

# Heterogeneity in farmer preferences for breeding goal traits - effects of herd characteristics and production system

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Undersøgelsen er en del af Organic RDD 2-projektet SOBcows

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for landbrug



# Outline

- Introduction
- Materials and methods
- Holstein results
- RDM results
- Jersey results
- Conclusions

# Breeding goal

- Based on economic weights
- Farmer preferences
  - What do farmers want? → Ownership of the breeding goal

# This study

- Aim: To quantify preferences of Danish dairy farmers for breeding goal traits and associations to herd characteristics and production system.
- Hypothesis: Heterogeneity exists within farmers' preferences and herd characteristics and production system can be linked to farmers' choices for trait improvements.

# The survey

1000minds®

## Preferences survey

Please reveal your preferences by answering the following questions.

Question # 1

**Which of these two alternatives do you prefer?**

(given they're identical in all other respects)

Milk production

**+38 kg ECM per 305 days lactation**

Mastitis

**As in your herd today**

this one

OR

Milk production

**As in your herd today**

Mastitis

**5.3 less cases per 100 cows**

this one

they are equal

[skip this question for now »](#)

0% complete

Larger font for questions (easier to read)

# The survey

- Improvements are economically equal
- Based on economic weights of simulation study for an organic system

Trait	Holstein	RDM	Jersey	
Feed efficiency	0.010	0.010	0.010	kg ECM per feed unit
Milk production	38	35	33	kg ECM per 305 days lactation
Cow fertility	39	10	8	Additional pregnancies per 100 inseminations
Heifer fertility	11	11	13	Additional pregnancies per 100 inseminations
Calving difficulty	-8.2	-8.6	-8.5	Cases per 100 cows
Mastitis	-5.3	-5.0	-5.1	Cases per 100 cows
Other diseases	-10.1	-10.9	-8.6	Cases per 100 cows
Leg and claw diseases	-13.5	-13.9	-17.9	Cases per 100 cows
Calf mortality	-12	-64	-23	Dead heifer calves per 100 cows
Cow mortality	-1.8	-1.8	-1.7	Cases per 100 cows years

# The survey

- Organic and conventional farmers
- Breed specific survey
  - Holstein, RDM, Jersey



# General questions

- Herd characteristics
  - ECM, herd size, crossbreeding between dairy breeds, etc.
- For conventional (1: strongly agree; 5: strongly disagree)
  1. The choice of an optimal breeding strategy for my herd is important for the operational return in my herd.
  2. NTM is my primary criterion for choice of AI bulls.
  3. The present level for udder conformation among my cows fits my production system.



# General questions

- For conventional (1: strongly agree; 5: strongly disagree)
  4. The present level for feet and leg conformation among my cows fits my production system.
  5. The present level for body conformation among my cows fits my production system.
  6. Uniformity with regard to the cows' size is an important trait.

# Response

- Trait rankings per farmer (1 highest - 10 lowest)
- Number of respondents

Herds	Holstein	RDM	Jersey
Organic (48%)	106	29	27
Conventional (13%)	290	58	49
Total (16%)	396	87	76

