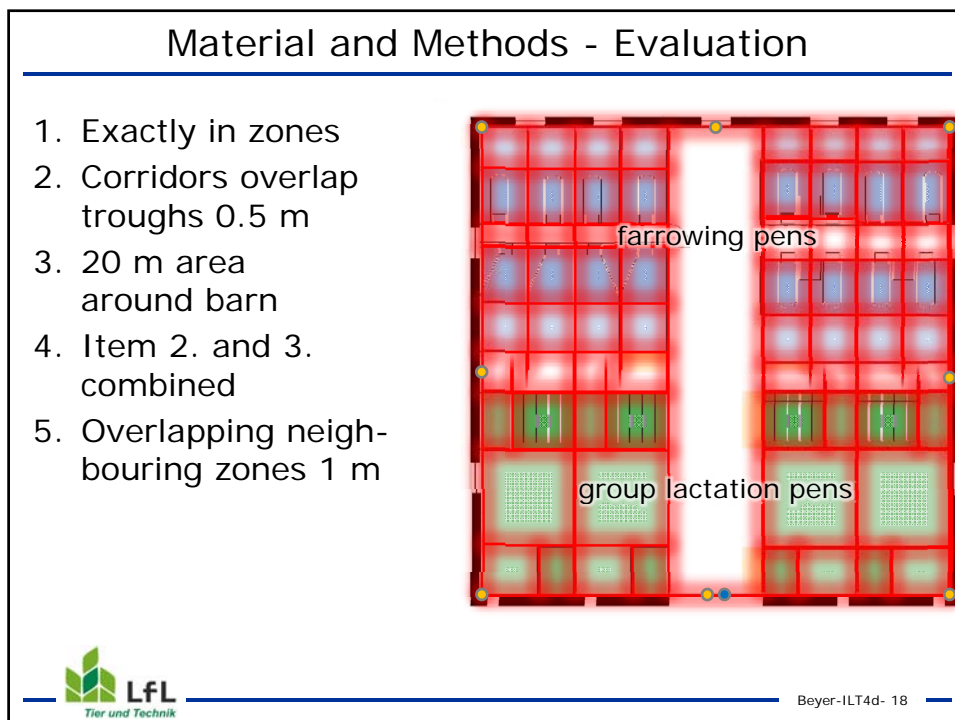
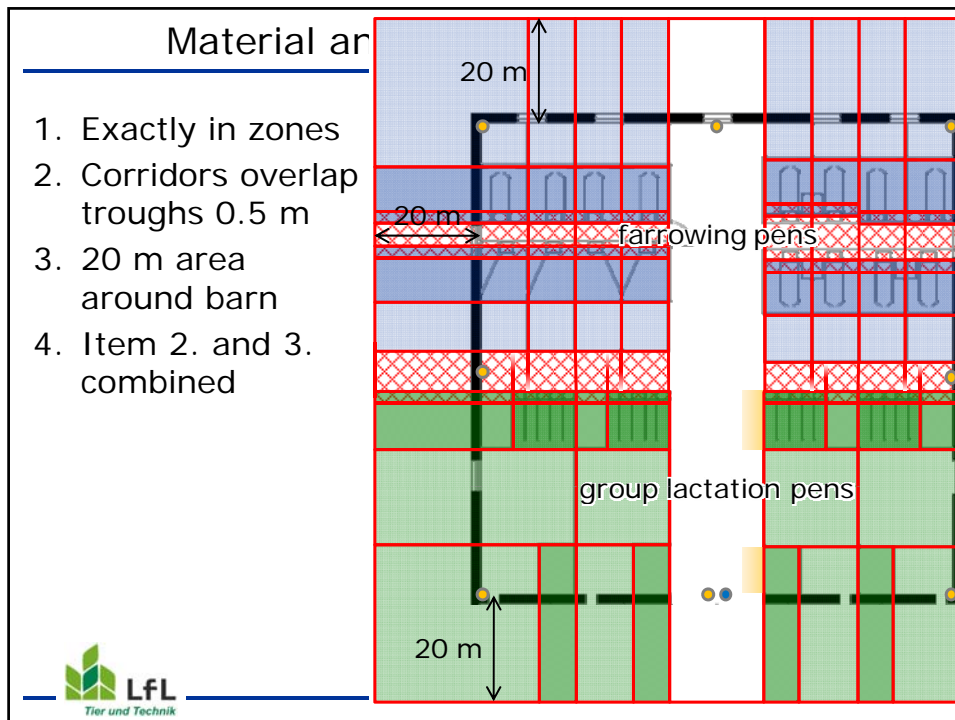


