Use of sensor technologies in Precision Dairy Farming – an overview

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Precision Dairy Farming – Hot topic!

„Die Revolution im Kuhstall hat begonnen“ (Elite, November 2015)

„Die gläserne Milchkuh“

„Hightech auch im Melkstand“

„Kühe melden Brunst per SMS“

„iPad statt Tränkeeimer“

„Kuh Navis für den Stall“

„Big Data im Milchviehstall“

„Der Melkroboter ist kein Selbstläufer“

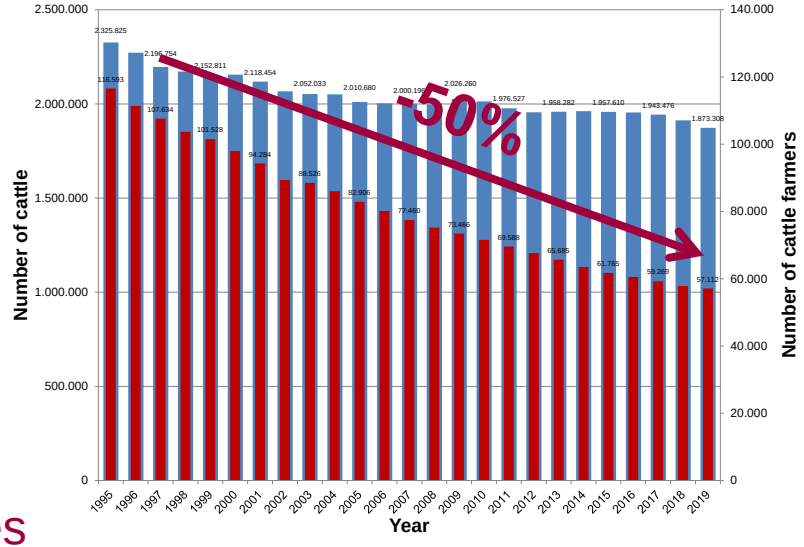
„Ohne schnelles Internet geht`s nicht!“

„Welche Technik passt zu mir?“

Framework – Structural changes

- Fewer, but larger dairy farms
- Volatile producer prices
- Increased costs for labor, feed, …
- Narrow profit margins
- Increased specialization of farms
- Lack of skilled workers

→ Investment in (sensor) technologies



Framework – Consumer expectations

- Continuous quality control („quality label“)
- Conventional *vs*. organic food production
- Reduced medical treatments
- Increasing focus on animal welfare
- Zoonotic disease transmission
- Reduced greenhouse gas production
- Affordable food

→ (Sensor)technologies?!

Precision Dairy Farming – Definition

Use of technologies for automated measurement of

- physiological parameters,
- behavior and
- performance in individual animals

to improve

- herd (health) management and the
- economic success of the farm

while considering

- ecological and
- social concerns

modified, Bewley (2010)