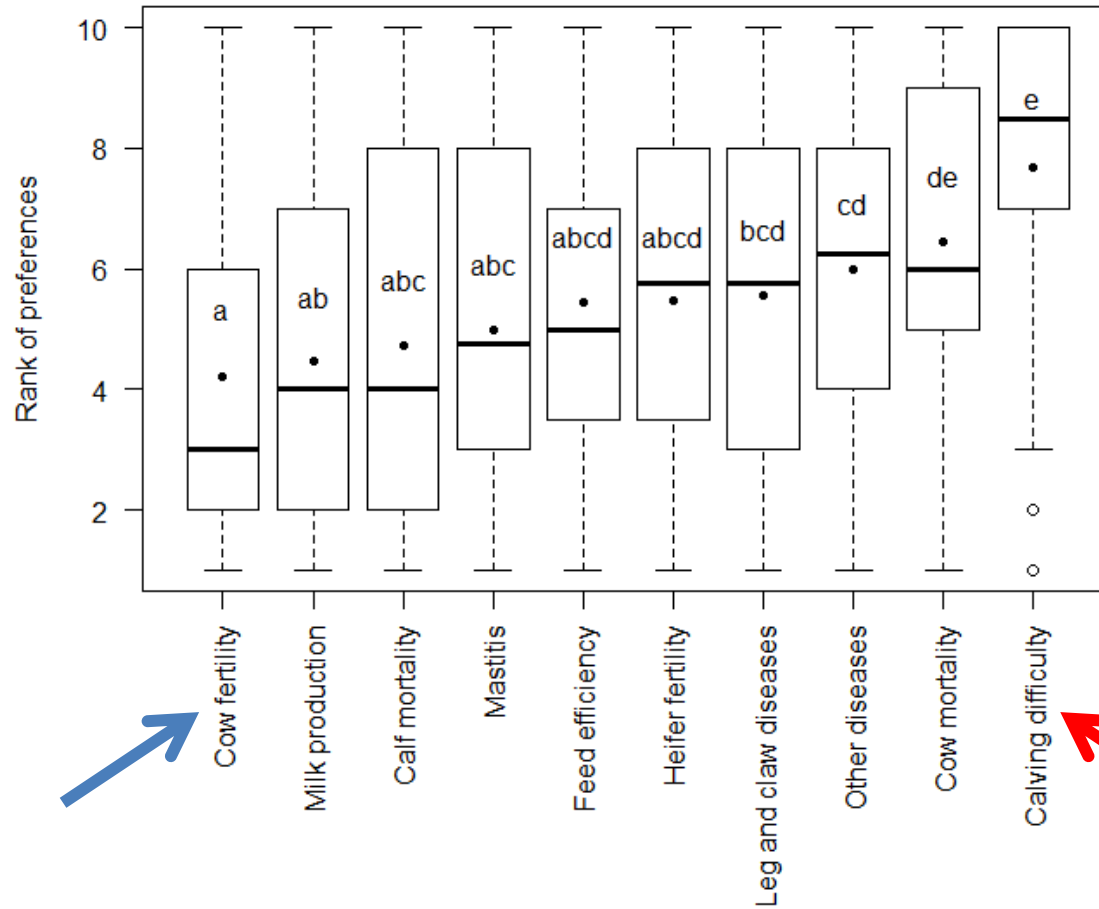
# Methods

- Friedman test for mean trait rank differences
- Principal component analysis
  - No evidence for reducing dimensions
- Cluster analysis
  - No. of clusters based on gain of inertia
- Differences between clusters
  - Kruskal-Wallis + Dunn's test for pairwise differences