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Material an

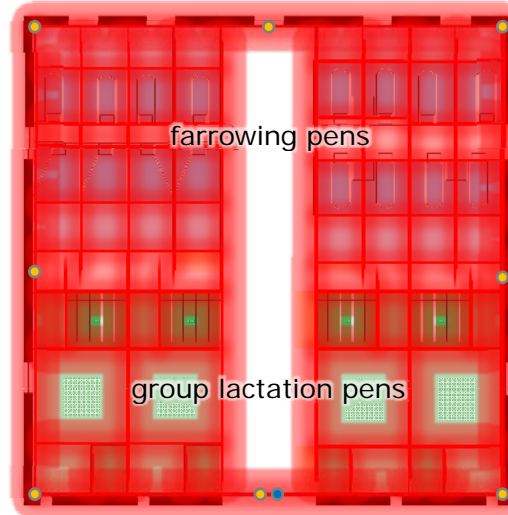
1. Exactly in zones
2. Corridors overlap troughs 0.5 m
3. 20 m area around barn



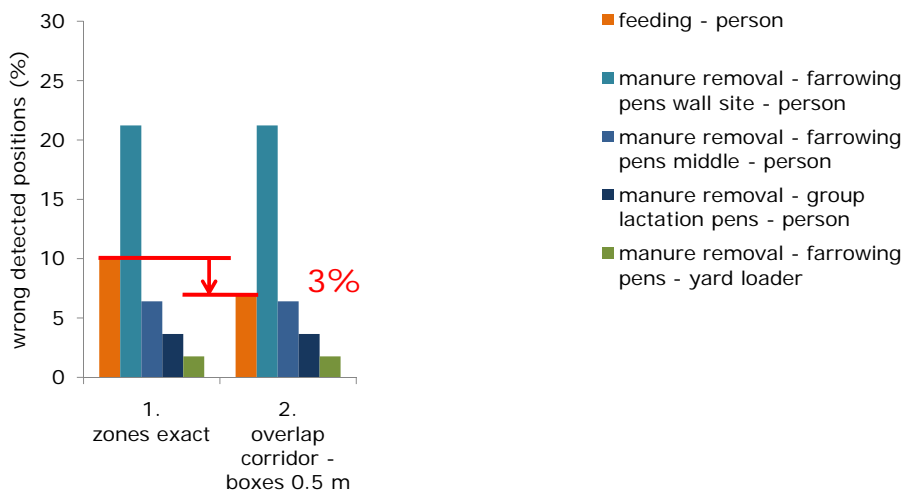


Material and Methods - Evaluation

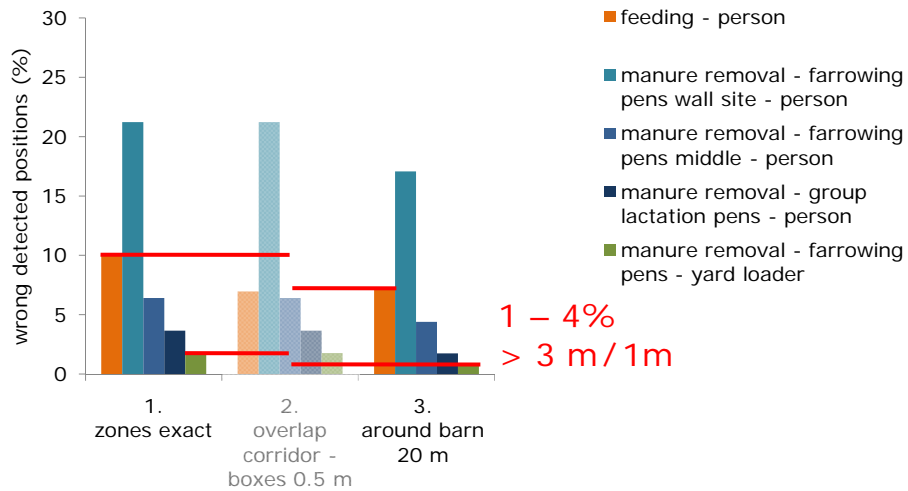
1. Exactly in zones
2. Corridors overlap troughs 0.5 m
3. 20 m area around barn
4. Item 2. and 3. combined
5. Overlapping neighbouring zones 1 m
6. Overlapping neighbouring zones 2 m



