



Comparison of native and commercial dairy cattle breeds on organic farms in different European countries

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Background

- › **recommendation in organic standards: “the choice of breeds should take account of their capacity to adapt to local conditions” (EC, 2007)**
- › **Local/native breeds may be better adapted to local, especially organic conditions characterized by**
 - › **stronger dependency on local fodder resources**
 - › **higher share of pasture based feeding systems**
 - › **less concentrate feeding**
 - › **more restrictive regulations on medicine use**

Gap: little hard data supporting such claim

Aim:

- › **Compare local ↔ commercial dairy cattle breeds on organic farms → give recommendations**

Traits evaluated

- › Countries: **A (BOKU), CH (FiBL), PL (NRIAP), DE (UniKassel), SE (SLU)**
- › period: **1.7.2011-30.6.2014**

› **Data:**

| | | | | | | |
|----------------------------|---------------------|--------------------------------|------------------|-----------------------|----------------|---------------------|
| Production traits | Milk (kg) | Fat (kg, %) | Protein (kg, %) | Lifetime production | | |
| Functional traits | Somatic cell counts | Metabolic disorder risks (FPQ) | Fertility traits | Lactation persistency | Treatment data | Productive lifespan |
| Conformation traits | Height | Foot angles | Rear leg set | | | |

- › **Unbalanced data across countries, e.g. treatment records**

Breeds involved: Switzerland and Austria



↙ ↘
 $n_{CH}=445$

$n_A \sim 2.600$

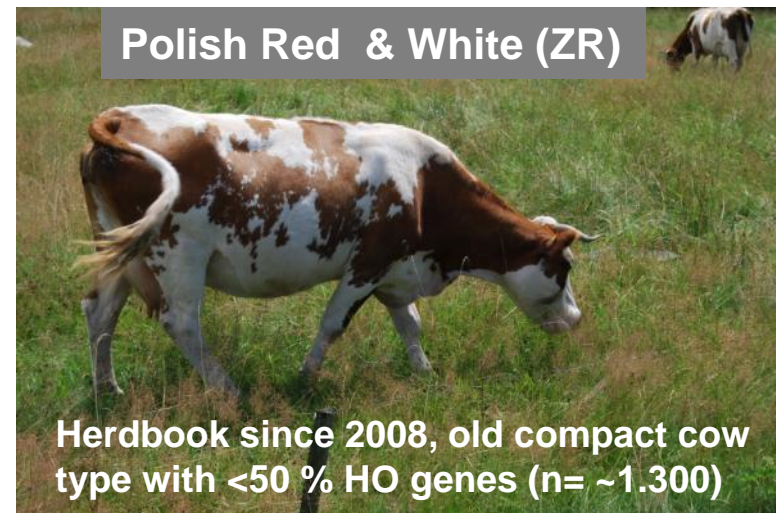


$n_{CH} \sim 3.500$



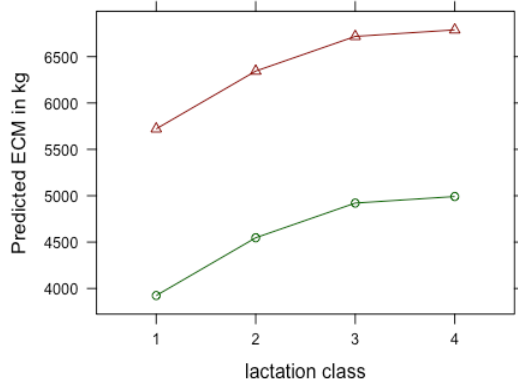
$n_{CH} \sim 41.000$
 $n_A \sim 16.200$

Breeds involved: Poland

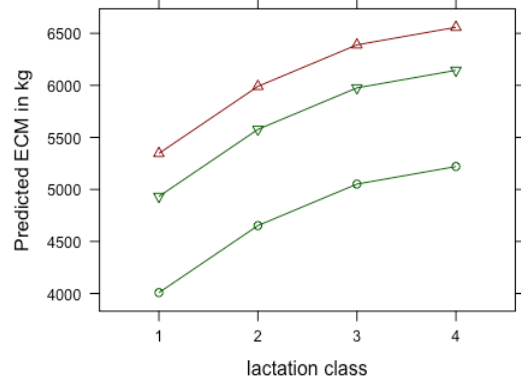


Estimation of ECM (kg) by breed and lactation class

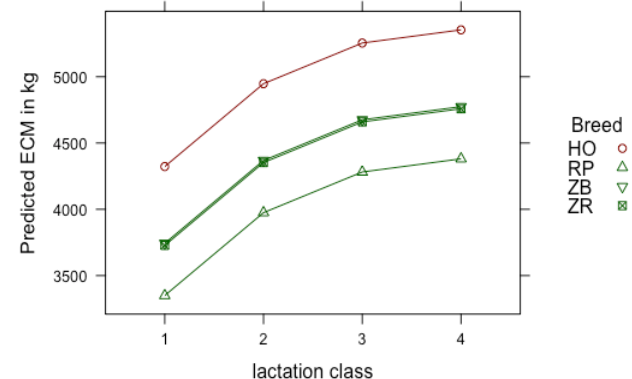
Austrian data



Swiss data



Polish data



Breed contrasts of estimated ECM yield (kg)

| Breed contrasts | ECM (kg) | SE | p |
|-----------------|----------|------|---------|
| AL - BV | -1.797 | 71.9 | < .0001 |

n: AL= 2.624, BV=16.207

| Breed contrasts | ECM (kg) | SE | p |
|-----------------|----------|------|---------|
| AL - BV | -1.338 | 82.4 | < .0001 |
| AL - OB | -924 | 85.5 | < .0001 |
| BV - OB | +413 | 28.6 | < .0001 |

