Bavarian State Research
Center for Agriculture

1st EAAP Conference on Artificial Intelligence 4 Animal Science

Challenge of dairy housing automation through M2M networking: how farmers' experience shapes expectations

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Zurich, 4 June 2025

Outline

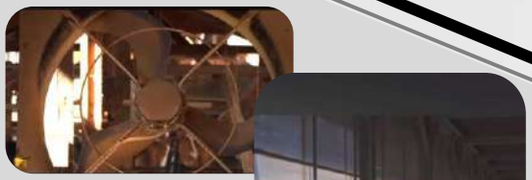
- Background & motivation – digital technologies/devices in dairy cattle barns
- Animation of M2M networking
- Requirements and needs
- Implementation of use case on a practical farm
- Outlook

Digital technologies/devices in dairy cattle barns

Barn technology - Today

- Barn technology automatically performs its own tasks/activities (feeding, manure removal, milking, air conditioning,...) successfully

- Farmer adjusts settings when something changes



State of the art

Digital technologies in the field of barn technology ➔ Automation as a management aid (executive function)

- Relief from routine tasks and increased flexibility of work

- Manual readjustment under changing conditions

Challenge for a farmer

- Settings of the implements → farmer would need to consider the interactions between the devices
- Mutual communication and coordination between the devices

What is networked barn technology?

- Direct machine-to-machine (M2M) communication/exchange of information between devices
- M2M → exploit the existing possibilities of digitalisation

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Chances of networked barn technology

– Adapt equipment to current conditions in the barn
– Action without active intervention of the farmer
– Improve animal housing conditions in the barn
– Optimisation of energy consumption
– Reduction of the farmer´s physical labour
– More flexible working times

Barriers of networked barn technology

– Limited communication between the equipment in the barn
– Data exchange due to different communication interfaces and/or incompatibility between devices from different manufacturers
– Time-consuming networking and risk of errors
– Data exchange for smaller devices often overlooked/not provided

Identifying farmers' needs and requirements

Online survey: networking of digital technologies in dairy barns

Data basis: approx. 250 farmers (fully answered survey)

Period: November 2020 - February 2021

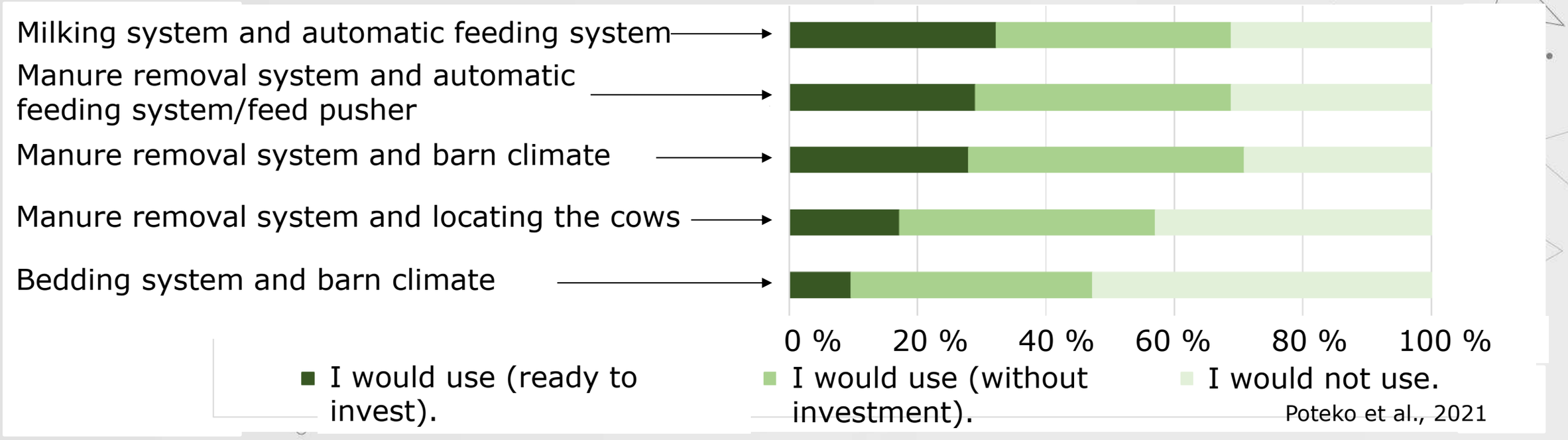
Questions:

- technology used in the dairy barns of interviewed farmers
- experiences, expectations, barriers with digital technologies from the networking point of view

Results

Which networking between the barn technologies would you procure for your farm?