Results and Discussion – Comparison of Variants



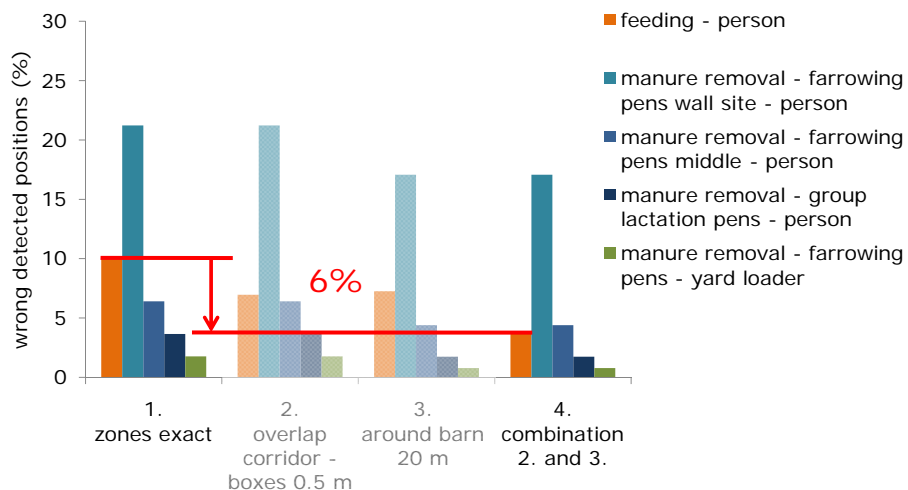
Results and Discussion – Comparison of Variants



time offset: 1 s; y-coordinate shift: -0.5 m

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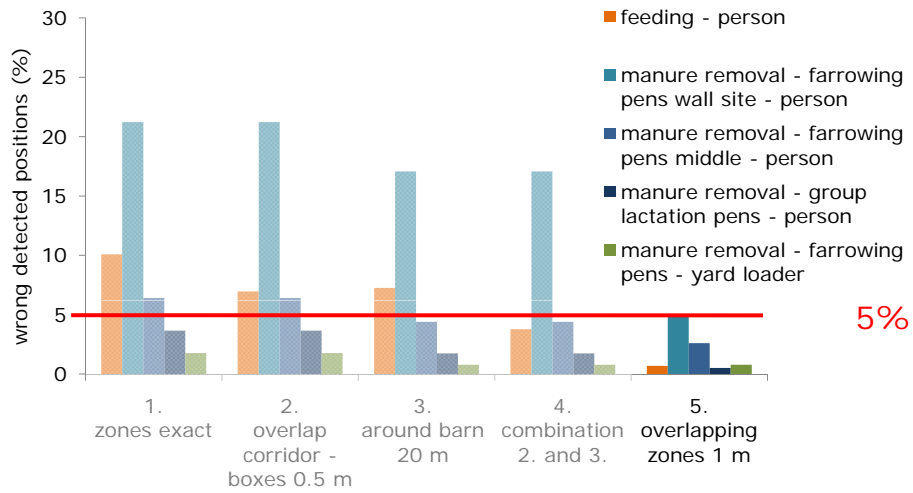
Results and Discussion – Comparison of Variants