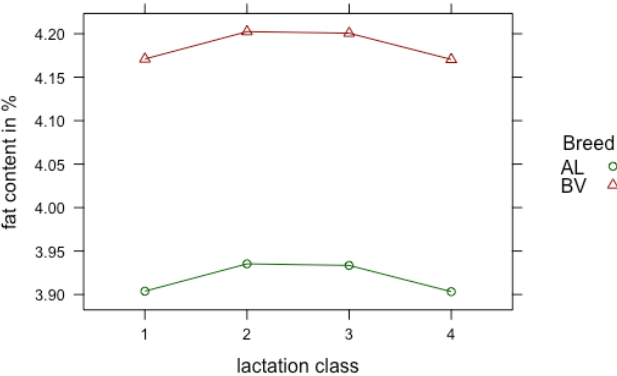
n: AL= 445, BV=41.127, OB= 3.528

| Breed contrasts | ECM (kg) | SE | p |
|-----------------|----------|-------|---------|
| HO - RP | +973 | 98.4 | < .0001 |
| HO - ZB | +579 | 105.7 | < .0001 |
| HO - ZR | +595 | 108.0 | < .0001 |
| RP - ZB | -394 | 136.8 | 0.0211 |
| RP - ZR | -378 | 88.3 | 0.0001 |
| ZB - ZR | +15 | 145.3 | n.s. |

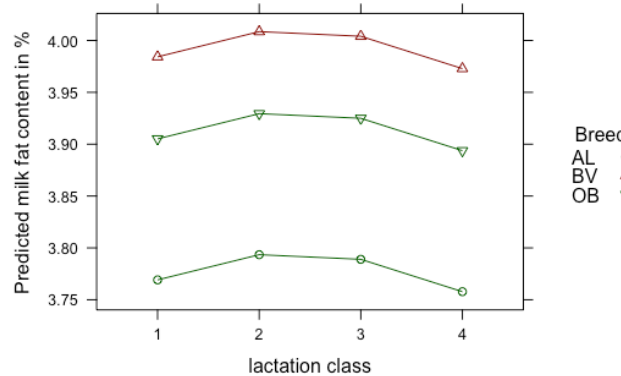
n: HO= 2.349, RP=1117, ZB=589, ZR=1.248

Fat content estimation by breed and lactation class

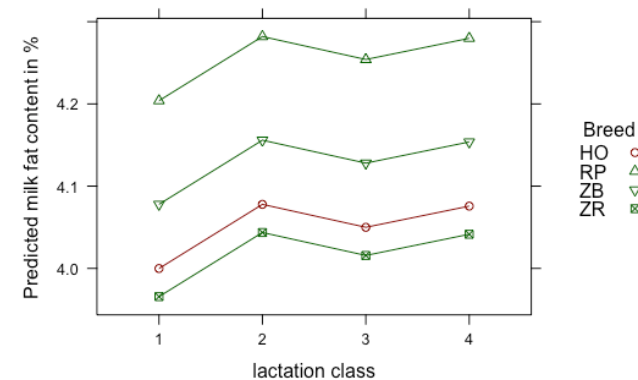
Austrian data



Swiss data



Polish data



Breed contrasts of estimated milk fat content (%)

| Breed contrasts | fat (%) | SE | p |
|-----------------|---------|------|--------------------|
| AL - BV | -0.23 | 0.02 | < 0.0001 |

n: AL= 2.624, BV=16.207

| Breed contrasts | fat (%) | SE | p |
|-----------------|---------|------|--------------------|
| AL - BV | -0.22 | 0.03 | < 0.0001 |
| AL - OB | -0.14 | 0.03 | 0.0001 |
| BV - OB | 0.08 | 0.01 | < 0.0001 |

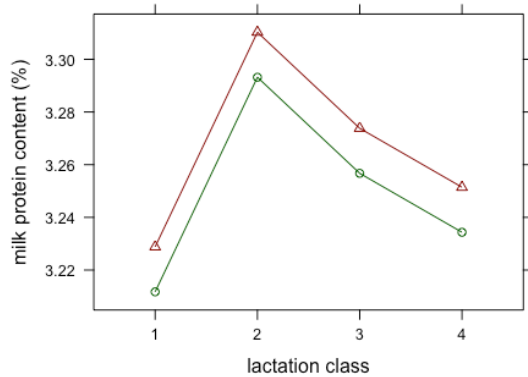
n: AL= 445, BV=41.127, OB= 3.528

| Breed contrasts | fat (%) | SE | p |
|-----------------|---------|------|--------------------|
| HO - RP | -0.20 | 0.04 | < 0.0001 |
| HO - ZB | -0.08 | 0.05 | n.s. |
| HO - ZR | 0.03 | 0.05 | n.s. |
| RP - ZB | 0.13 | 0.06 | n.s. |
| RP - ZR | 0.23 | 0.04 | < 0.0001 |
| ZB - ZR | 0.11 | 0.07 | n.s. |