(n=93 farmers with an automatic milking system in Bavaria, Germany)



Poteko et al., 2021

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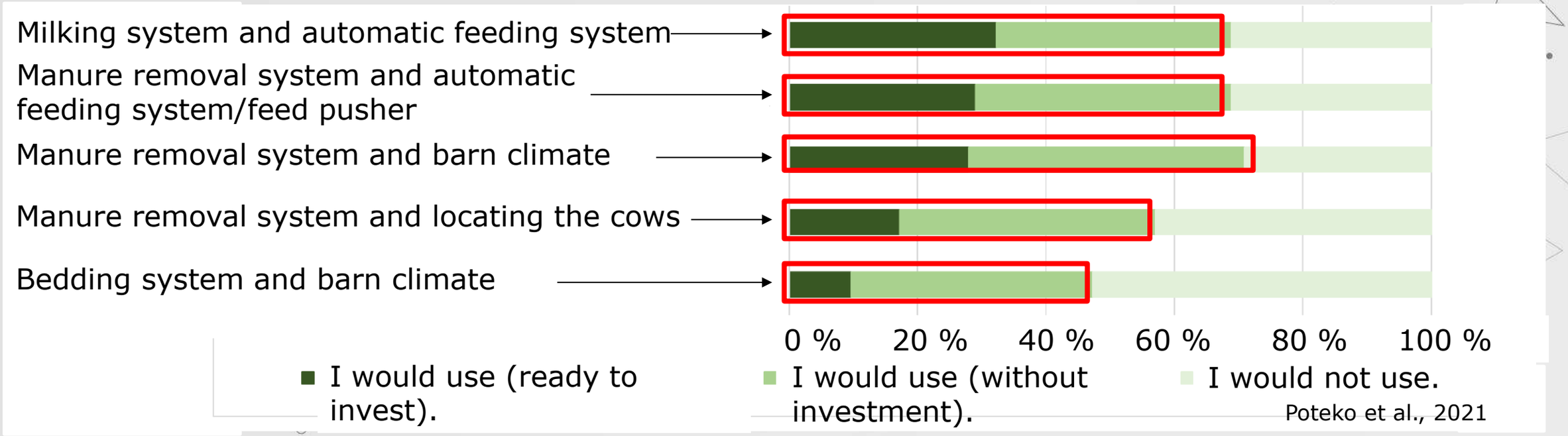
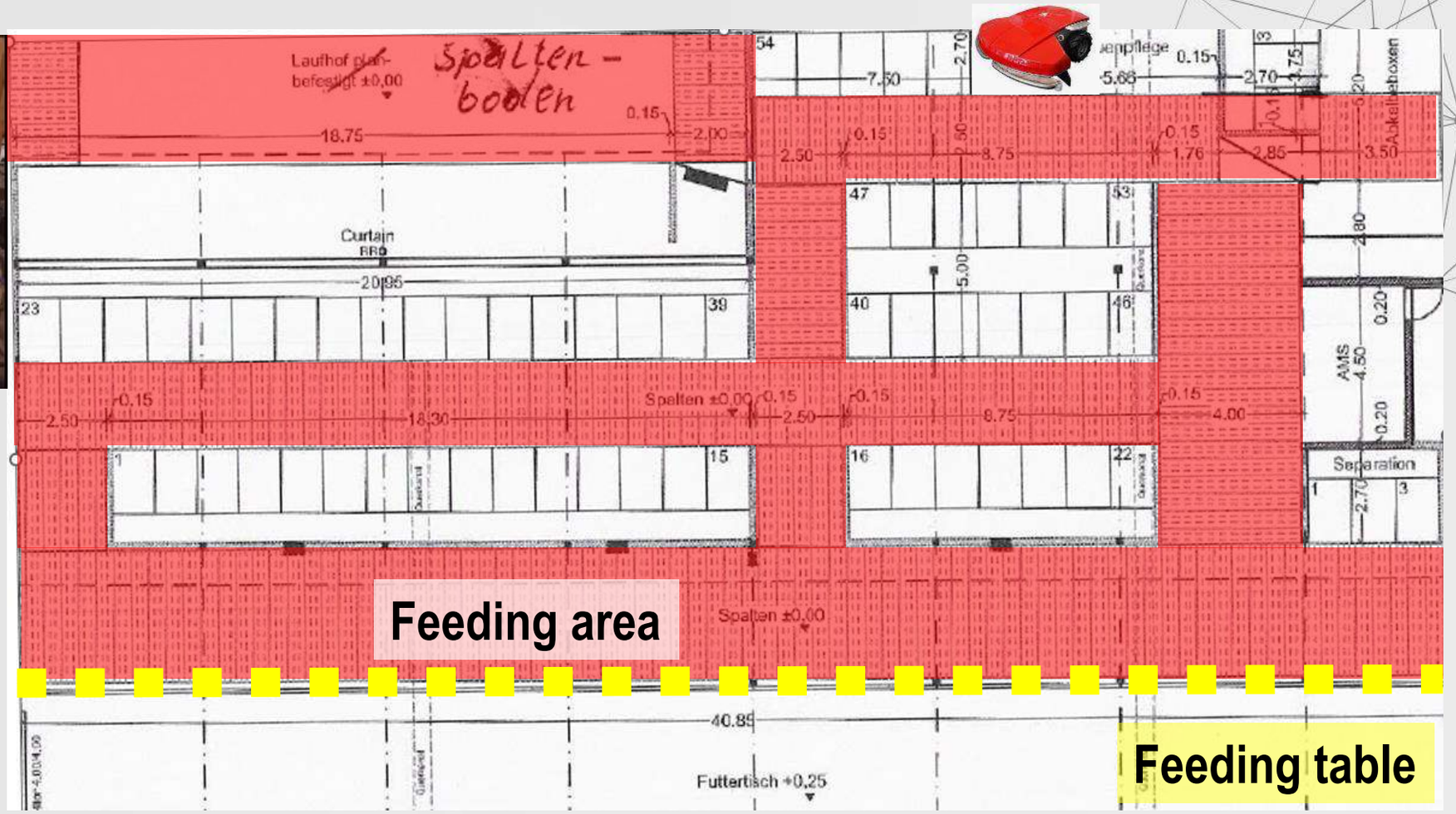