time offset: 1 s; y-coordinate shift: -0.5 m

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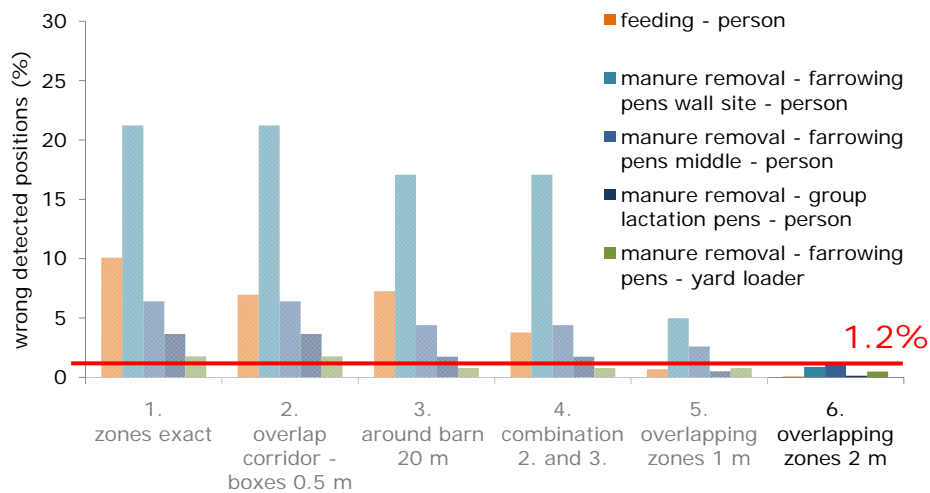
Results and Discussion – Comparison of Variants



time offset: 1 s; y-coordinate shift: -0.5 m

Beyer-ILT4d- 23

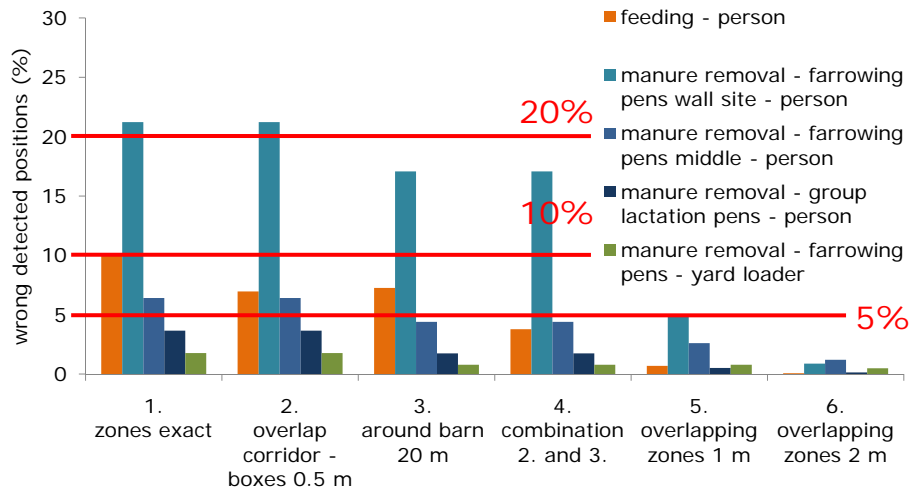
Results and Discussion – Comparison of Variants



time offset: 1 s; y-coordinate shift: -0.5 m

Beyer-ILT4d- 24

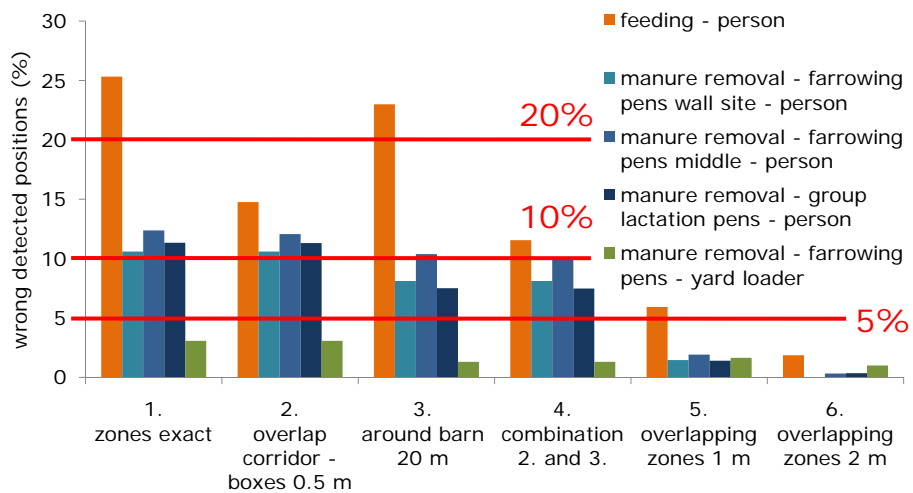
Results and Discussion – Comparison of Variants