# Holstein

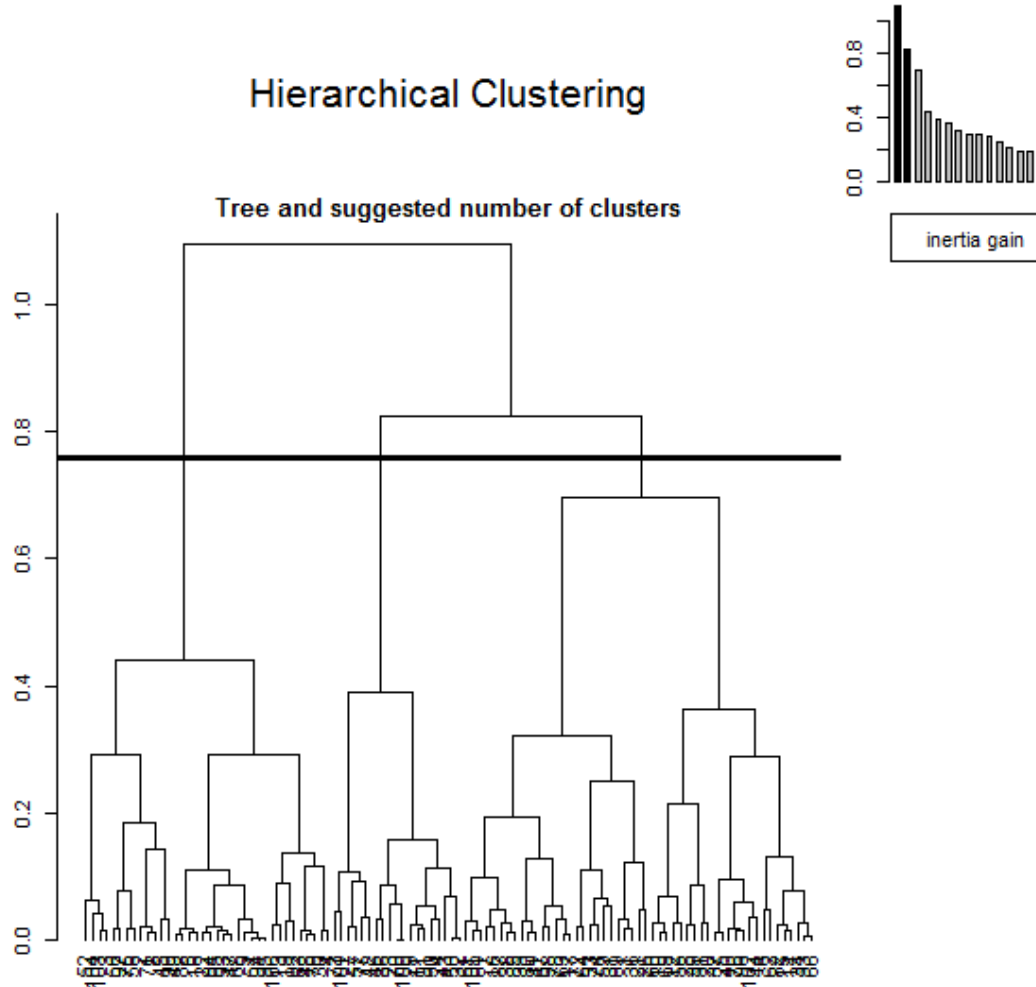


# Organic Holstein

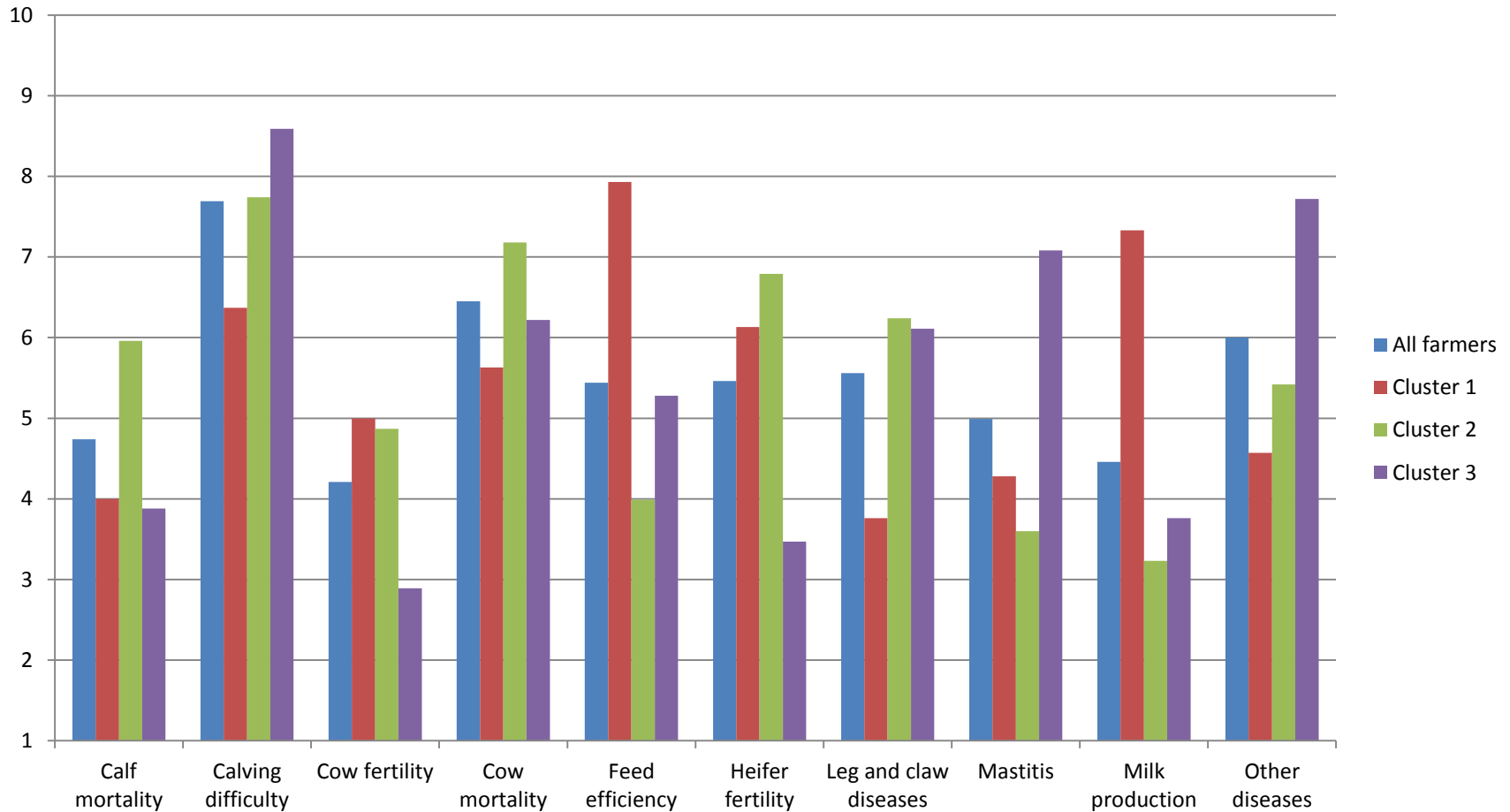