➔ **Farmers' interest in networked technology**

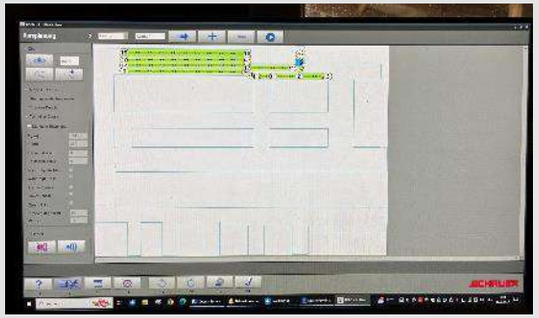
Use-Case

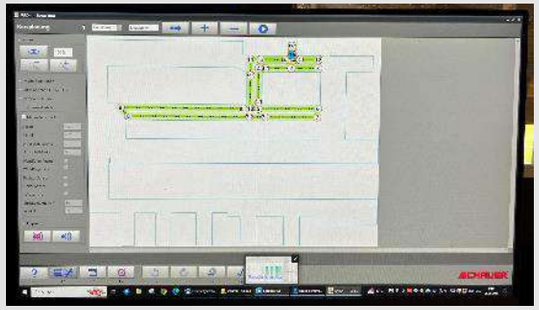
Project with dairy farm and industry

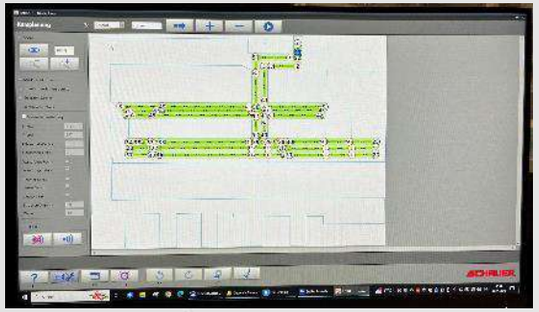
Use-Case → M2M & Dung removal

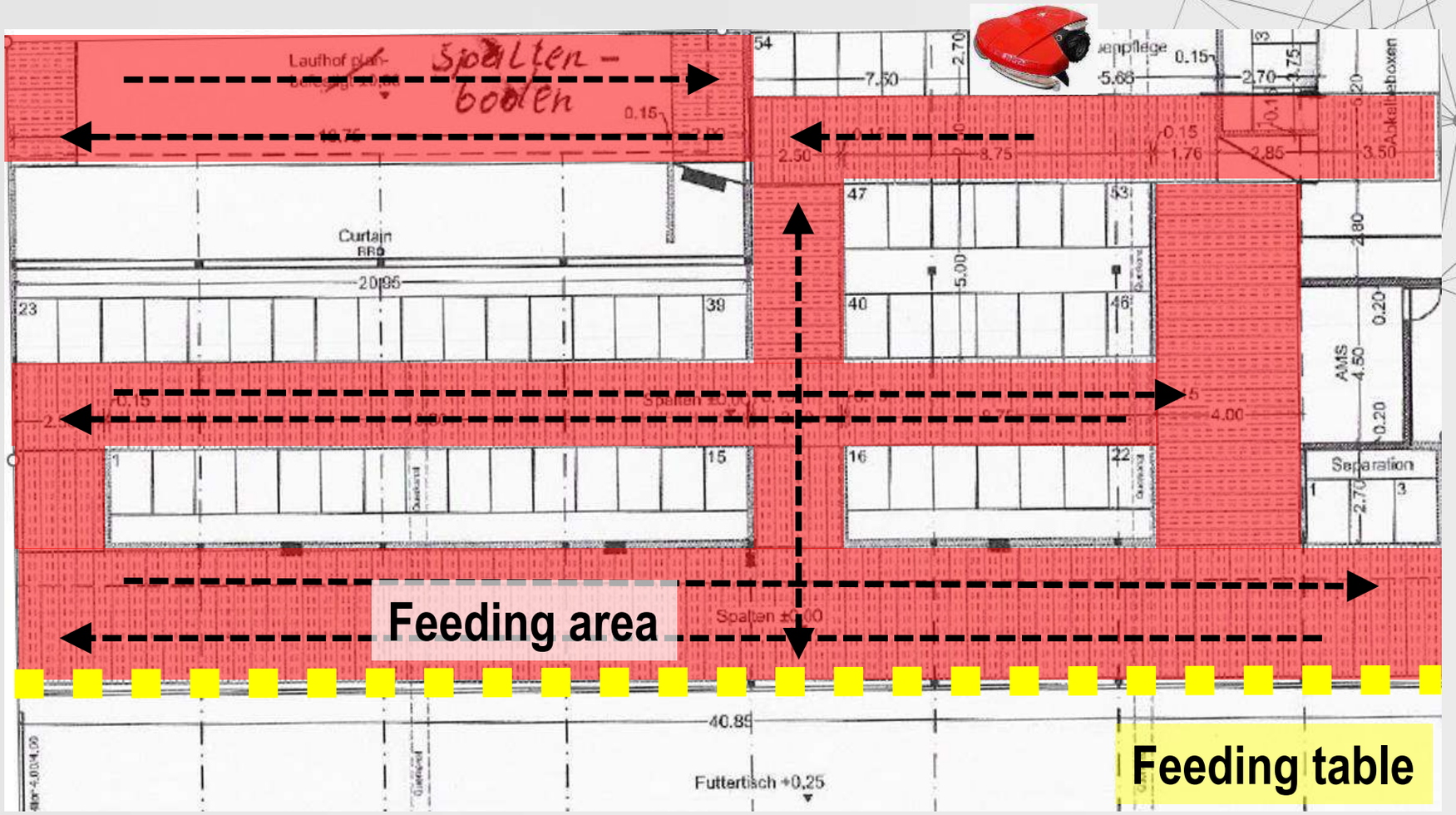