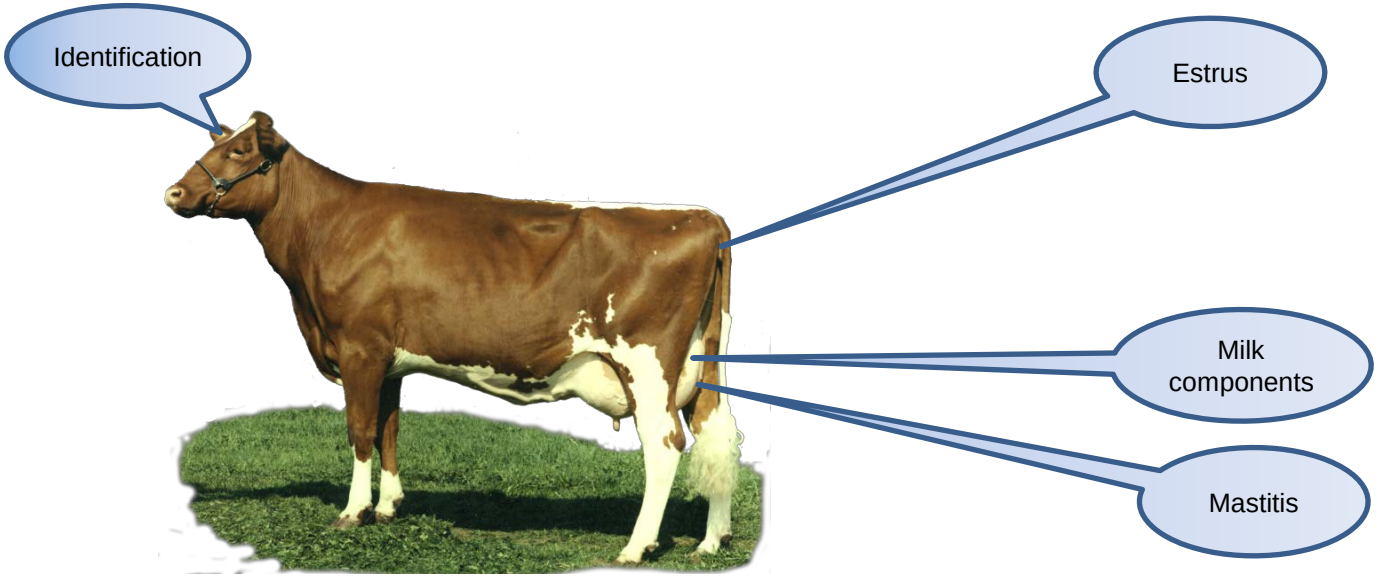
Sensor systems – Historical development

1980

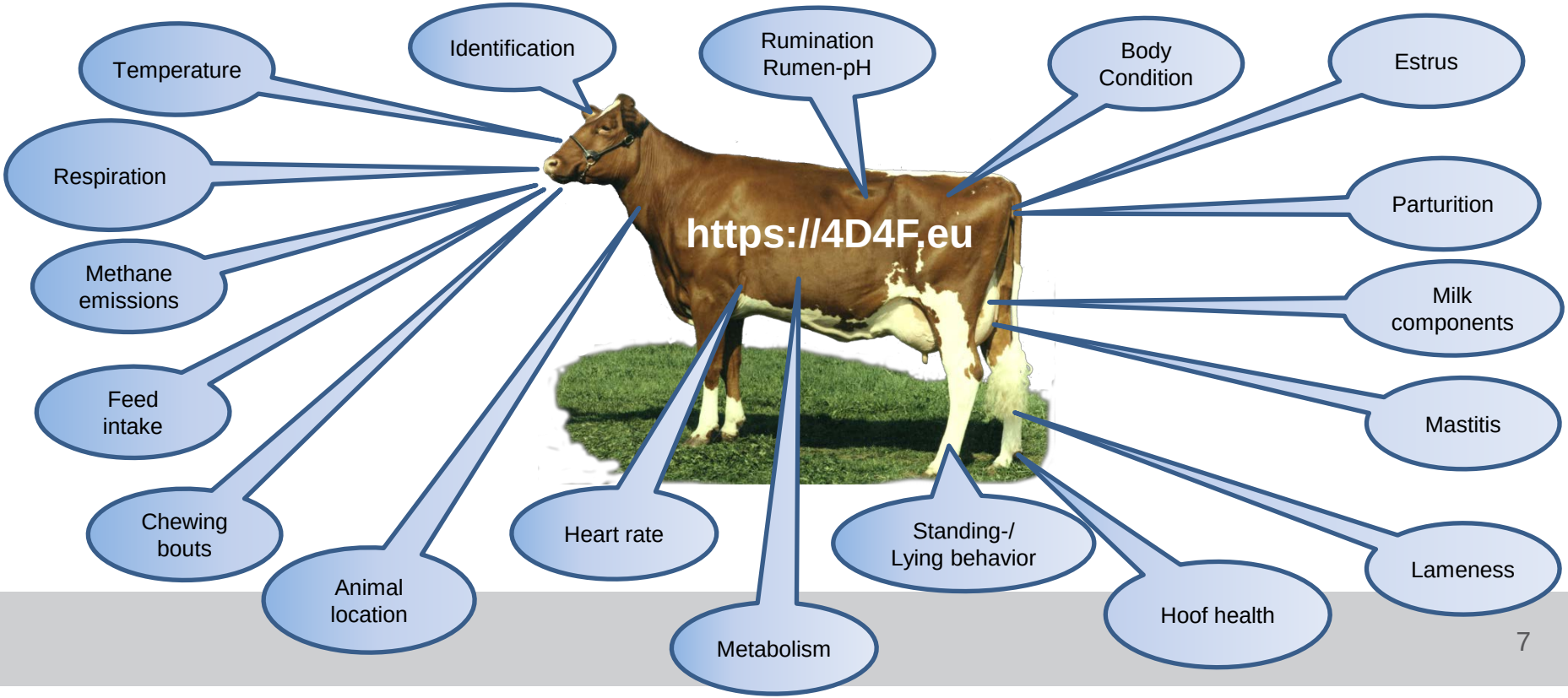
Identification
- feeders
- animal activity

