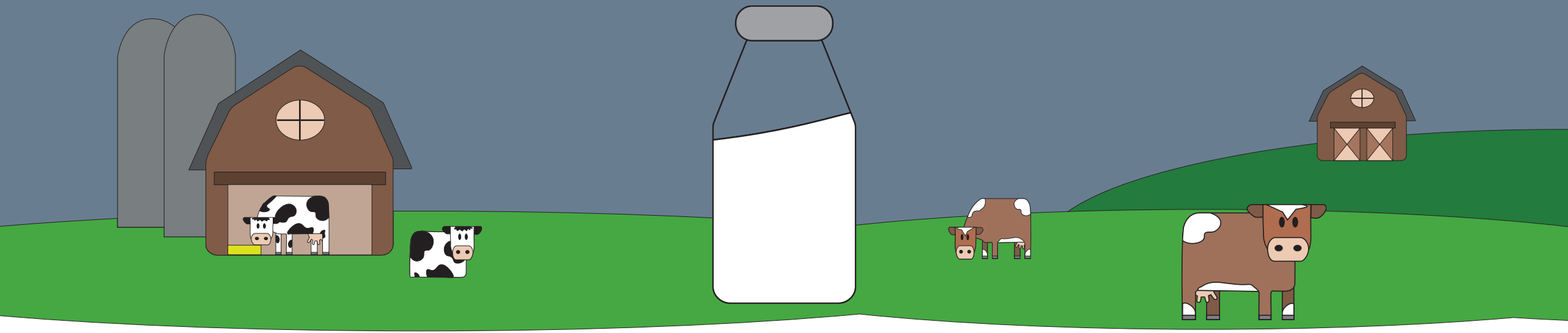
Antibiotic use and resistance of Swiss dairy herds

Janine Braun
Supervised by Eddie Bokkers and Beat Reidy
Supported by Urs Niggli and Judith Riedel



Bern University of Applied Sciences
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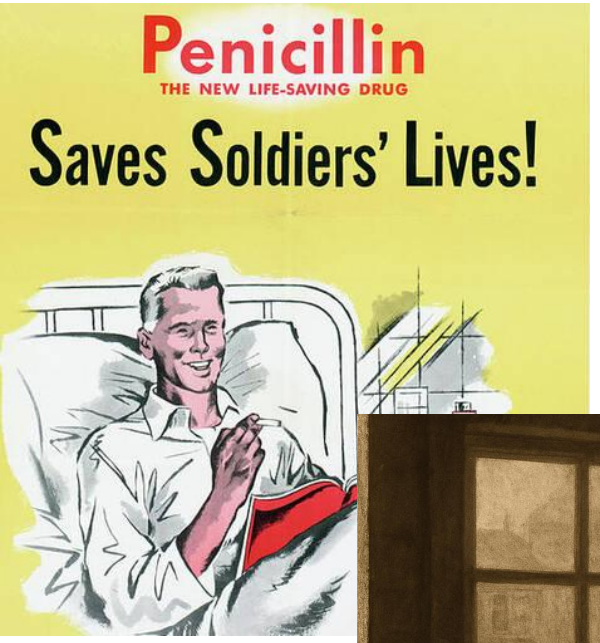
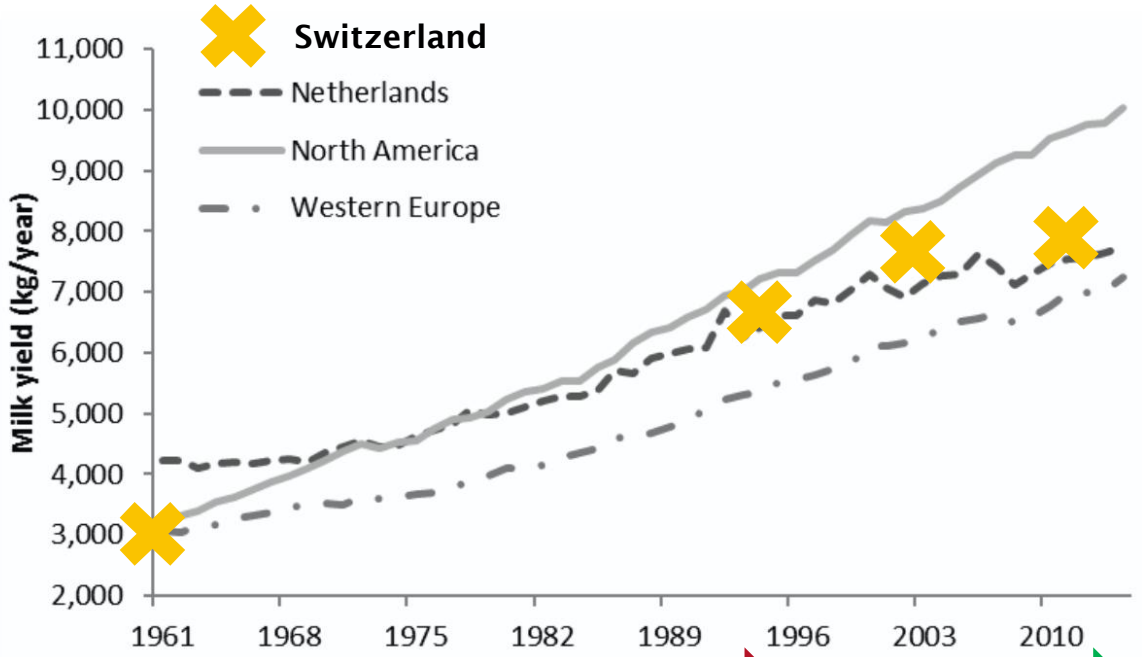
Dairy production in the 20. century



"A dairy farmer's dream comes true?"



feeding → cure

preventive < therapeutic

Figure 1.1: Average milk yield per cow per year in Northern America and Europe between 1961 and 2014 (**FAOSTAT**, 2017).

Antibiotic use
Curse or blessing?

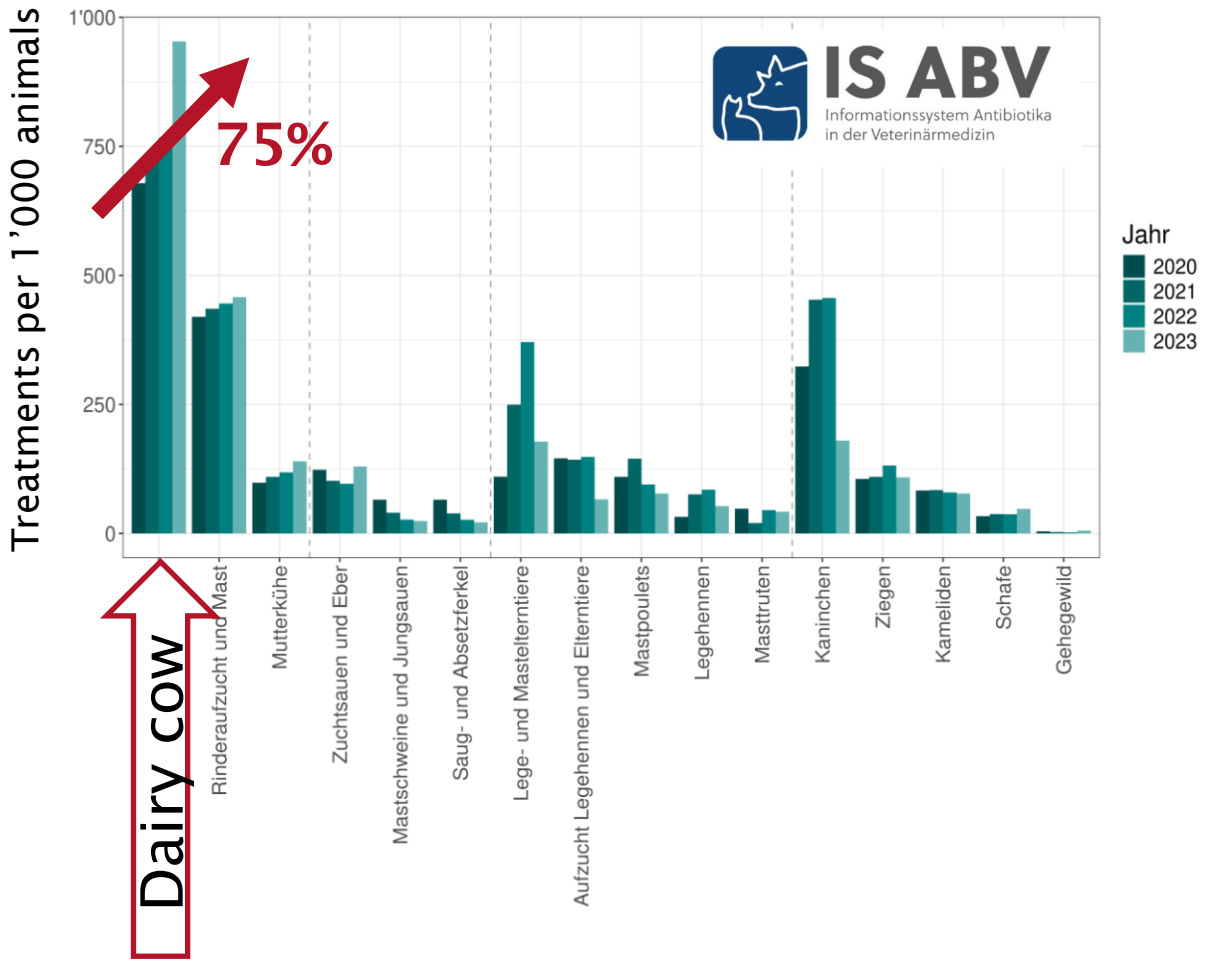
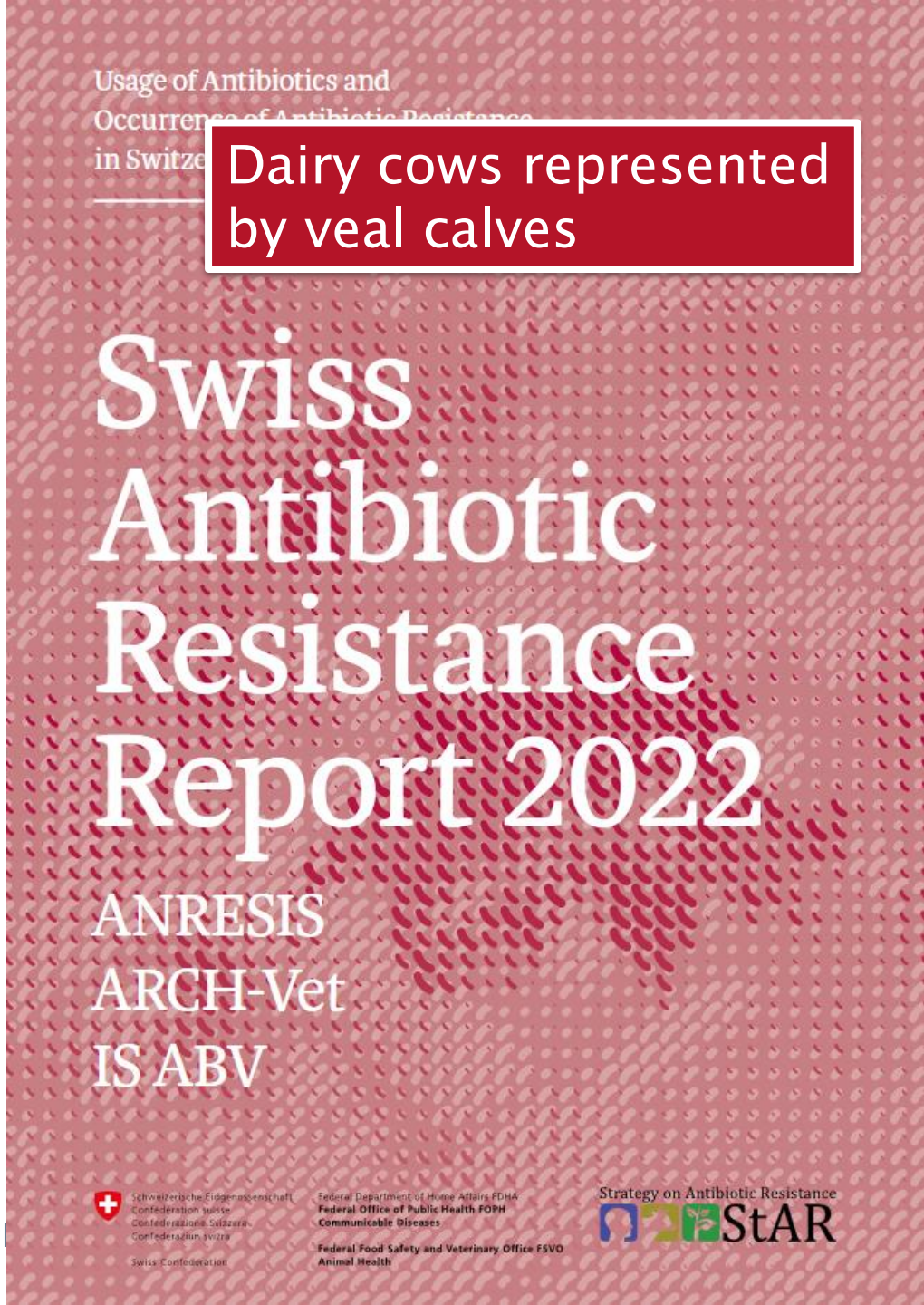