time offset: 1 s; y-coordinate shift: -0.5 m

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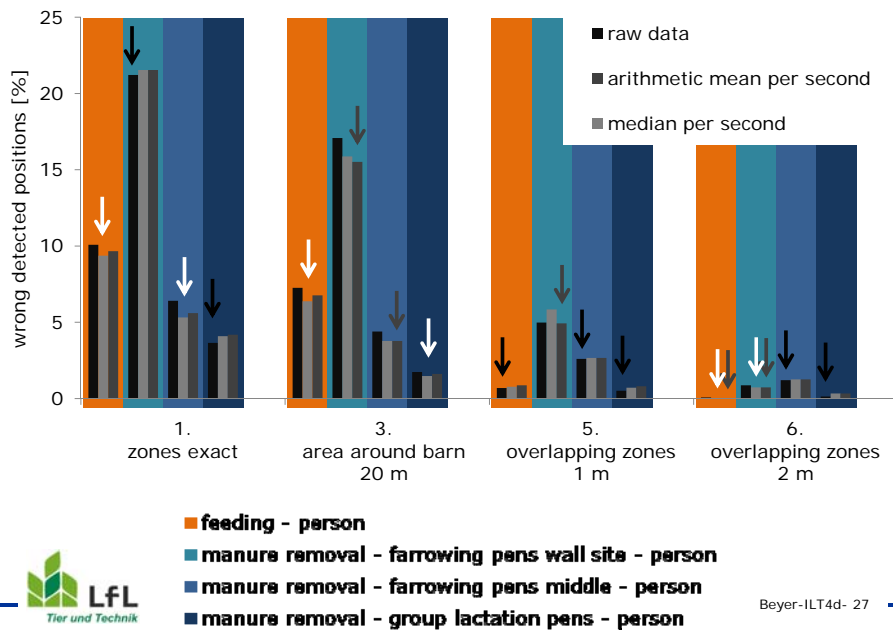
Results and Discussion – Comparison of Variants



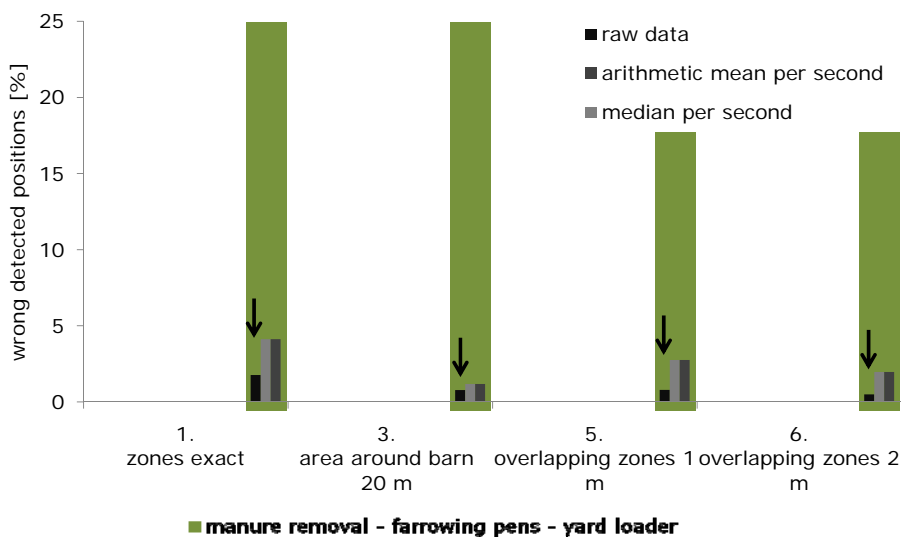
time offset: 0 s; y-coordinate shift: 0 m

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Results and Discussion – Comparison of Variants



Results and Discussion – Comparison of Variants



Conclusion

- The recorded position data allowed to follow the positions of the workers in the stable
- Data processing shows some difficulties in data evaluation (time offset and coordinates shift)
- The settings in variant 4 with the overlap of corridors and troughs and the area around the barn seem to be the best
- Similar error rate of raw data, mean per second and median per second
- The obtained data of the tested location system are exact enough for work-analysing