# Organic Holstein

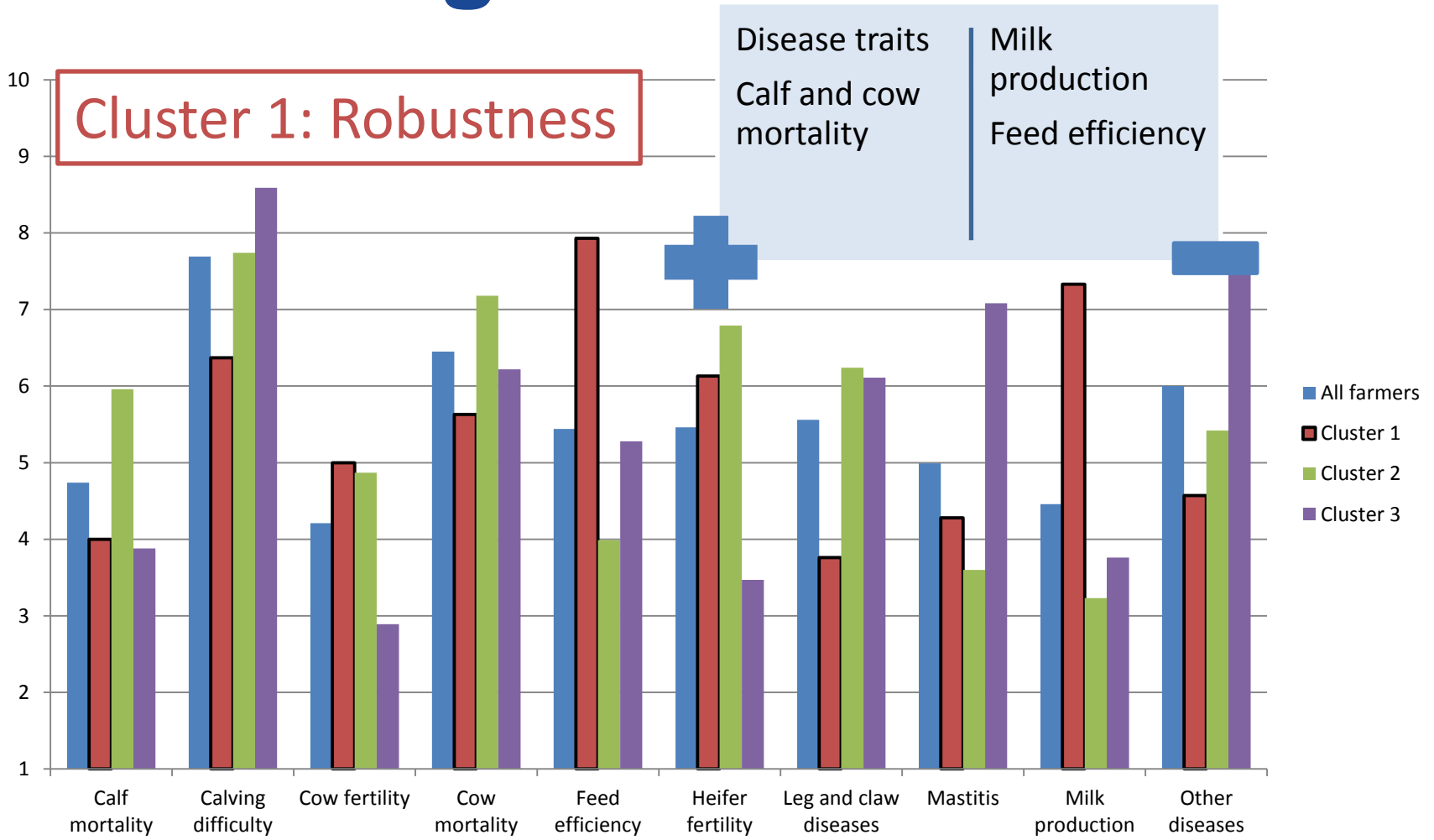
## Hierarchical Clustering



# Organic Holstein

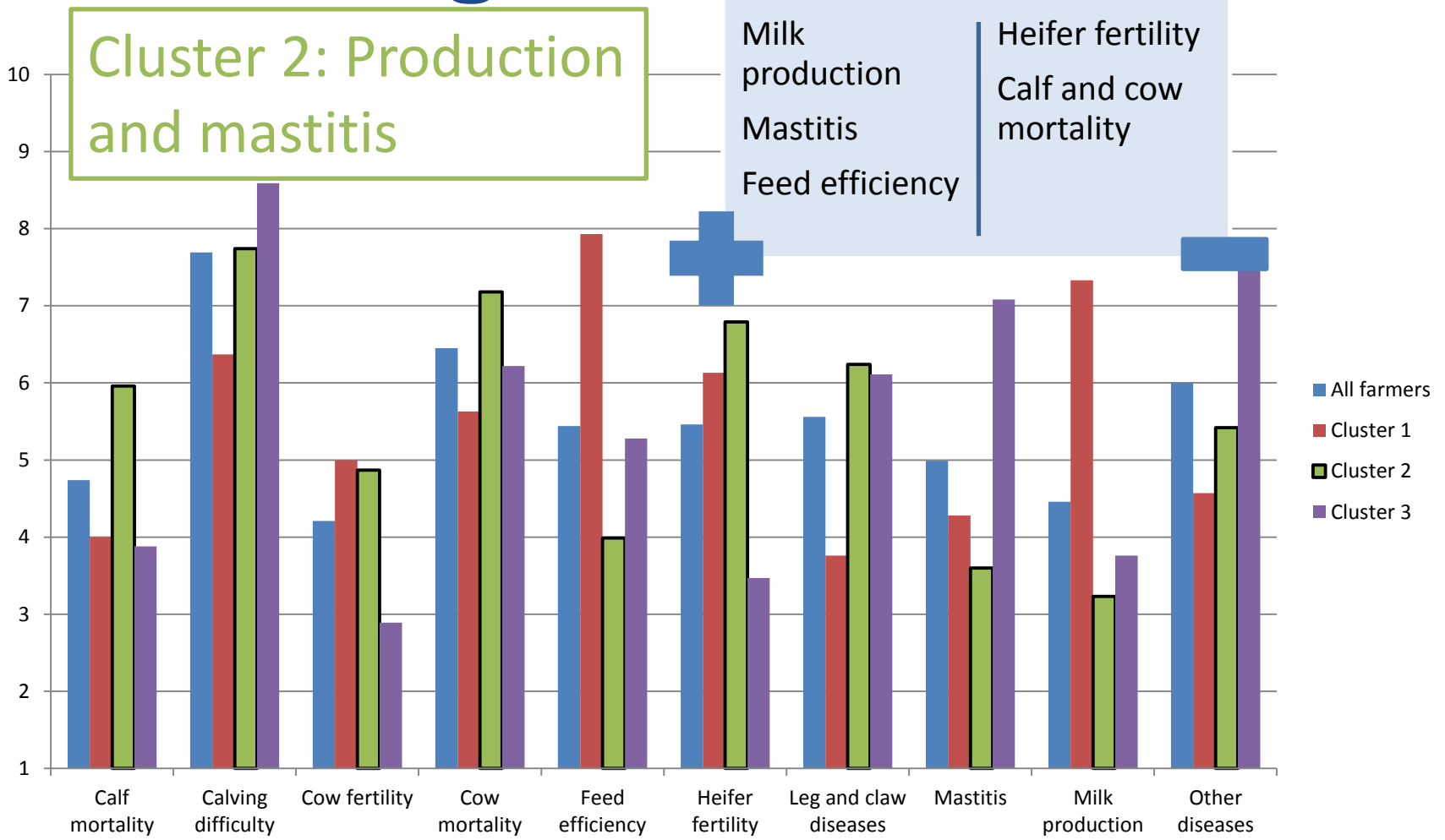