Abbildung 4: Übersicht der Tierbehandlungen pro 1 000 Tiere nach kombinierter Nutztierkategorie 2020 bis 2023[7]



Voluntarily participating dairy farms in my PhD project

Confinement-based management

N=15

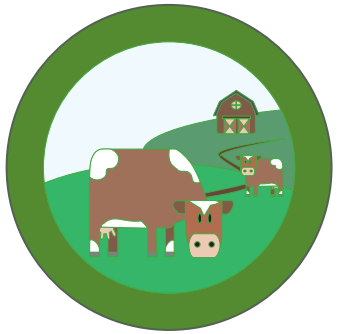
Loose-housing with cubicles (BTS)

Pasture to promote health (RAUS, no grazing)

Mixed ration year-round

Pasture-based management

N=15



Loose-housing with cubicles (BTS)

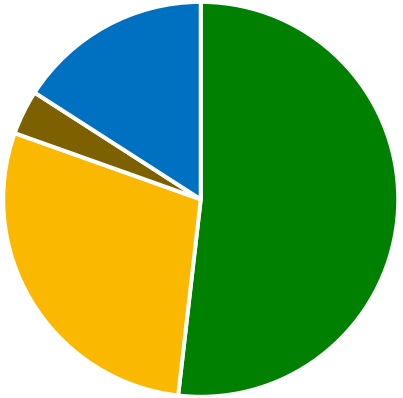
Pasture for grazing (Weide-RAUS, >70% DMI)

Focus on grassland (>95% DMI from grassland)

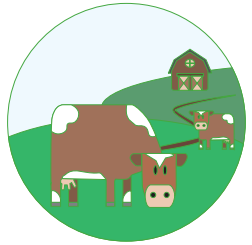
Daily management, feeding, breeding, etc.

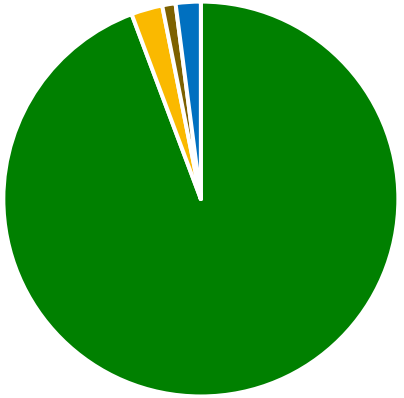
Contrasting dairy production strategy

Feed ration

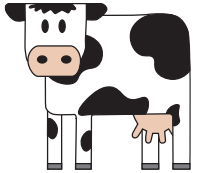


Grassland-based feeds
Whole-plant maize
By-products
Concentrated feed

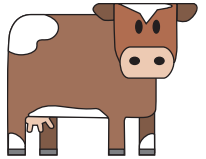




Breeds



95% High-yielding



40% Small-framed
60% dual-purpose

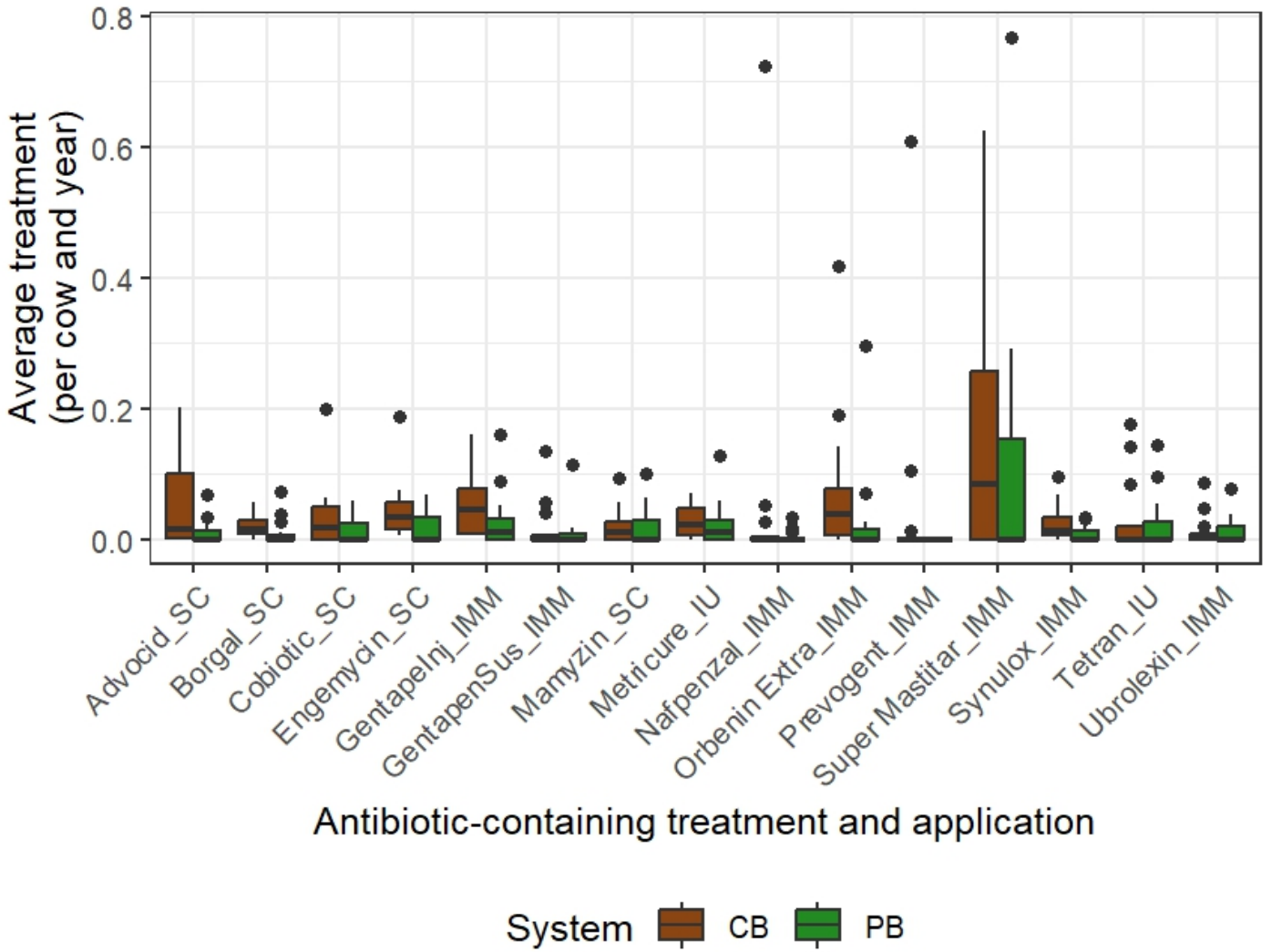
Antibiotic use

IS ABV
Informationssystem Antibiotika in der Veterinärmedizin

$$\frac{Treatments\ between\ 2021\ and\ 2023}{Herd\ size\ of\ 2021 + 2022 + 2023}$$

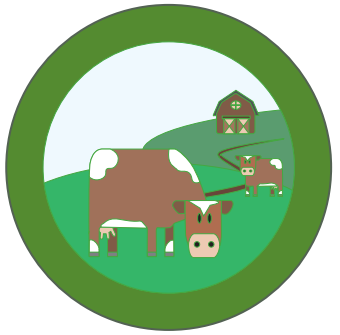
Excluded all livestock other than adult dairy cows

Most important antibiotic-containing products



Application: Intramammary (IMM), Subcutaneous (SC), Intrauterine (IU)