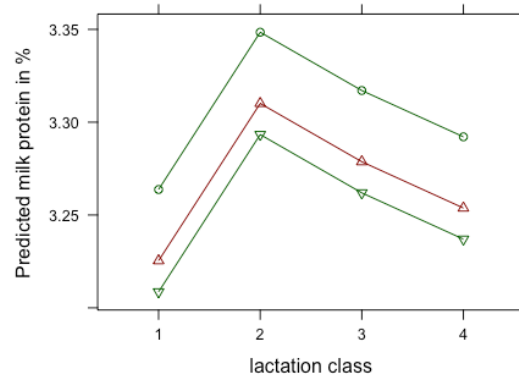
n: HO= 2.349, RP=1117, ZB=589, ZR=1.248

Protein content estimation by breed and lactation class

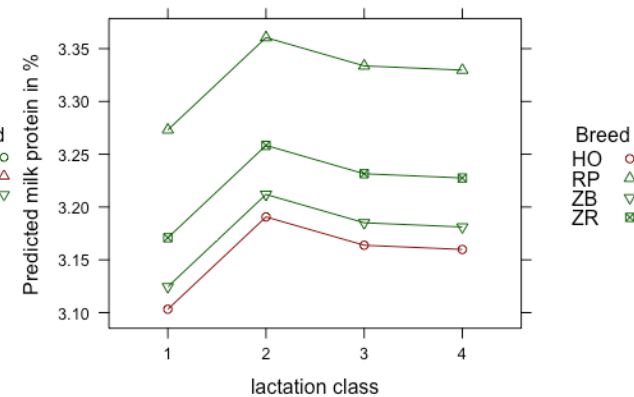
Austrian data



Swiss data



Polish data



Breed contrasts of estimated milk protein content (%)

| Breed contrasts | protein (%) | SE | p |
|-----------------|-------------|------|------|
| AL - BV | -0.02 | 0.01 | n.s. |

n: AL= 2.624, BV=16.207

| Breed contrasts | protein (%) | SE | p |
|-----------------|-------------|------|---------------|
| AL - BV | 0.04 | 0.02 | n.s. (!) |
| AL - OB | 0.06 | 0.02 | 0.0072 |
| BV - OB | 0.02 | 0.01 | 0.0251 |

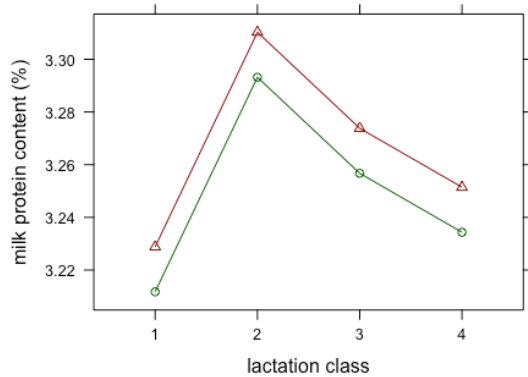
n: AL= 445, BV=41.127, OB=3.528

| Breed contrasts | protein (%) | SE | p |
|-----------------|-------------|------|--------------------|
| HO - RP | -0.17 | 0.02 | < 0.0001 |
| HO - ZB | -0.02 | 0.02 | n.s. |
| HO - ZR | -0.07 | 0.02 | 0.0058 |
| RP - ZB | 0.15 | 0.03 | < 0.0001 |
| RP - ZR | 0.10 | 0.02 | < 0.0001 |
| ZB - ZR | -0.05 | 0.03 | n.s. |

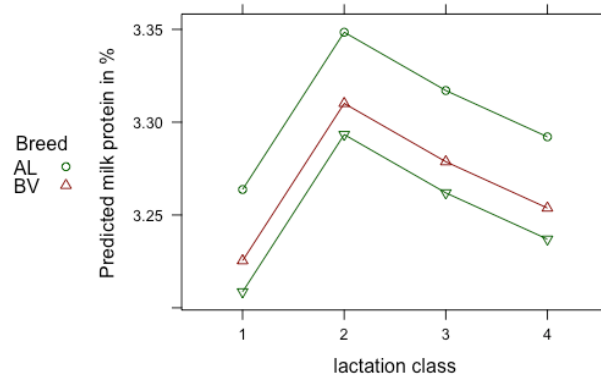
n: HO= 2.349, RP=1117, ZB=589, ZR=1.248

Protein content estimation by breed and lactation class

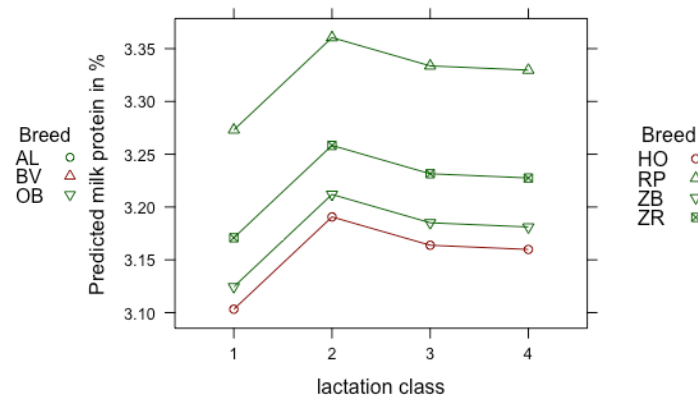
Austrian data



Swiss data



Polish data



Breed contrasts of estimated milk protein content (%)