# Organic Holstein





# Organic Holstein

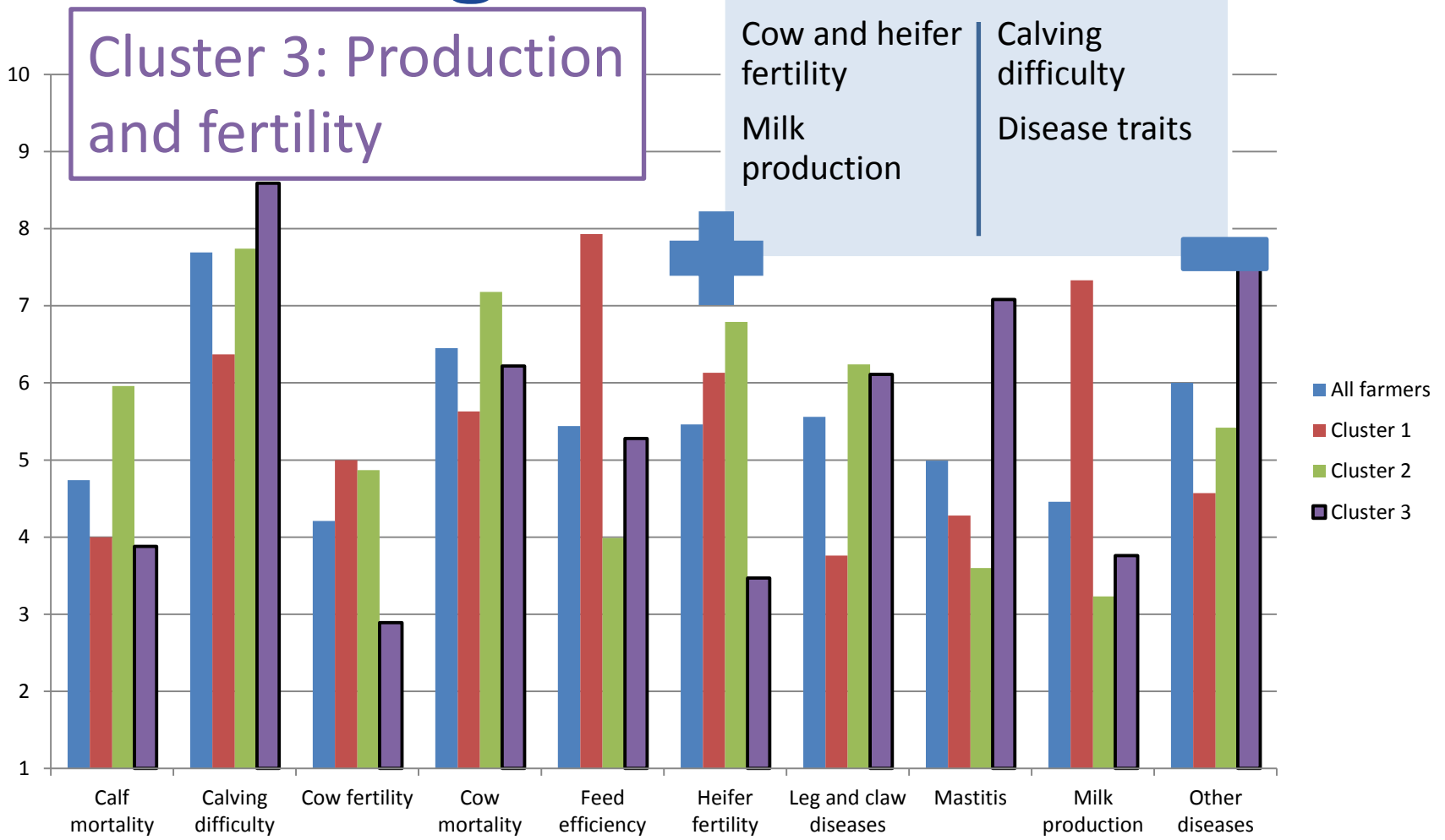


# Organic Holstein

Cluster 3: Production and fertility

Cow and heifer fertility  
Milk production

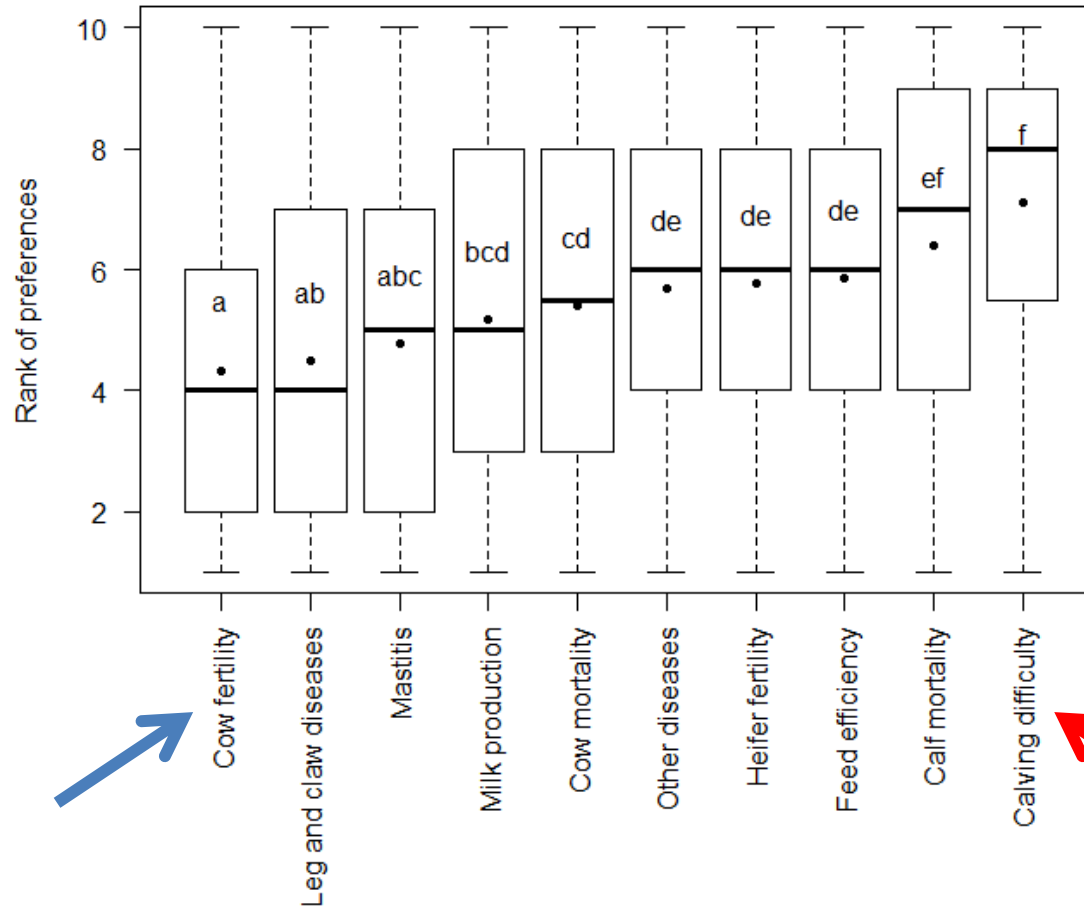
Calving difficulty  