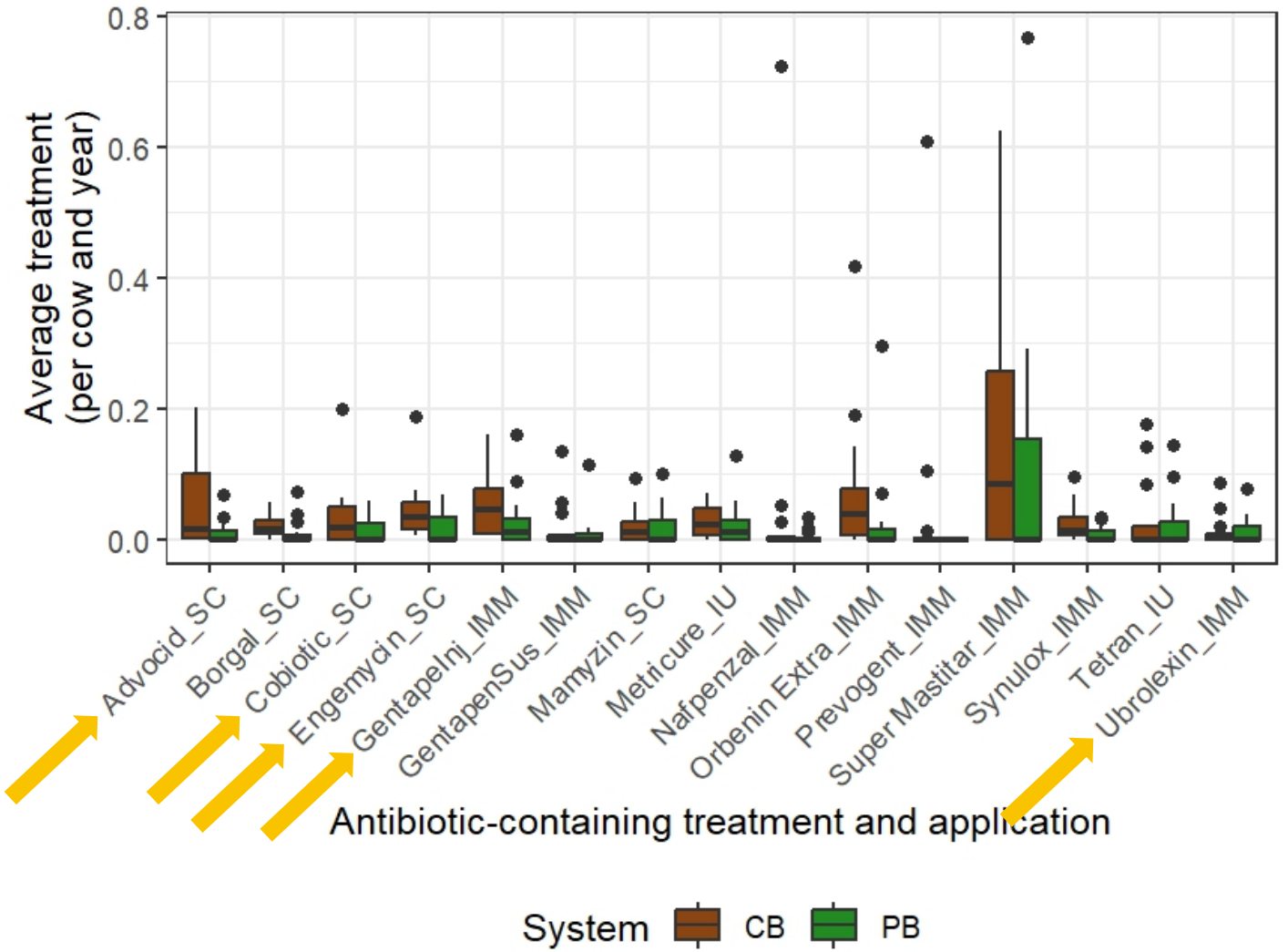
N=14



N=15

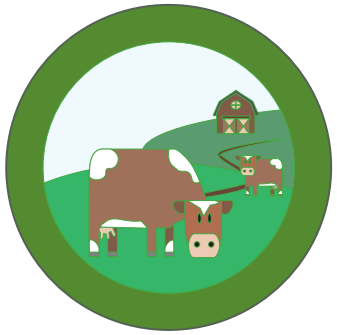
Treatment of individual dairy cows directly by the vet

Most important antibiotic-containing products



Application: Intramammary (IMM), Subcutaneous (SC), Intrauterine (IU)

N=14

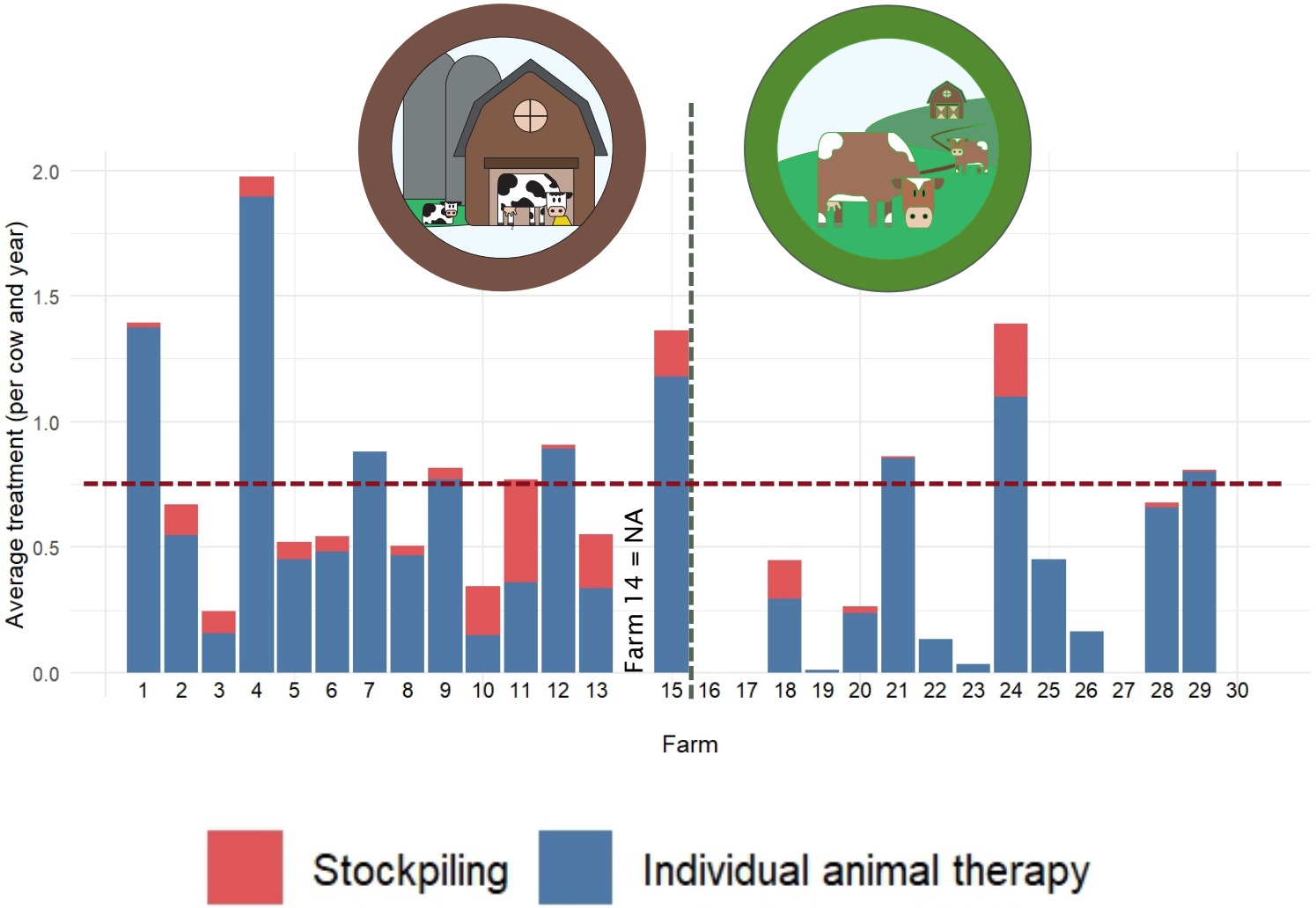


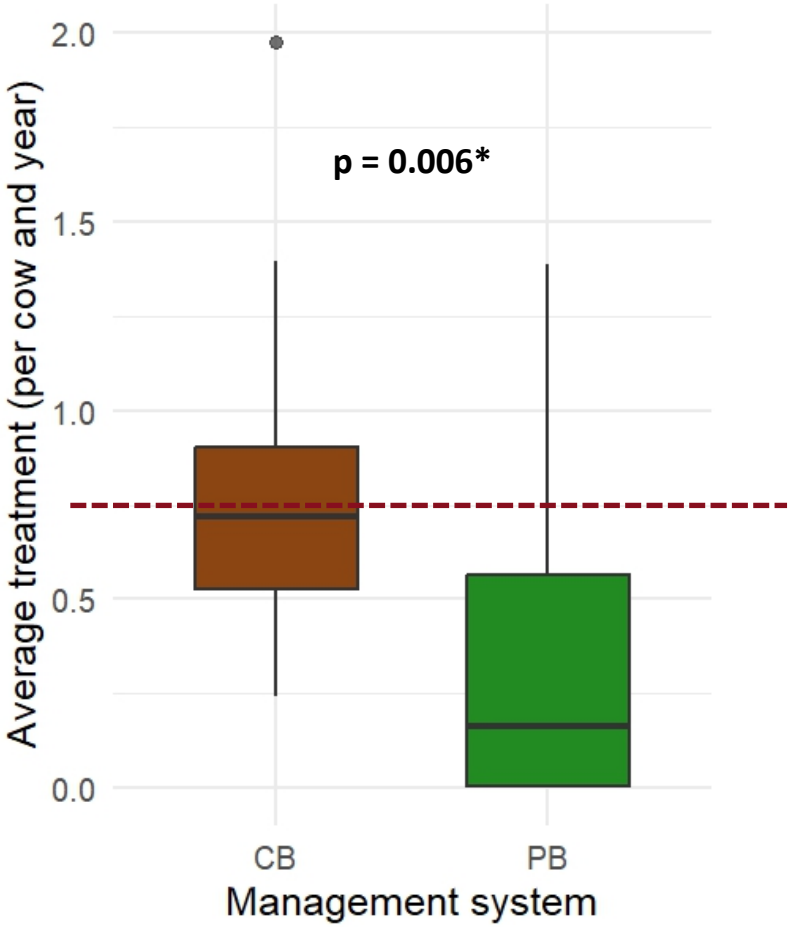
N=15

Treatment of individual dairy cows directly by the vet

Stockpiling is missing

Average antibiotic use per cow and year





*Wilcoxon rank sum test with continuity correction.