1992

1. AMS (NL)



Sensor systems – Historical development



Sensor systems – Made in Austria

- Sensor technologies
  - „on-cow“
  - „in-cow“
  - „off-cow“

Sensor systems – Made in Austria

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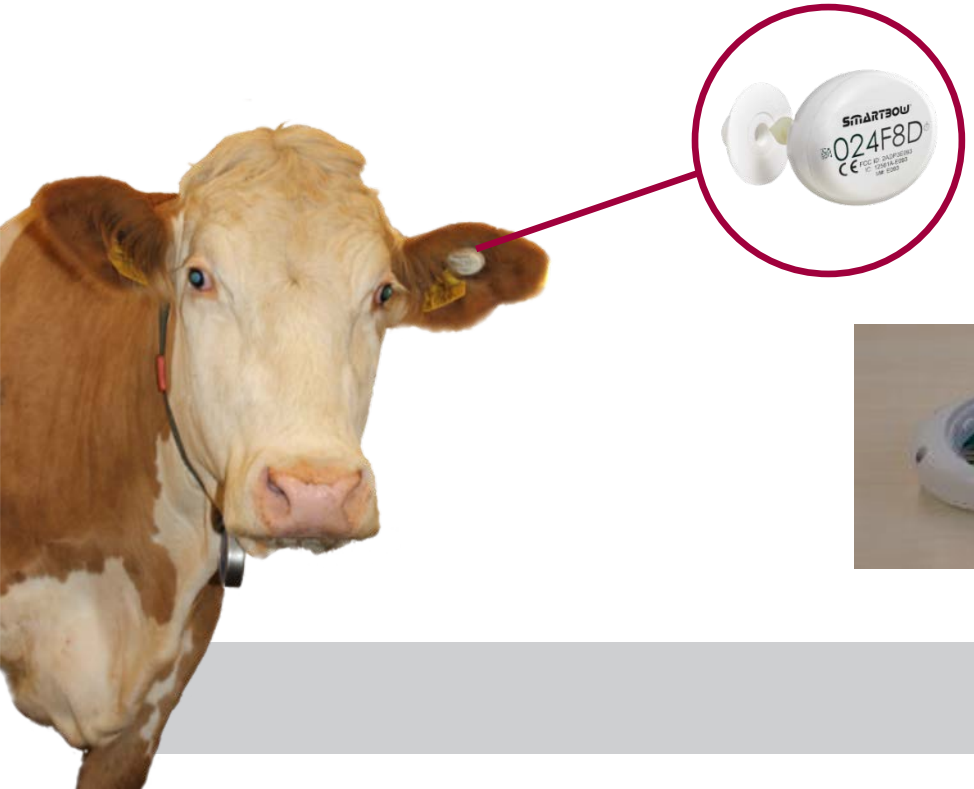
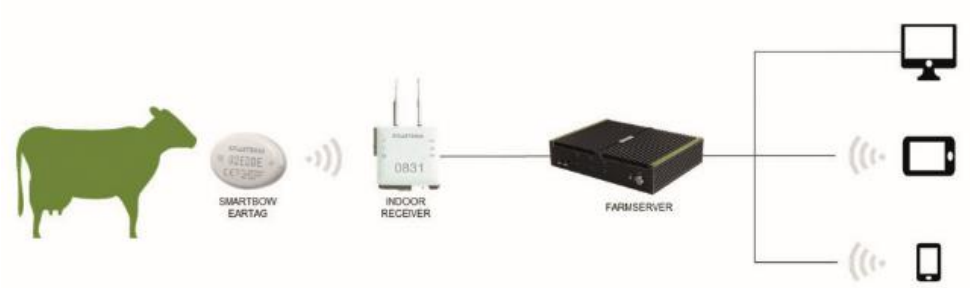
SMARTBOW

a part of zoetis



Sensor systems – Made in Austria

- 3-D accelerometer system
  - 1 Hz technology → 80.000 datasets per cow and day
- Algorithms
  - self learning, based on neural networks
  - animal specific
  - detecting deviations