Use-Case → M2M & Dung removal



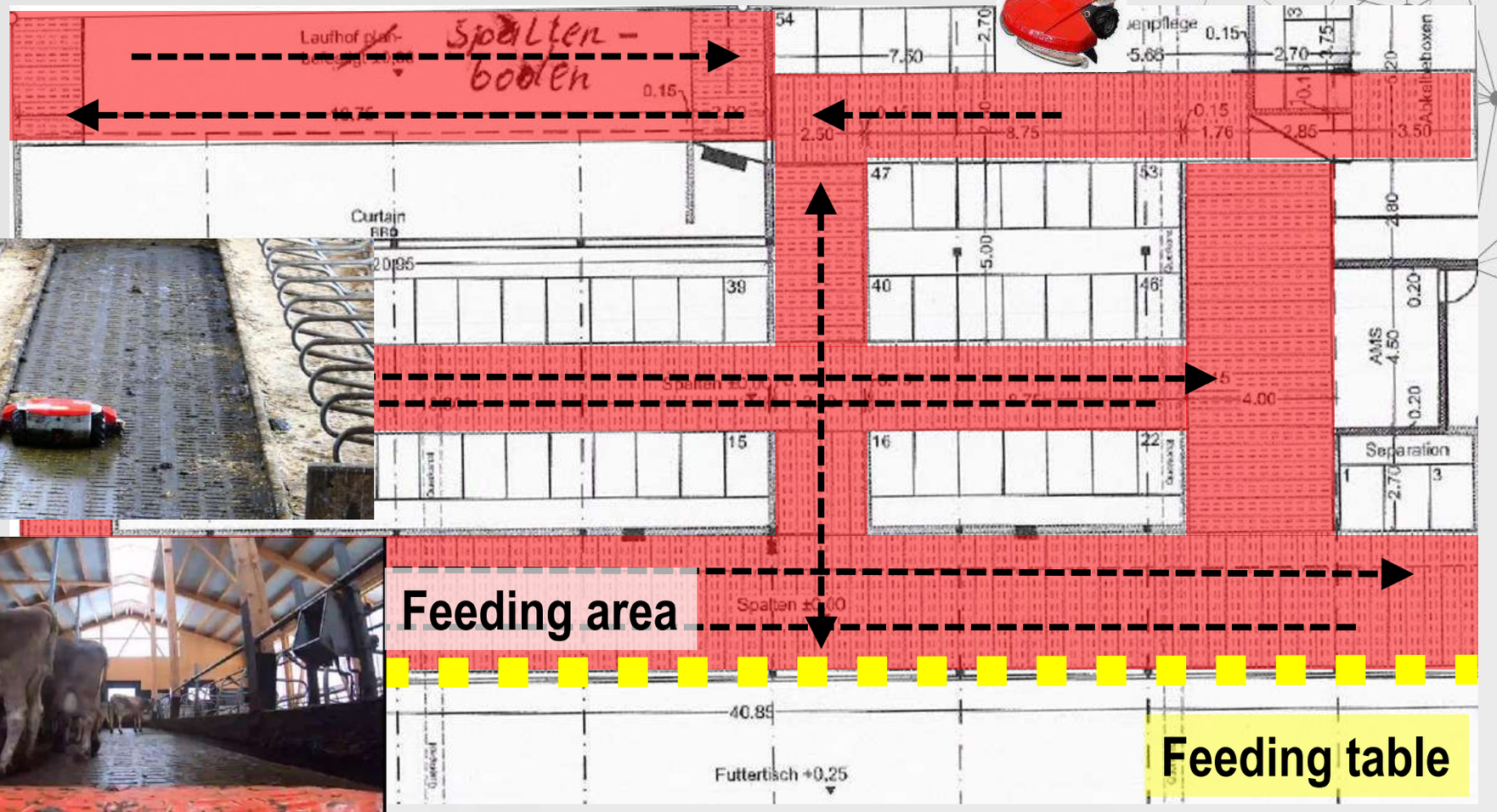






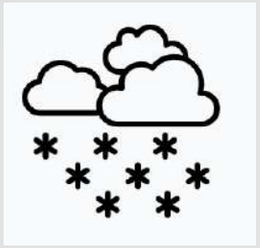
Use-Case → M2M & Dung removal

Changing conditions



Actual conditions in the dairy barn → Dung removal robot should chage ist routes