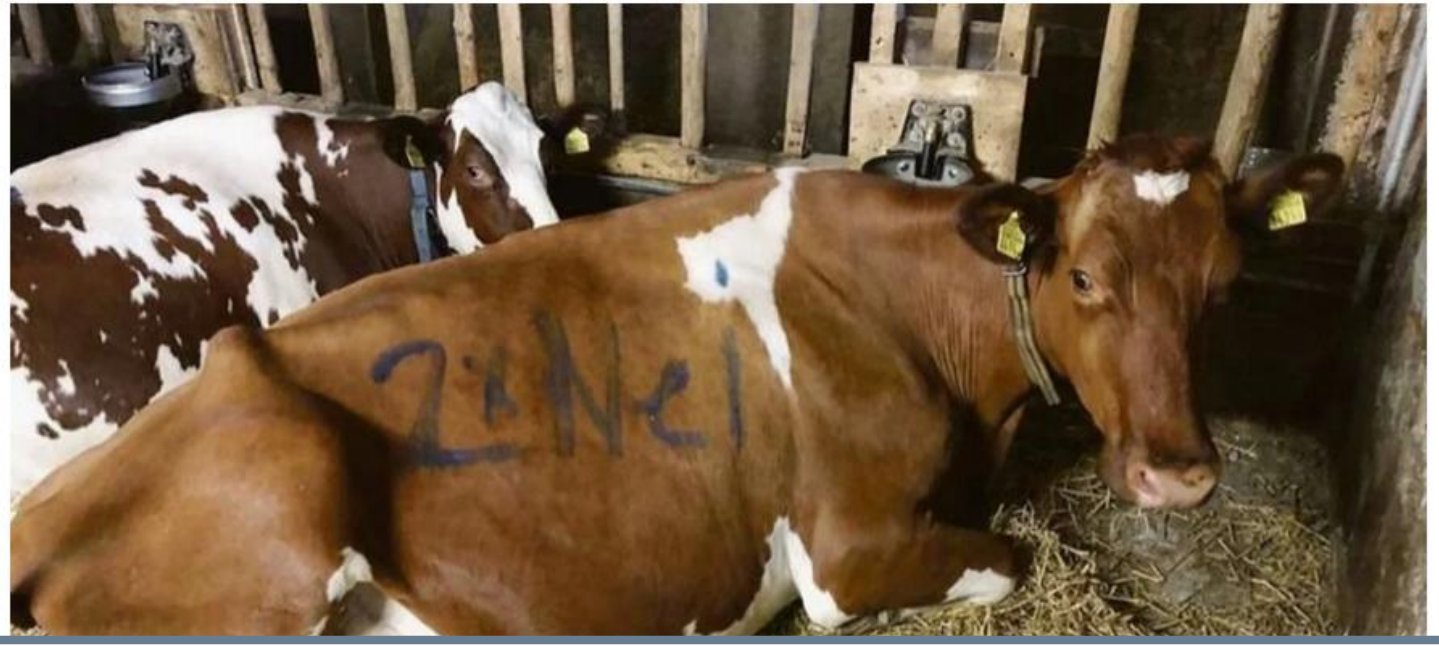
Antibiotikaresistenzen

Kili war unheilbar krank, weil kein Antibiotikum wirkte

Resistenzen gegen Antibiotika sind das Todesurteil für kranke Tiere. Bei Kili war die Resistenz angeboren, sie können aber auch erworben sein. Ein umsichtiger Antibiotikaeinsatz sowie ein gutes Management im Bereich Hygiene, Melken und Fütterung können dazu beitragen, die Resistenzentwicklung zu bremsen.

Von Simone Barth
Publiziert am Sonntag, 13. März 2022 12:08
Lesedauer 6 Minuten
Themen Tiergesundheit, Antibiotika, Rind

Artikel teilen Kommentare



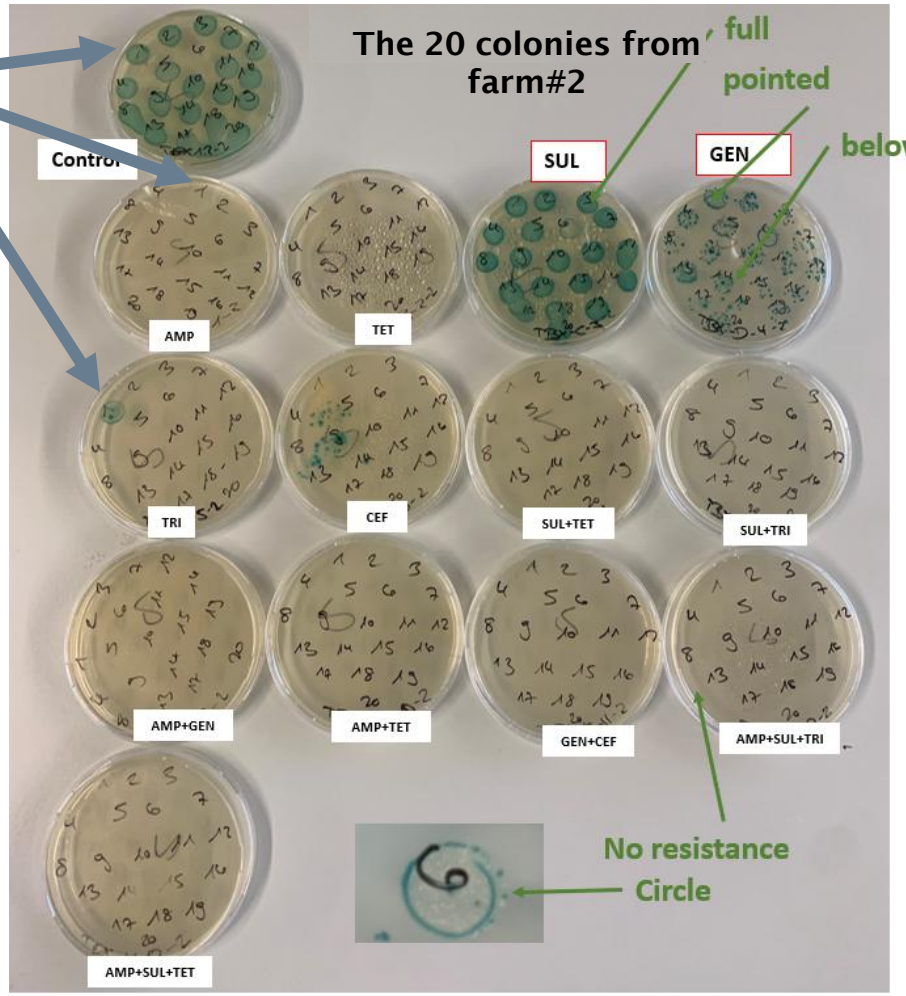
Can we successfully treat our cows with antibiotics in the long term?

Breeding of antibiotic-resistant *E.coli* from fresh cow feaces

5 samples Visit 1
5 samples Visit 2

2 colonies per feaces

20 colonies per farm



Plates with 13 different antibiotic combinations and one antibiotic-free

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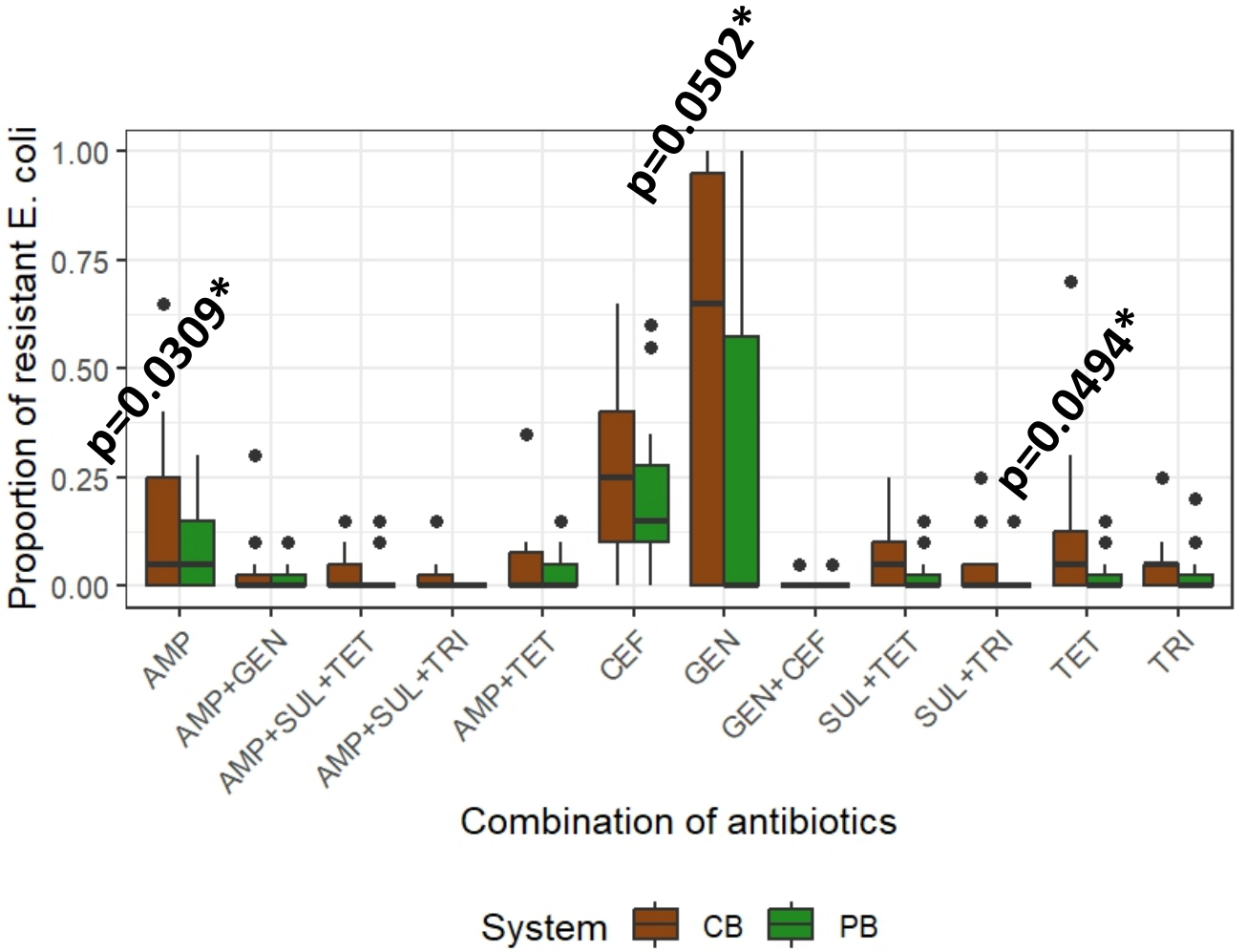
Kees Veldman
dr.
Researcher, Bacteriology, Host Pathogen Interaction & Diagnostics