Research – Precision Dairy Farming

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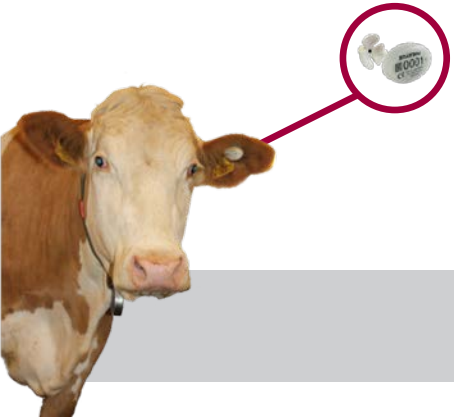
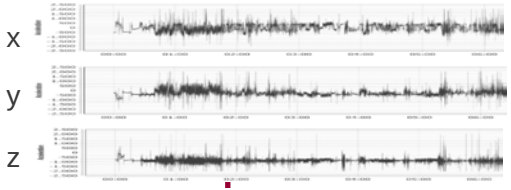


PDF Research – Example: Rumination

Applications
- Feeding assessment
- Early detection of disease
- Calving prediction

Reference („Gold standard“)

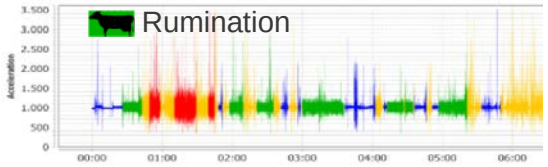
Raw data



Status

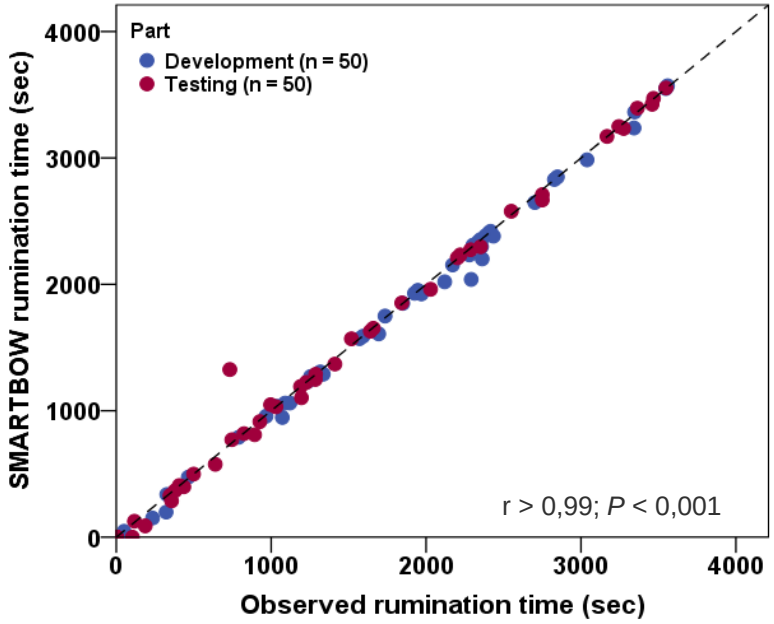
Basis for algorithm development and testing

Information



Alert / Recommendation

PDF Research – Example: Rumination



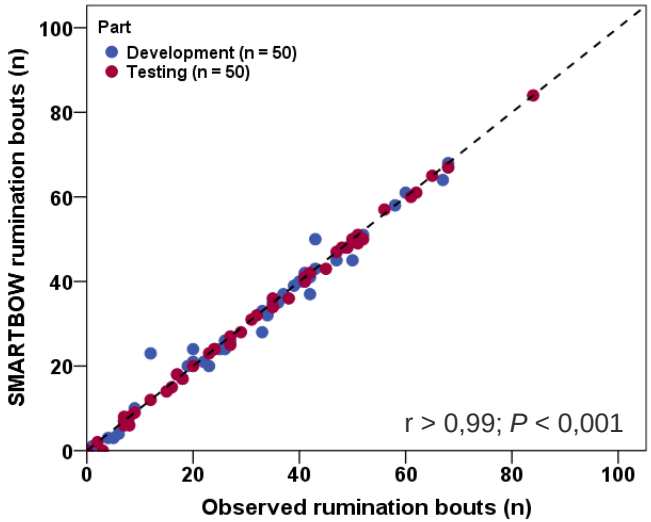
10 cows,
100h video observations

Ø Deviation 1,1%

Reiter et al. (2018)