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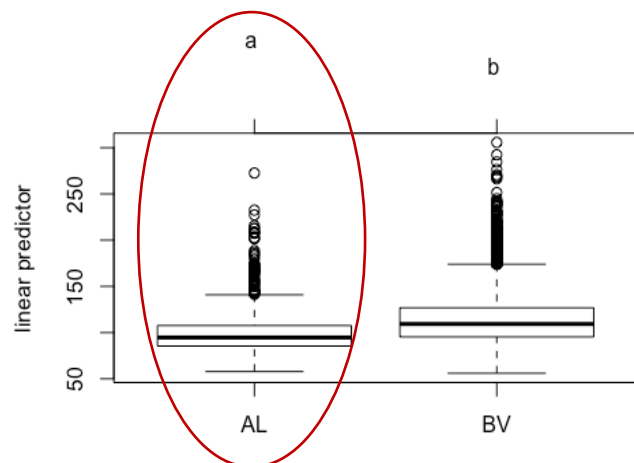
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| HO - ZR | -0.07 | 0.02 | 0.0058 |
| RP - ZB | 0.15 | 0.03 | < 0.0001 |
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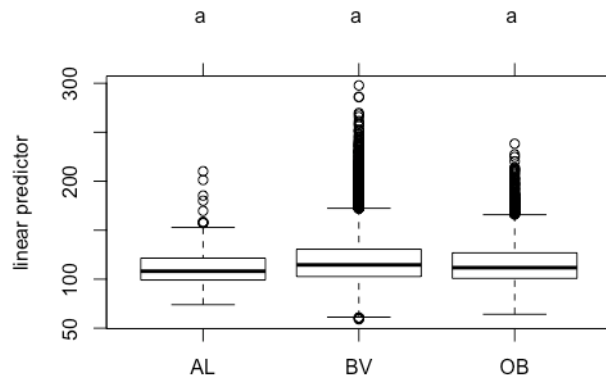
n: HO= 2.349, RP=1117, ZB=589, ZR=1.248

Estimation of days open by breed

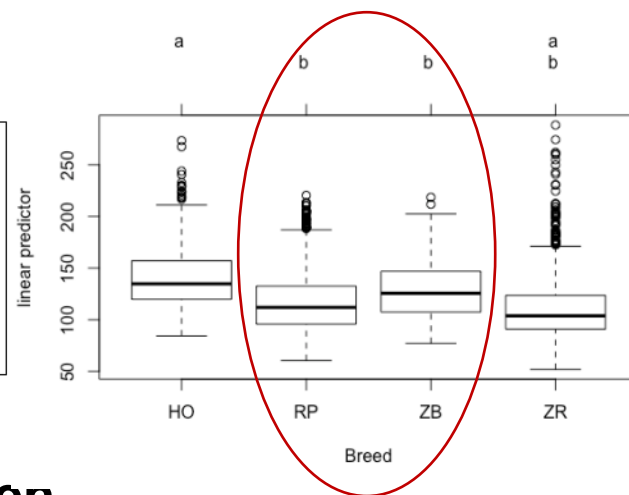
Austrian data



Swiss data



Polish data



Breed contrasts of days open

| Breed contrasts | Days open | SE | p |
|-----------------|-----------|------|--------------------|
| AL - BV | -19.27 | 3.23 | < 0.0001 |

n: AL= 1.282, BV= 6.627

| Breed contrasts | Days open | SE | p |
|-----------------|-----------|------|------|
| AL - BV | -4.29 | 5.43 | n.s. |
| AL - OB | -1.85 | 5.69 | n.s. |
| BV - OB | 2.43 | 1.99 | n.s. |

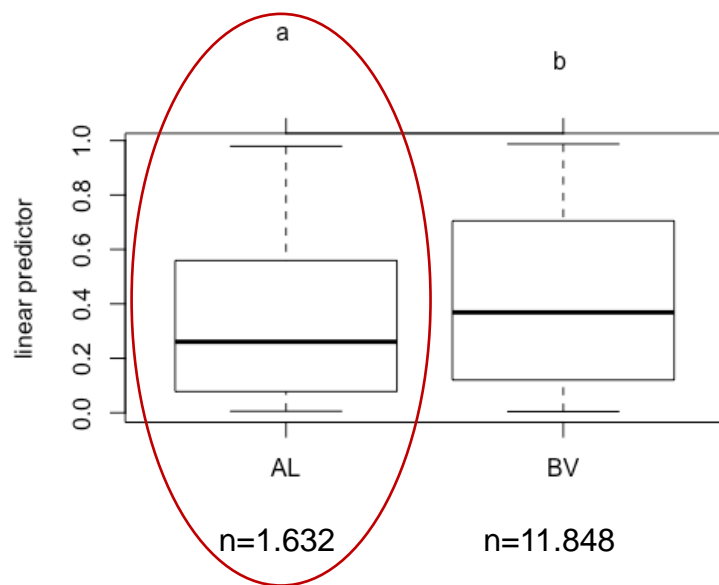
n: AL= 395, OB= 3.401, BV= 39.335

| Breed contrasts | Day open | SE | p |
|-----------------|----------|-------|---------------|
| HO - RP | +20.08 | 7.39 | 0.0309 |
| HO - ZB | +23.31 | 8.51 | 0.0292 |
| HO - ZR | +17.21 | 8.12 | n.s. |
| RP - ZB | +3.24 | 9.84 | n.s. |
| RP - ZR | -2.87 | 5.61 | n.s. |
| ZB - ZR | -6.10 | 10.45 | n.s. |

n: HO= 1.986, RP=1.330, ZB=553, ZR=1.506

Estimated proportions of test day records with >100.000 somatic cells per ml milk by breed