Results from 50 colonies cross-checked with MIC

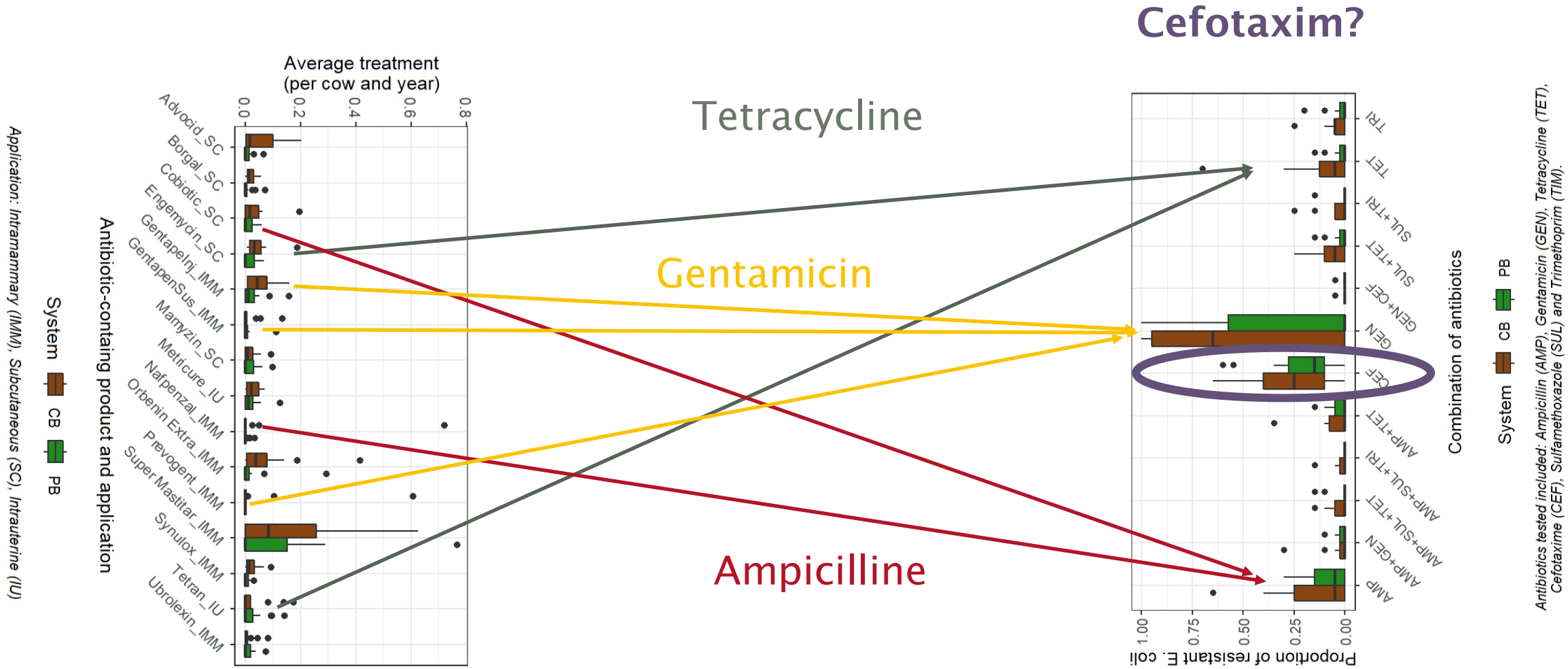
Resistance at herd-level

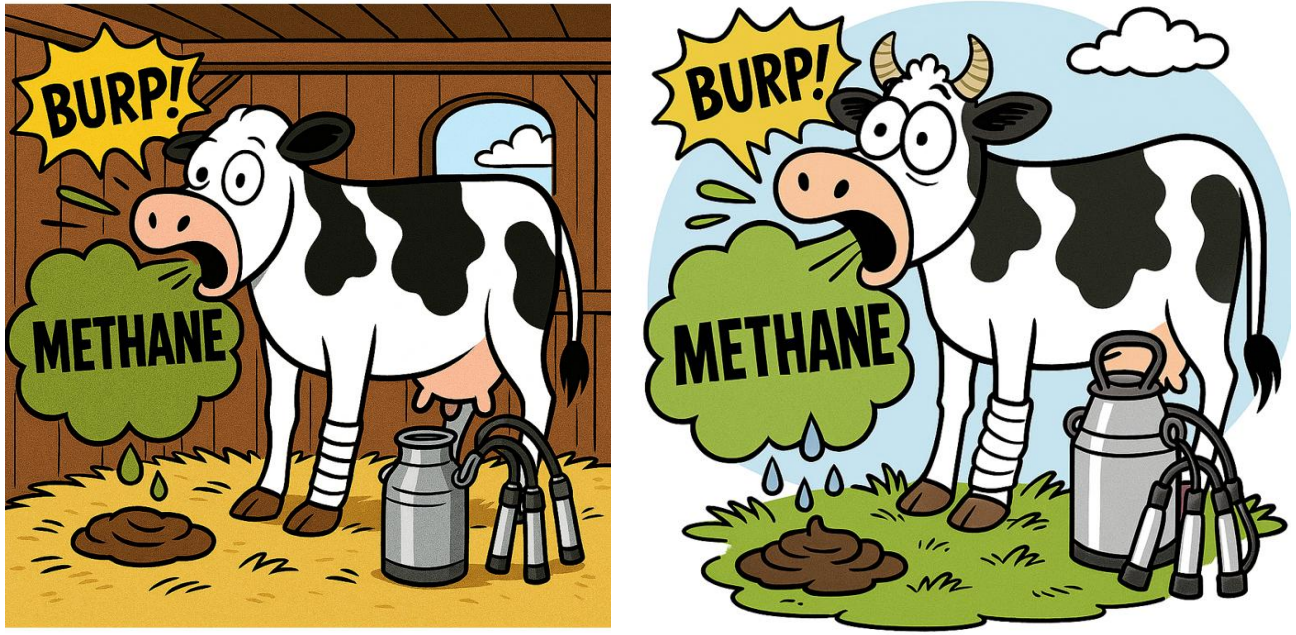


Antibiotics tested included: Ampicillin (AMP), Gentamicin (GEN), Tetracycline (TET), Cefotaxime (CEF), Sulfamethoxazole (SUL) and Trimethoprim (TIM).

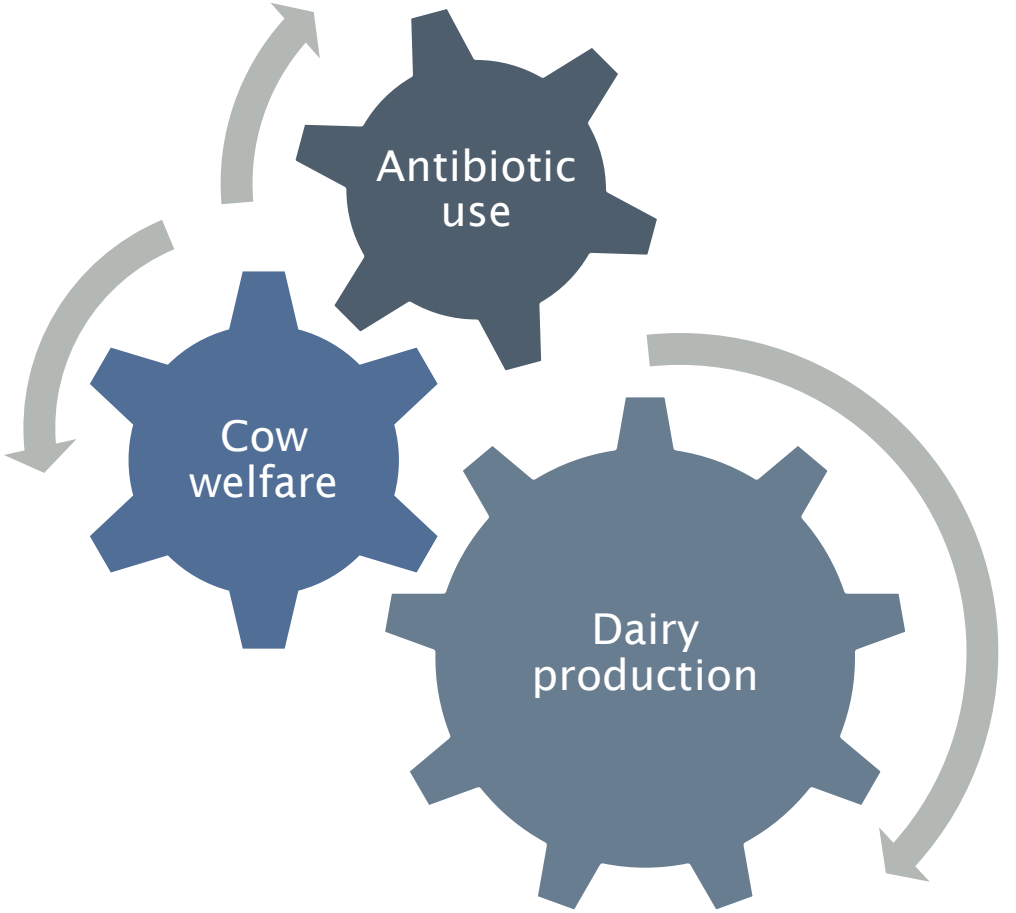
***Binominal Generalized Linear Mixed Model**