Use-Case → M2M im Bereich der Entmistung



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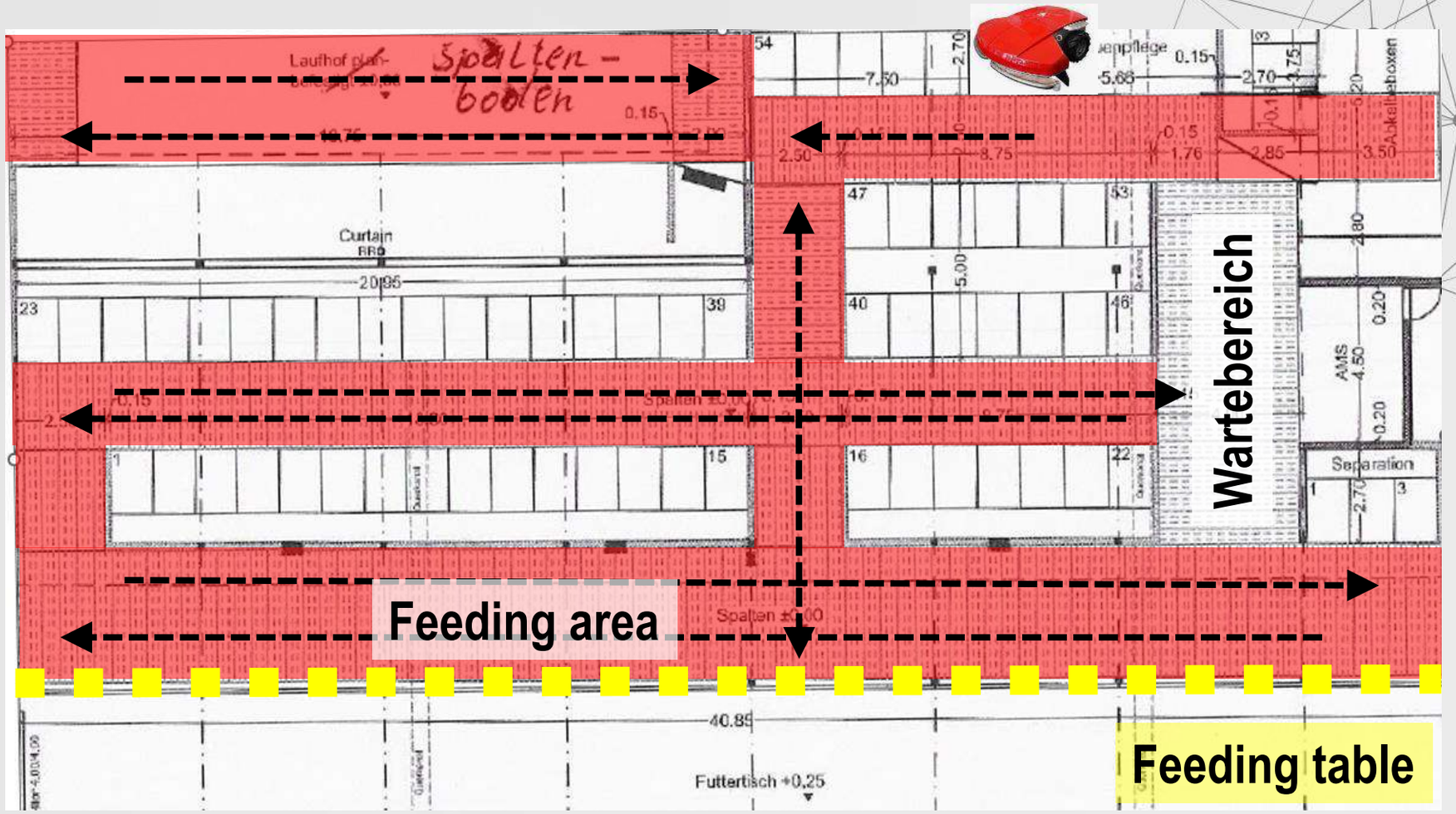
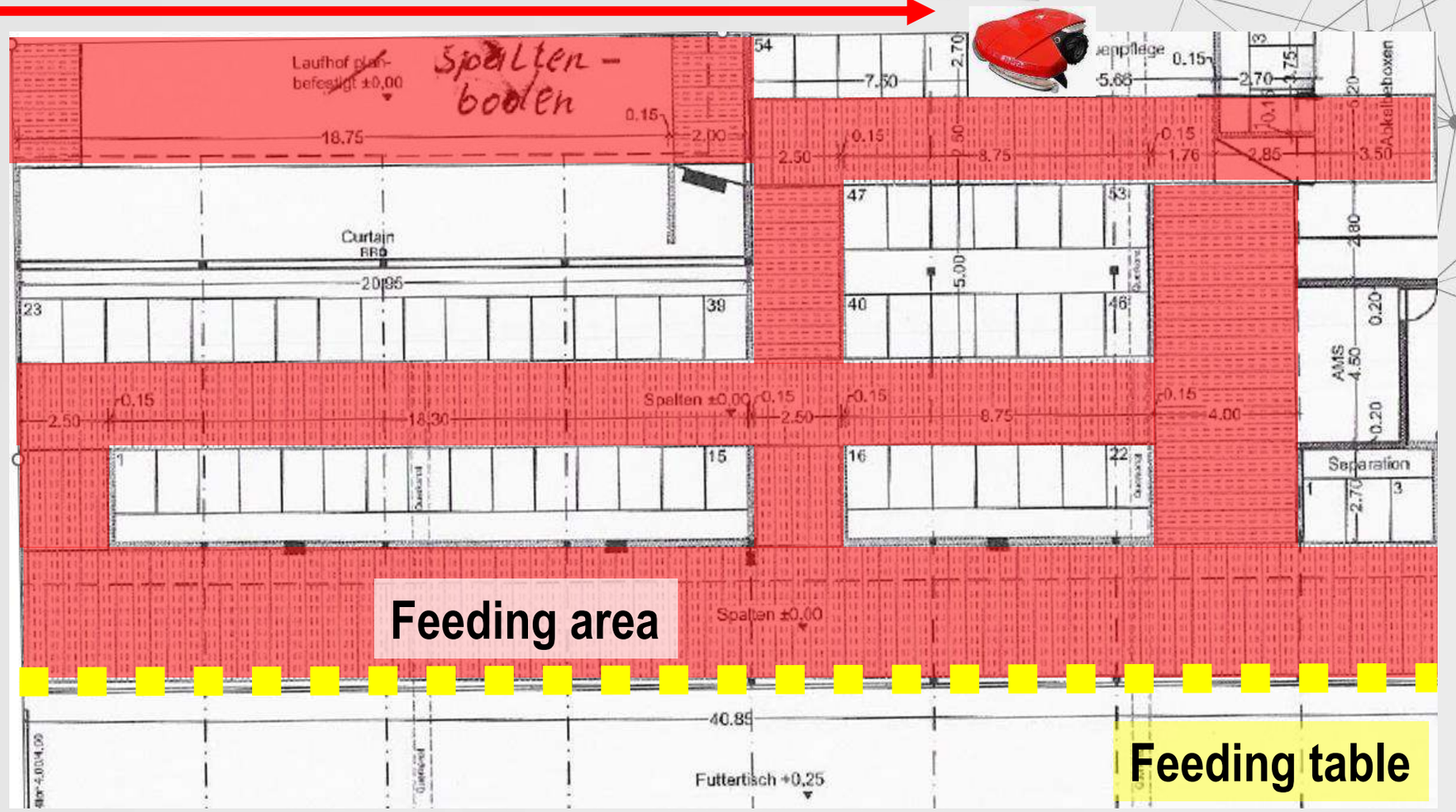


Implementation of use-case

Feeding fence open →
Dung removal

Feeding fence open →
No dung removal

App



Without M2M…

Outlook

- M2M & digital technologies in dairy farm…
  - The technologies may adapt their processes on different/new conditions
  - The adaptation is possible without farmer
  - The farmer activities are reduced or flexible

LfL

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