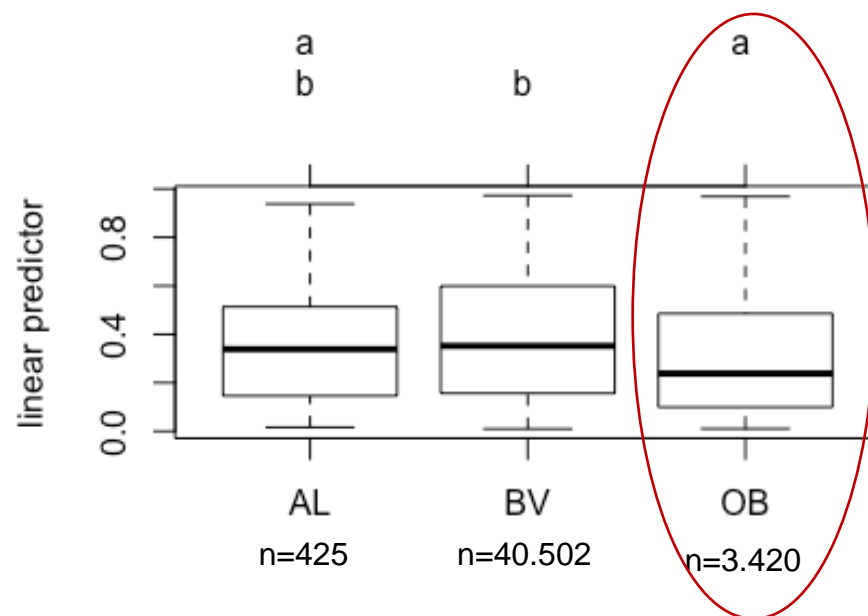
Austrian data



Odds ratio

BV / AL: 1.78 (CI: 1.41-2.25)

Swiss data



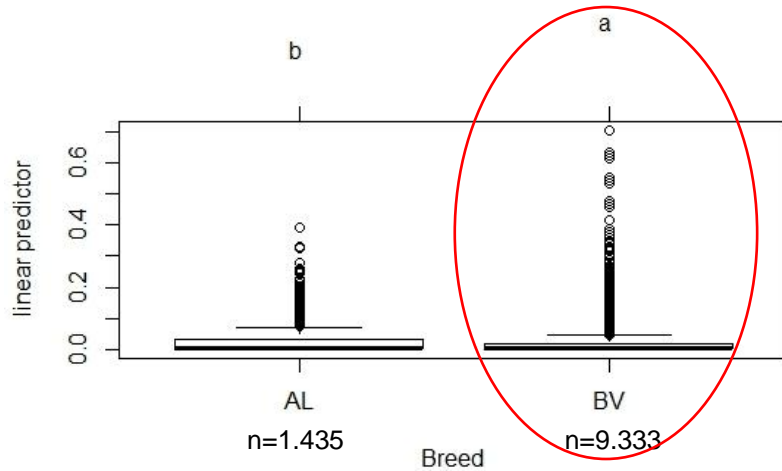
Odds ratio

BV / AL: 1.29 (CI: 0.97-1.71)

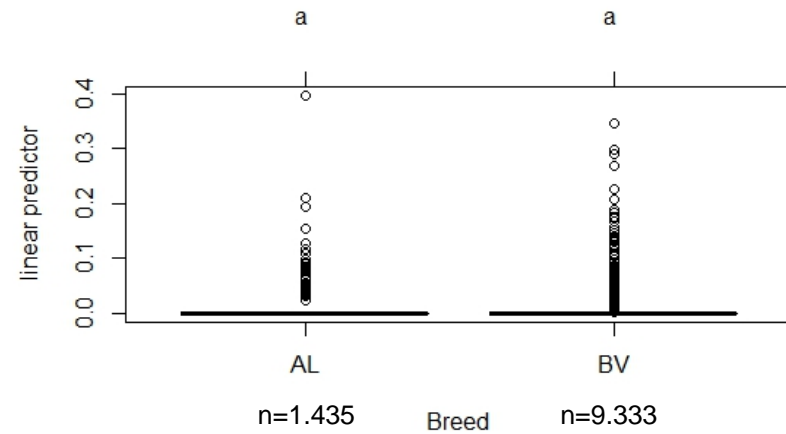
OB / AL: 0.82 (CI: 0.61-1.10)