Antibiotic use and resistance at herd-level

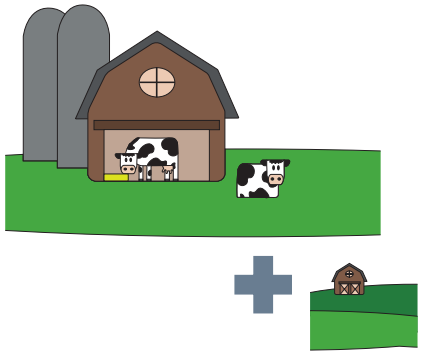


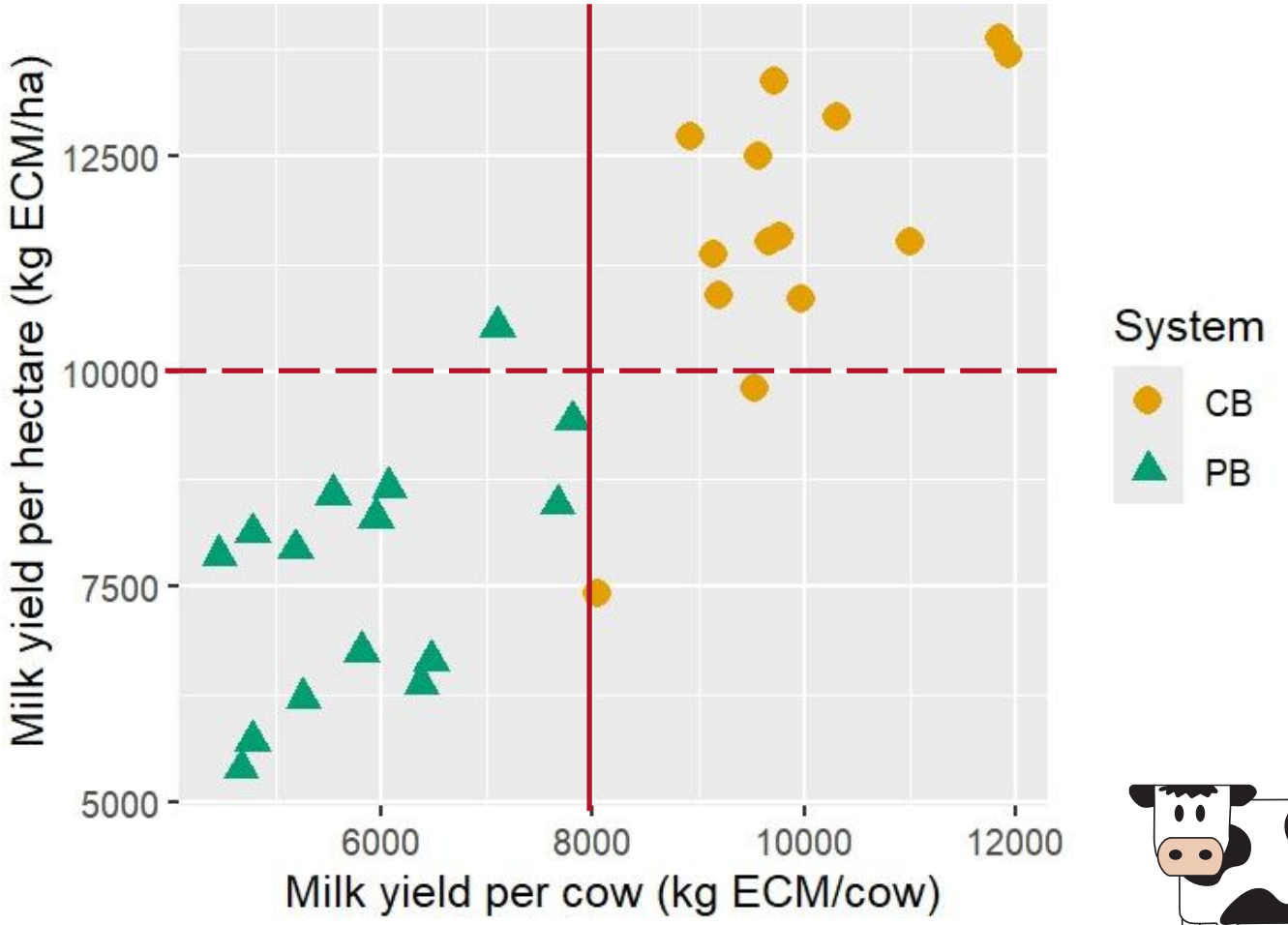


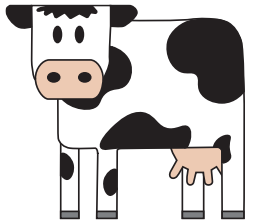
Considering differences due to the management system…



Same product, but contrasting strategies for milk production

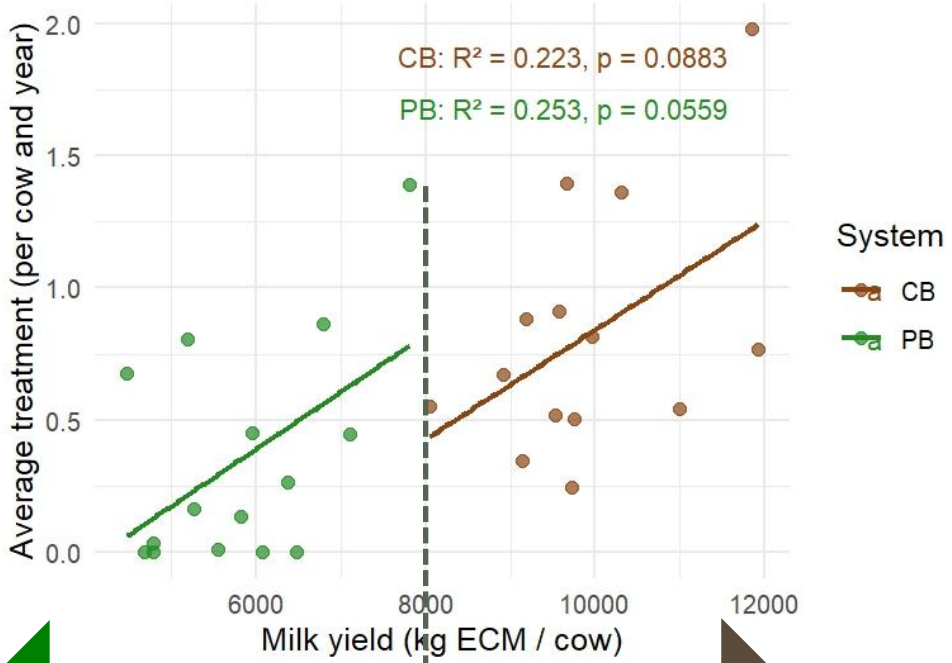






Dairy production – Breeding strategy

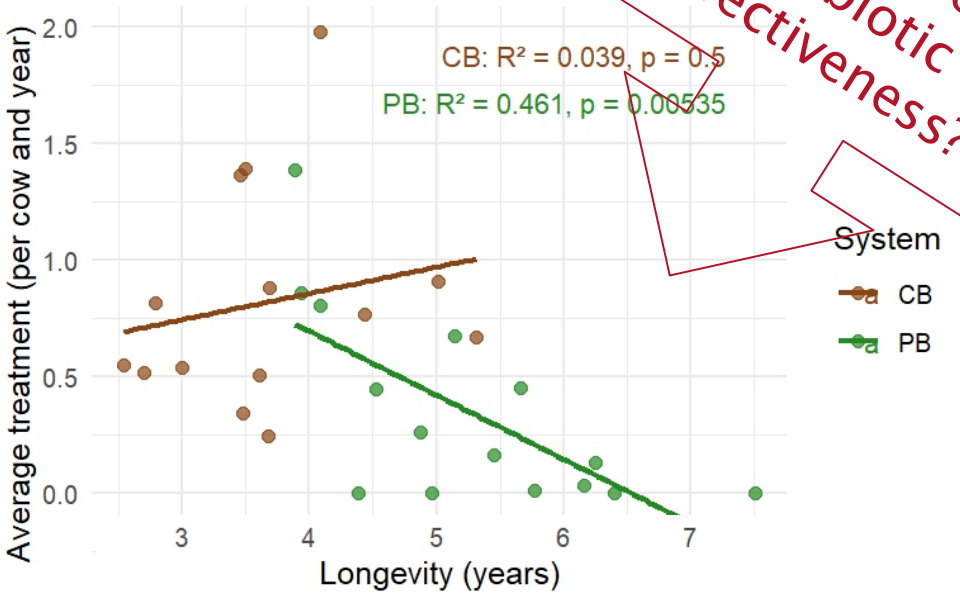
Milk yield per cow



MY per hectare
OB, JE, Kiwi, SF, F1

MY per cow
HO, RH, BS, F1

Longevity



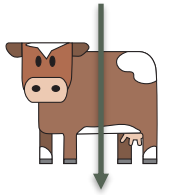
Can milk production be maintained with a 10% reduction in antibiotic effectiveness?

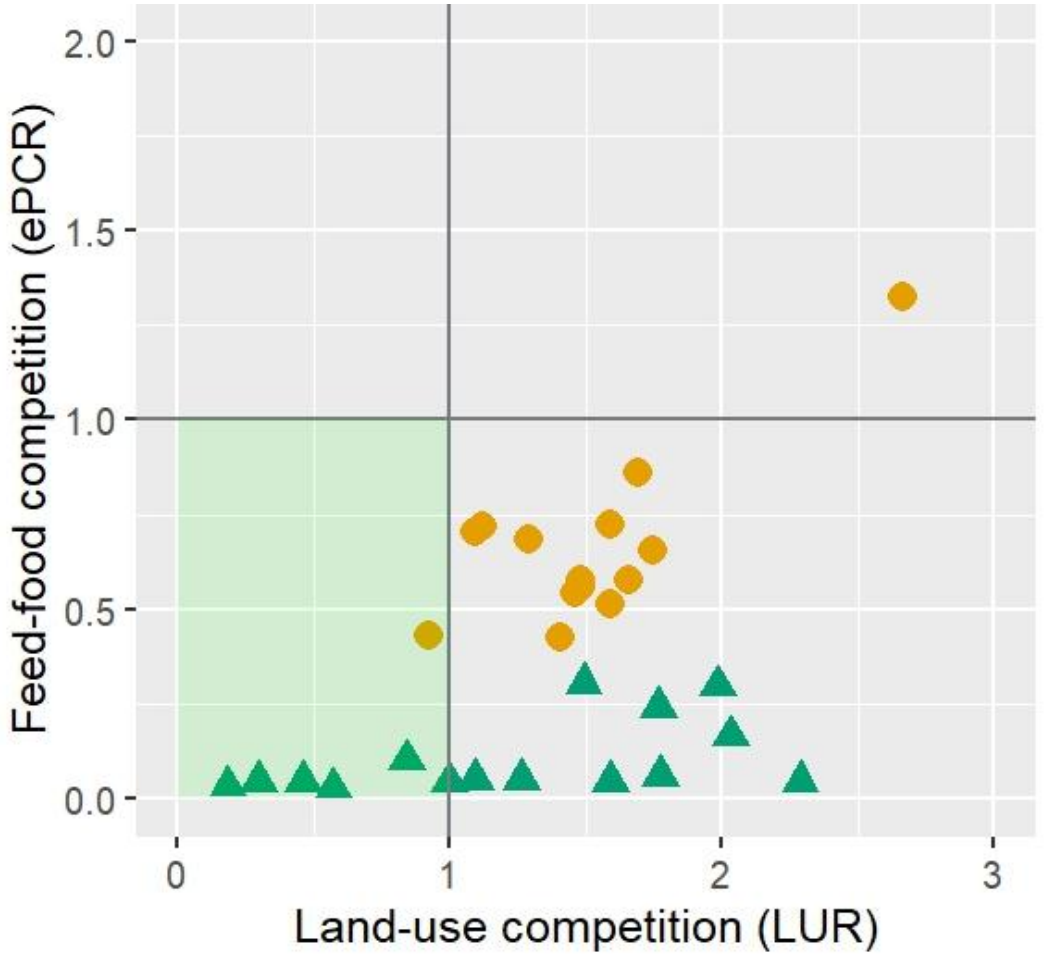
"easy-care"