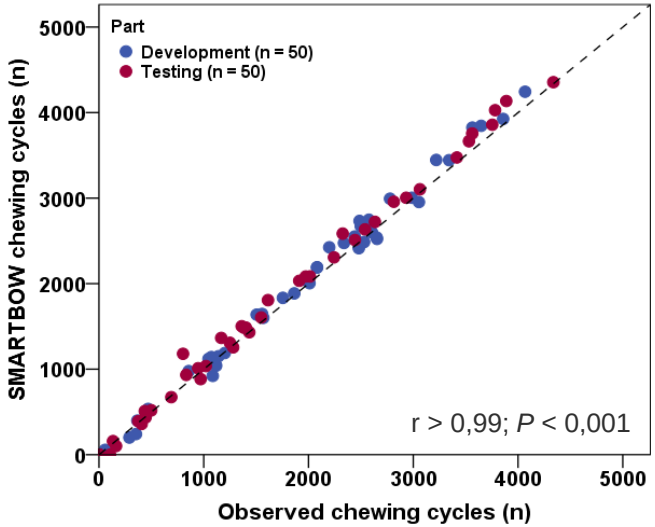
PDF Research – Example: Rumination

Rumination bouts



- Ø Deviation 1,3%

Chewing cycles



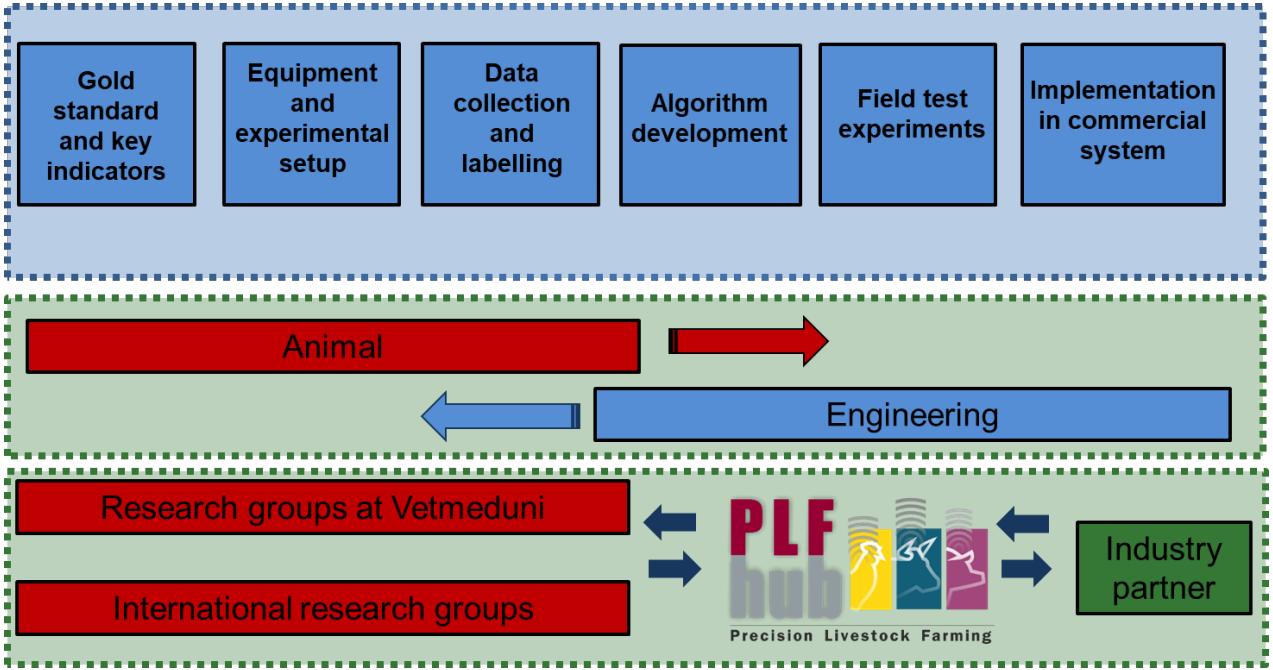
- Ø Deviation 3,7%

only possible with 10Hz ear-tags

PDF Research – Other topics

- Rumination
- Estrus detection
- Calving prediction
- Ketosis monitoring via data integration
- Detecting standing and lying behaviors
- Animal localization / „time budgets“
- Milk intake and „time budgets“ in calves
- Detecting diarrhea and respiratory disease in calves
- Monitoring of cows kept on pasture
- Use of ear(tag)temperature
- …

PDF Research – PLF Hub



Oczak (2020)

Conclusion

Precision Dairy Farming technologies…

- are at the beginning of their development
- are not „foolprooven“
- will neither change dairy cows nor farmers…

  …but potentially how they „interact“
- have the potential to improve the welfare of animals (and farmers?)
- lead to a lot of open questions, e.g. economic benefit, data rights, ethics

Thank you!