Treatment data: Austria

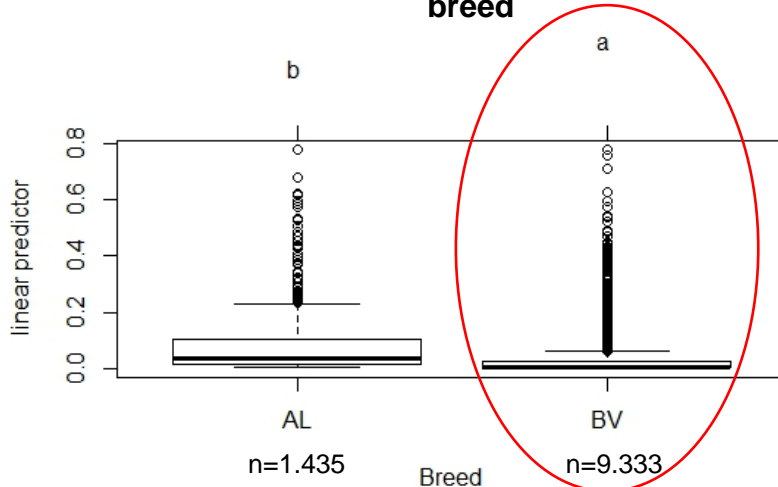
Estimation of udder treatments by breed



Estimation of leg and claw treatments by breed



Estimation of fertility treatments by breed

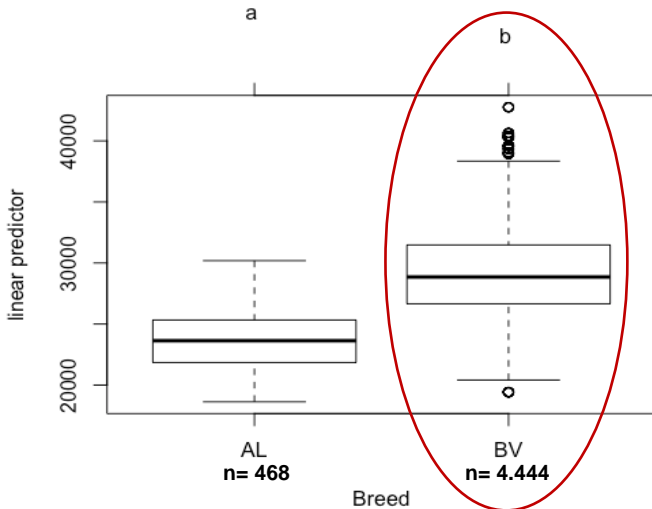


| Treatments of | Odds ratio (BV) | Confidence interval | p |
|---------------|-----------------|---------------------|---------|
| udder | 0.52 | 0.31 - 0.87 | 0.013 |
| leg/ claw | 0.85 | 0.29 - 2.53 | n.s. |
| fertility | 0.16 | 0.10 - 0.25 | <0.0001 |

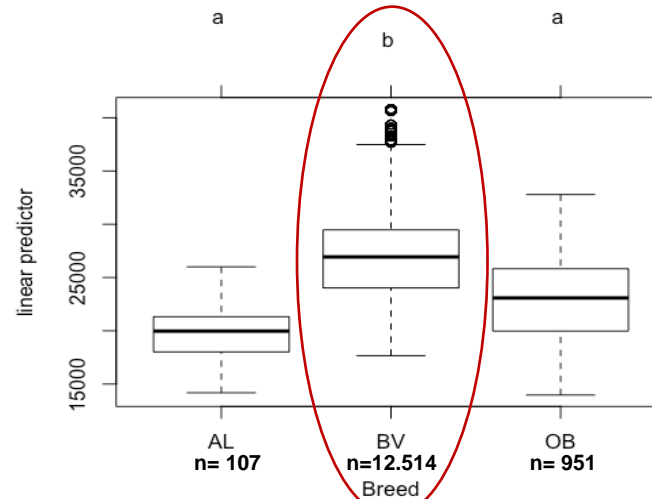
Lifetime production and productive lifespan