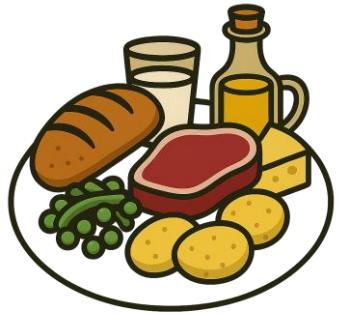
Cows for meat

Calves (>120d) for beef

Dairy - Human competition or protein producer?





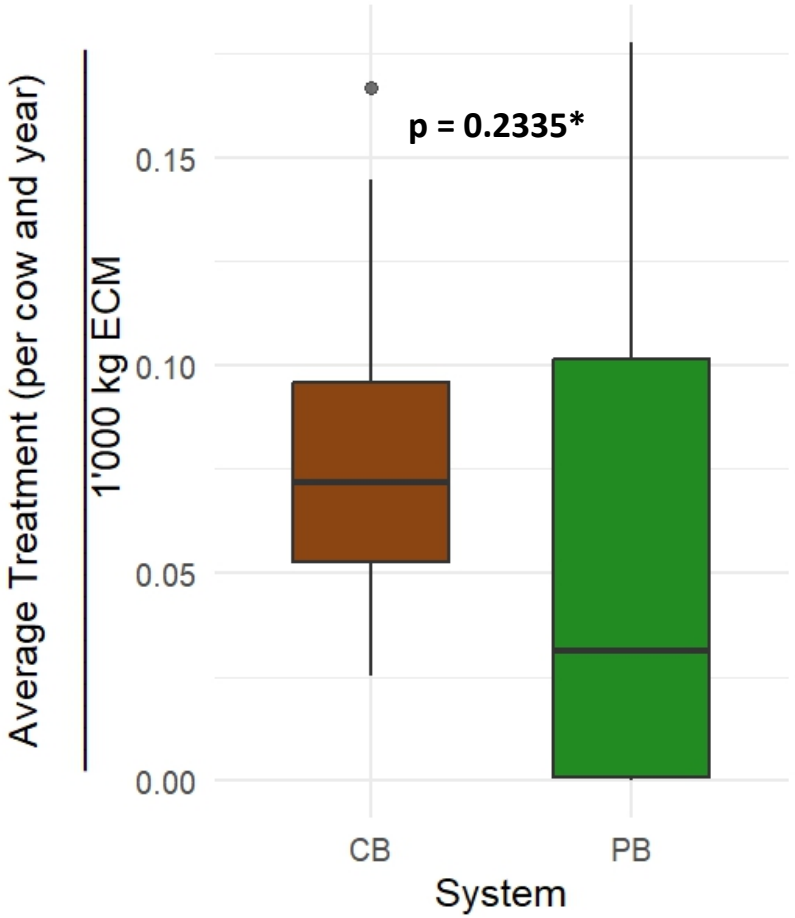


Human-edible crude protein

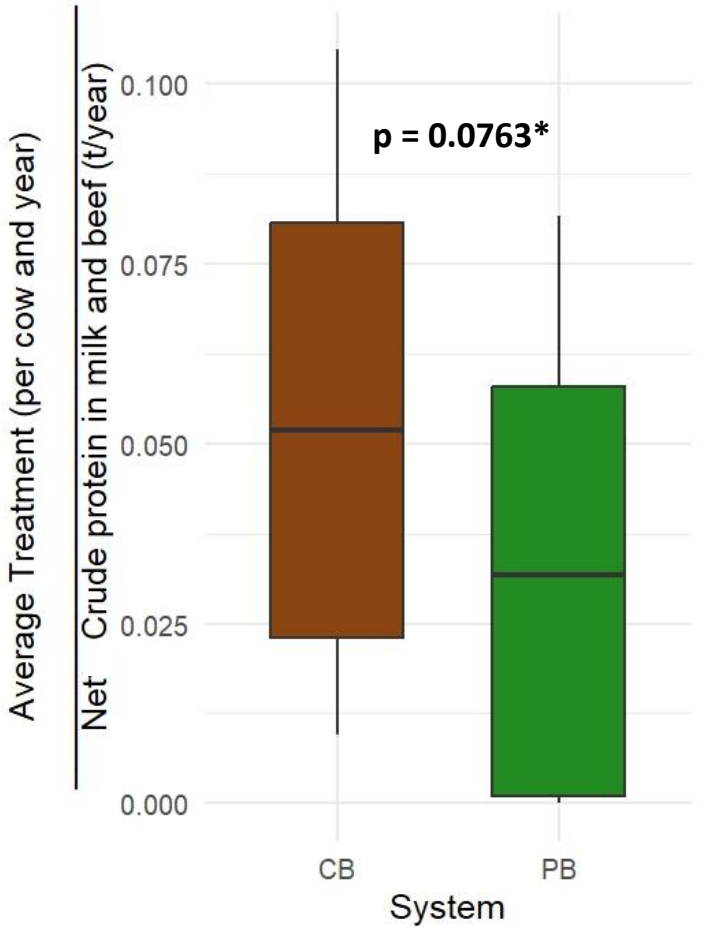
Considering herd productivity?

Net-Crude Protein Production =
Human-edible crude protein in milk and meat –
human-edible crude protein in feed ration

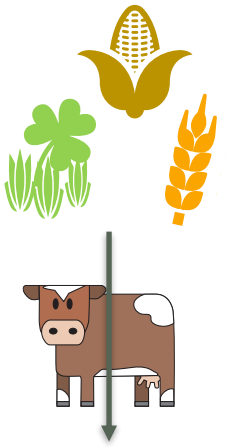
Treatments per 1’000 kg ECM



Net-Crude Protein production



“Feed – no Food”



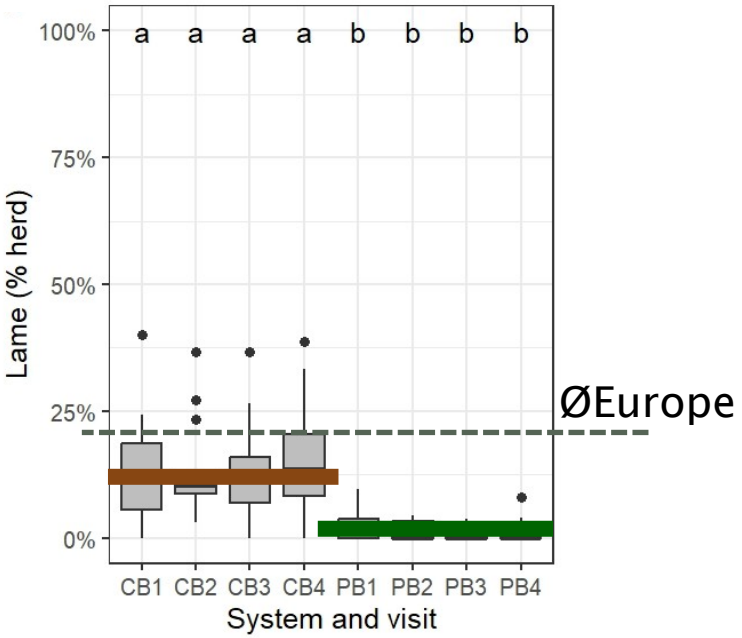
Cows
&
surplus calves (21d)

*Welch Two Sample t-test

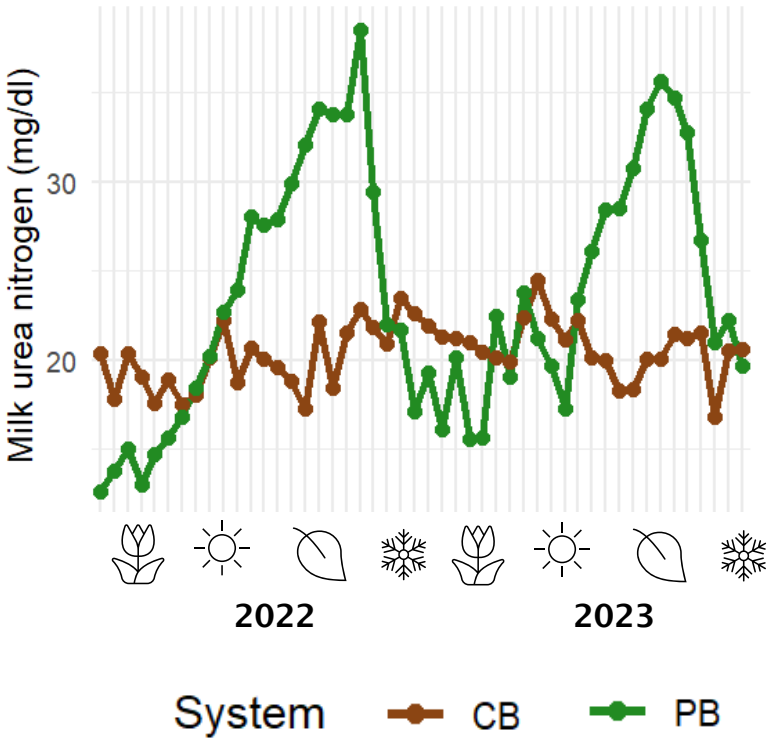
Considering dairy welfare or milk quality?

Cow size vs. cubicle size

Lameness



Milk urea nitrogen



Conclusions

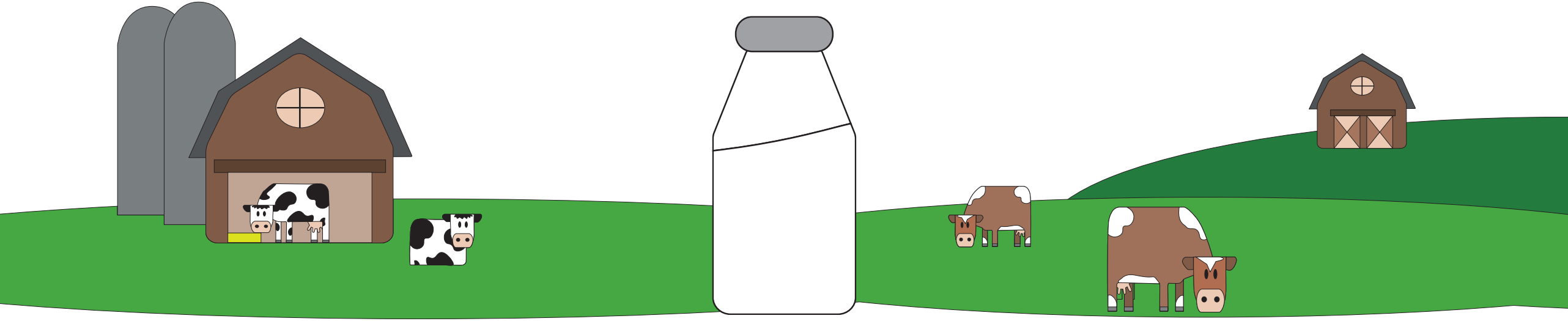
Antibiotic use

- Do not compare antibiotic use on dairy farms without knowing the management system…
- Costs of high animal welfare and milk quality standards?

Antibiotic resistance situation

- Preparations containing gentamicin may lose effectiveness.
- Longevity of CB dairy cows could be dramatically reduced with a reduced effectivness of antibiotics.

Thanks, open for questions



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30 dairy farms

pemol baumann stiftung

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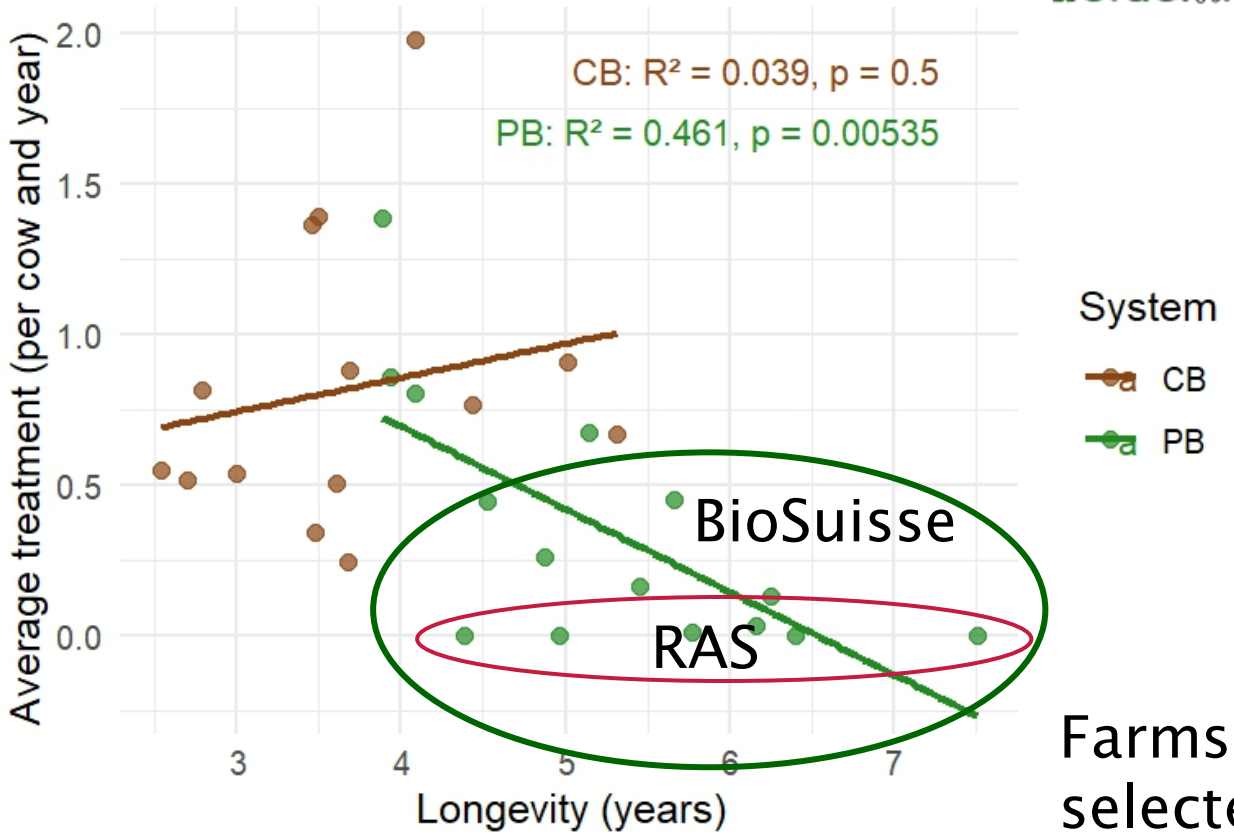
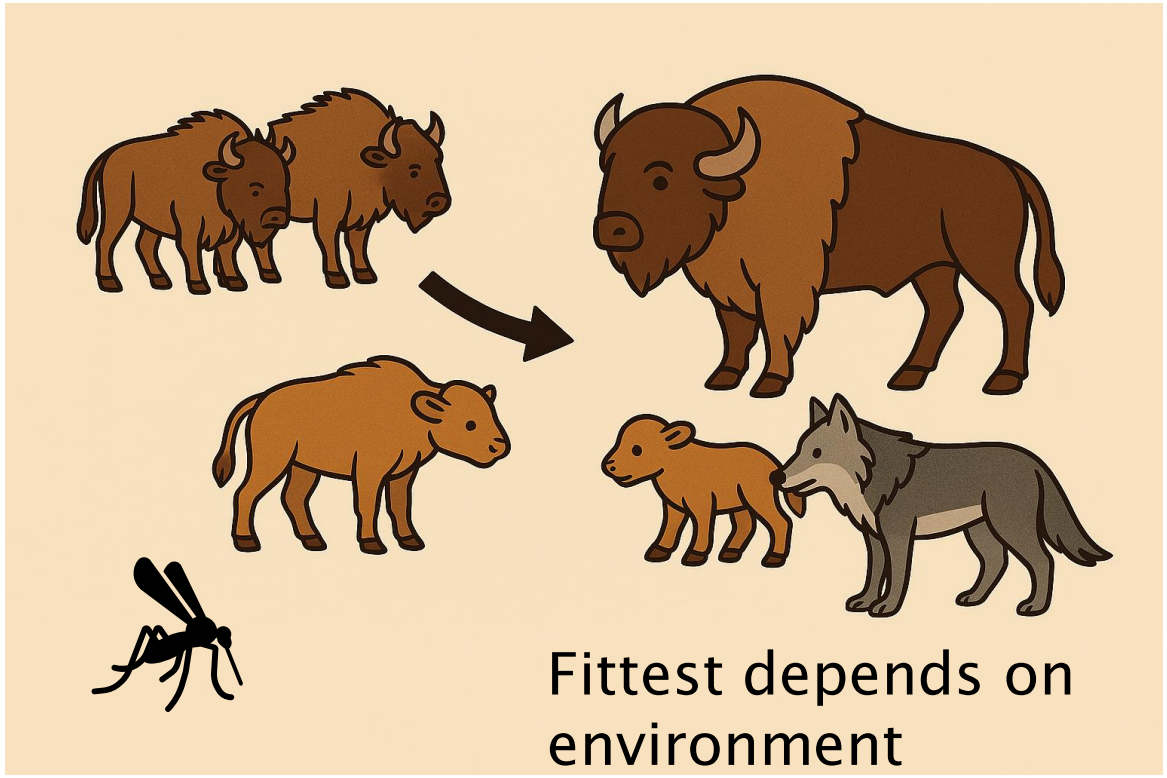
Pasture-based strategy fits with organic milk production



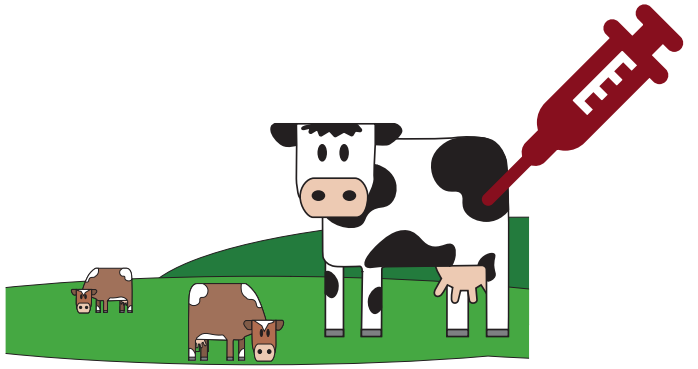
Farms were selected due to two other projects within the PhD

RAS – milk production
Selection of the fittest, as a breeding strategy

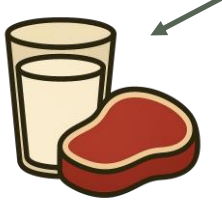
Survival of the fittest



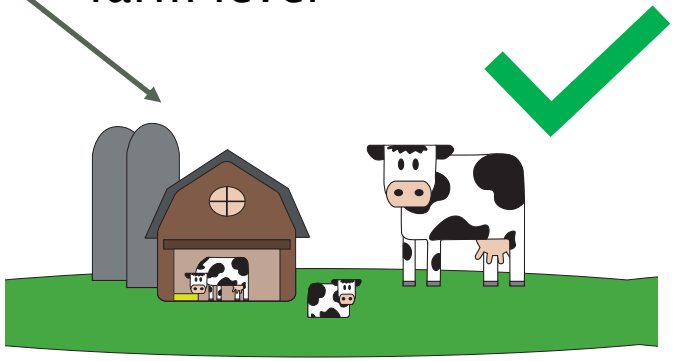
Fittest at farm-level



Antibiotic treatment
=
Selection



"Being the fittest" at farm-level



It's not a "bad cow", she was in the wrong environment