Lifetime production

Austria

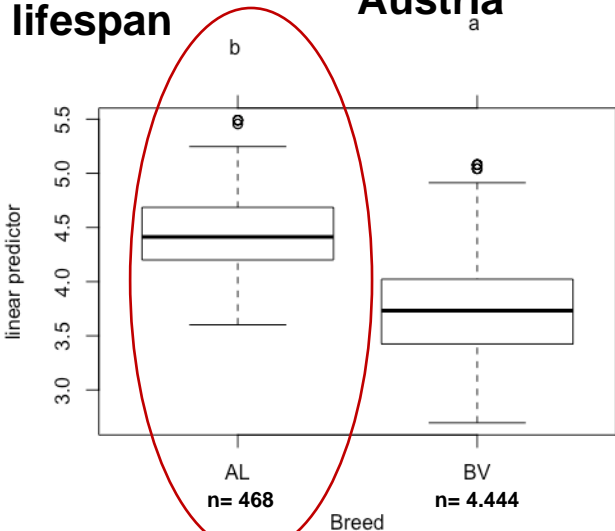


Switzerland

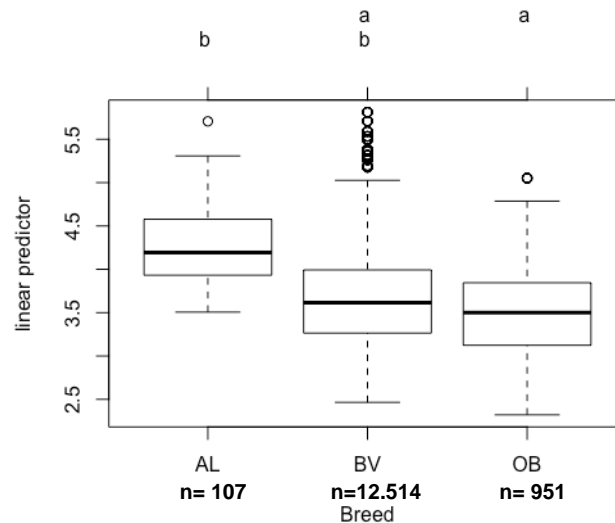


Productive lifespan

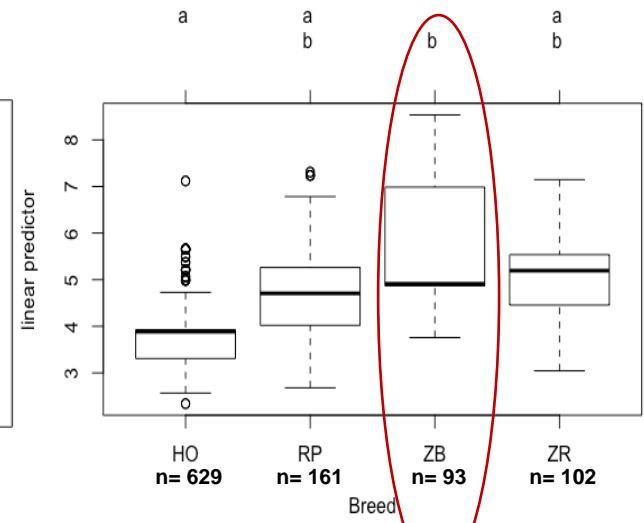
Austria



Switzerland



Poland



Summary

- › **Production: commercial breeds higher except for content traits**
- › **Fertility: either no differences or local breeds slightly better (Austria)**
- › **Health: conflicting results w.r.t. SCC (local breeds better) and treatment data**
- › **Productive lifespan: tends to be higher in local breeds**
- › **Lifetime production: higher in commercial breeds**

**We gratefully acknowledge funding from
CORE Organic Plus
within the OrganicDairyHealth project.**



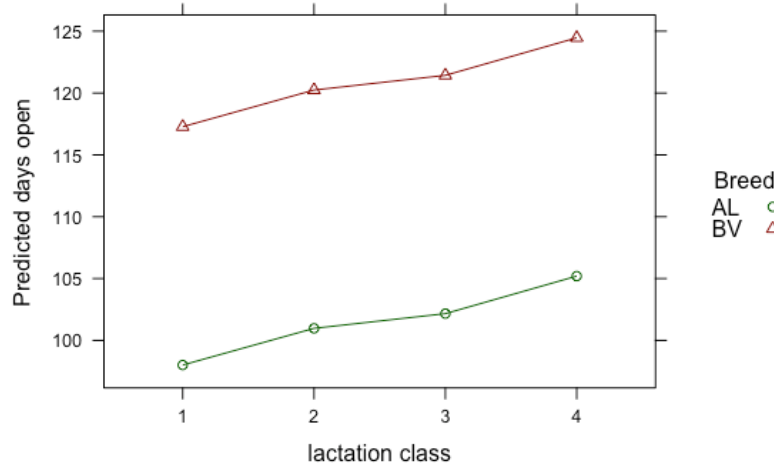
Thank you for your attention

Data analysis

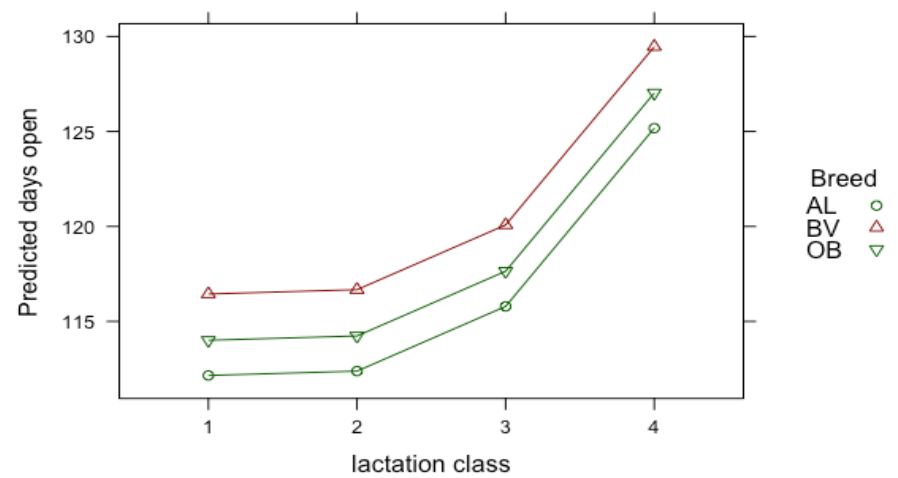
- › **Software: R (version 3.2.3)**
- › **Continuous outcome variables: Linear mixed models for repeated measurements**
- › **categorical, binary outcome variables: Logistic regression models for repeated measurements**
- › **Random effects: cow nested within herd**
- › **Fixed effects: breed, lactation number (1,2,3,>=4), calving season, alpine pasture (YES, NO), production zone OR production altitude**

Estimation of days open by breed and lactation class

Austrian data



Swiss data



Breed contrasts of days open

| Breed contrasts | Days open | SE | p |
|-----------------|-----------|------|----------|
| AL - BV | -19.27 | 3.23 | < 0.0001 |

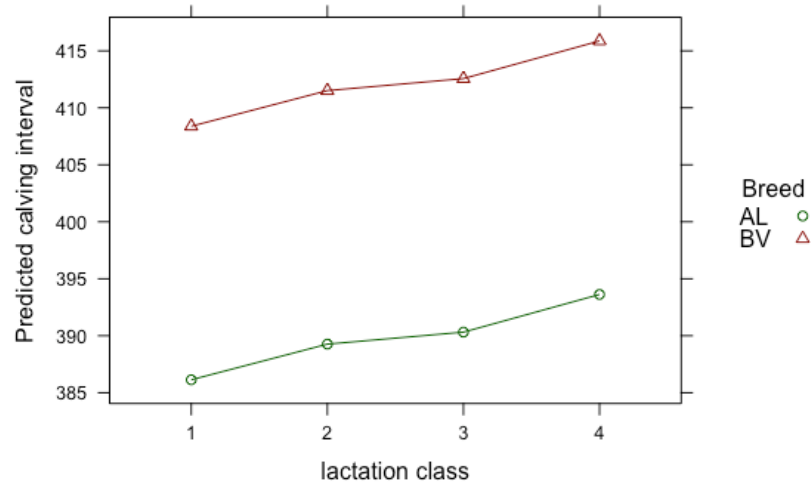
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| Breed contrasts | Days open | SE | p |
|-----------------|-----------|------|------|
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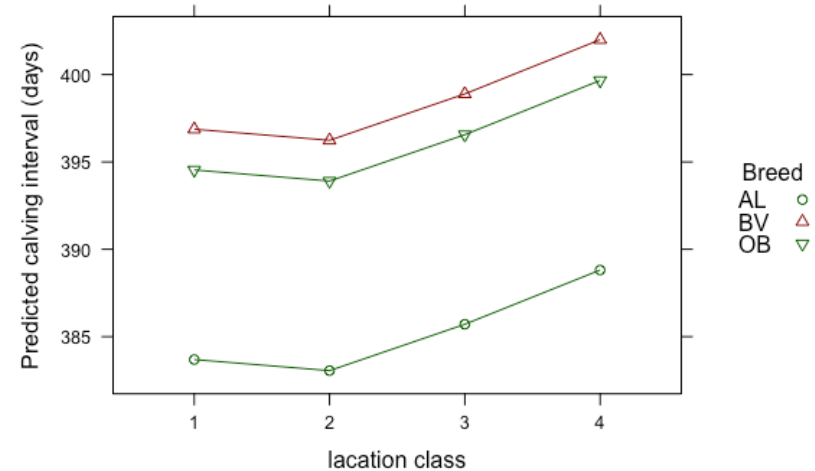
n: AL= 395, OB= 3.401, BV= 39.335

Estimation of calving interval by breed and lactation class

Austrian data



Swiss data



Breed contrasts of calving interval

| Breed contrasts | Calving interval | SE | p |
|-----------------|------------------|------|---------|
| AL - BV | -22.25 | 3.25 | <0.0001 |

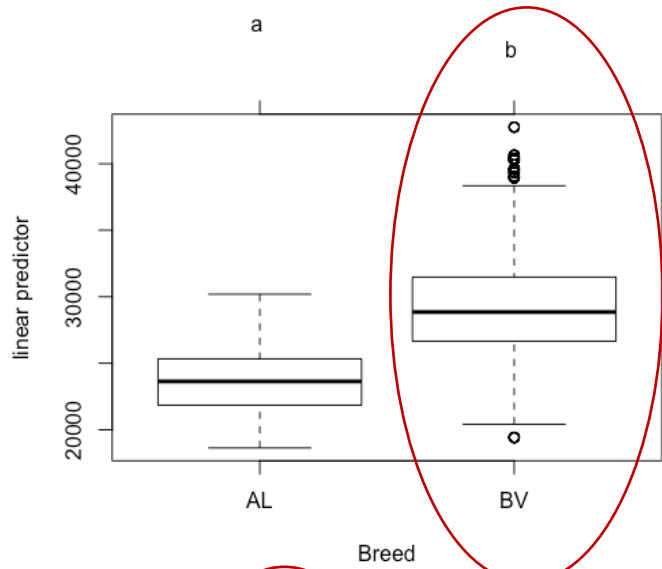
n: AL= 2.624, BV=16.207

| Breed contrasts | Calving interval | SE | p |
|-----------------|------------------|------|------|
| AL - BV | -13.18 | 5.82 | n.s. |
| AL - OB | -10.85 | 6.10 | n.s. |
| BV - OB | 2.33 | 2.06 | n.s. |

n: AL= 395, OB= 3.401, BV= 39.335

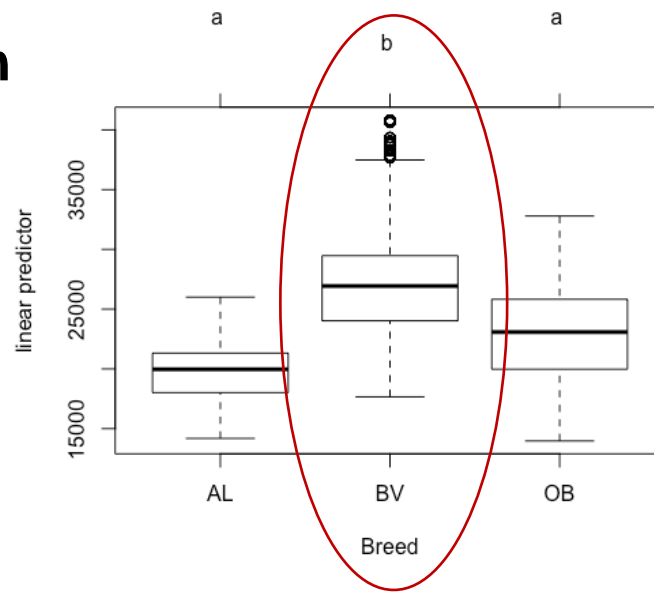
Lifetime production and productive lifespan

Austria



Lifetime production

Switzerland



Productive lifespan