Disease traits



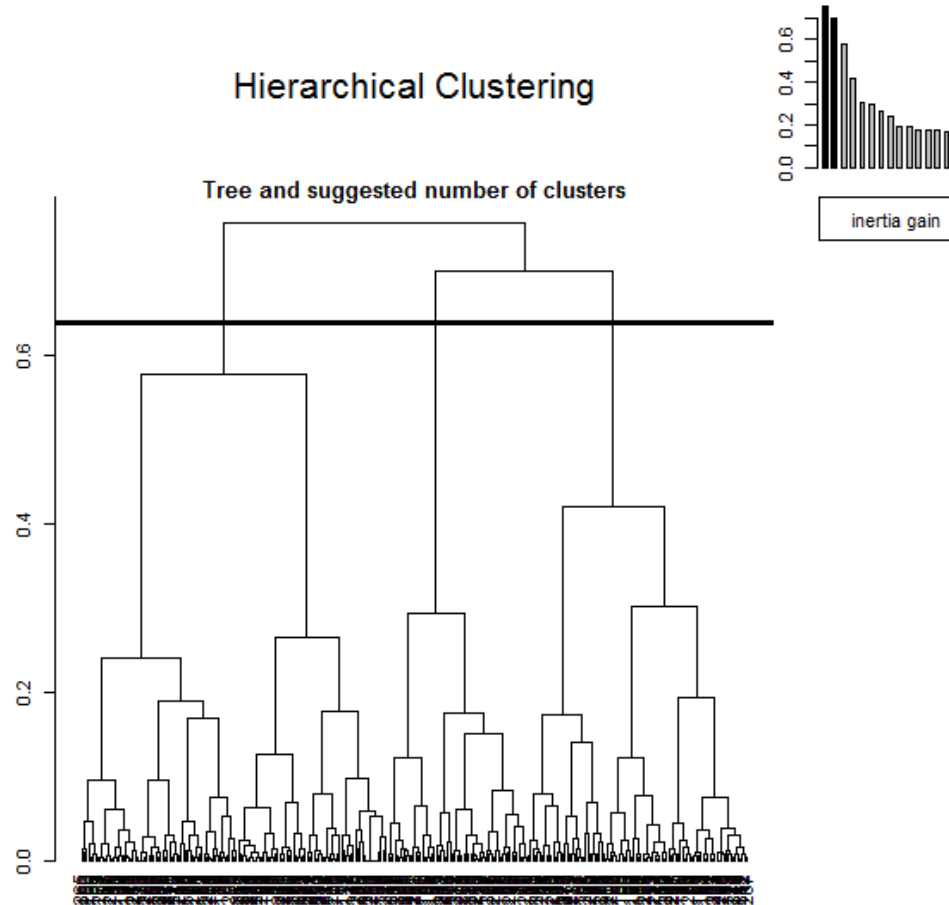
# Organic Holstein

- Cluster 1: Robustness
- Cluster 2: Production and mastitis
- Cluster 3: Production and fertility
- All trait ranks different between clusters
- No differences in herd characteristics

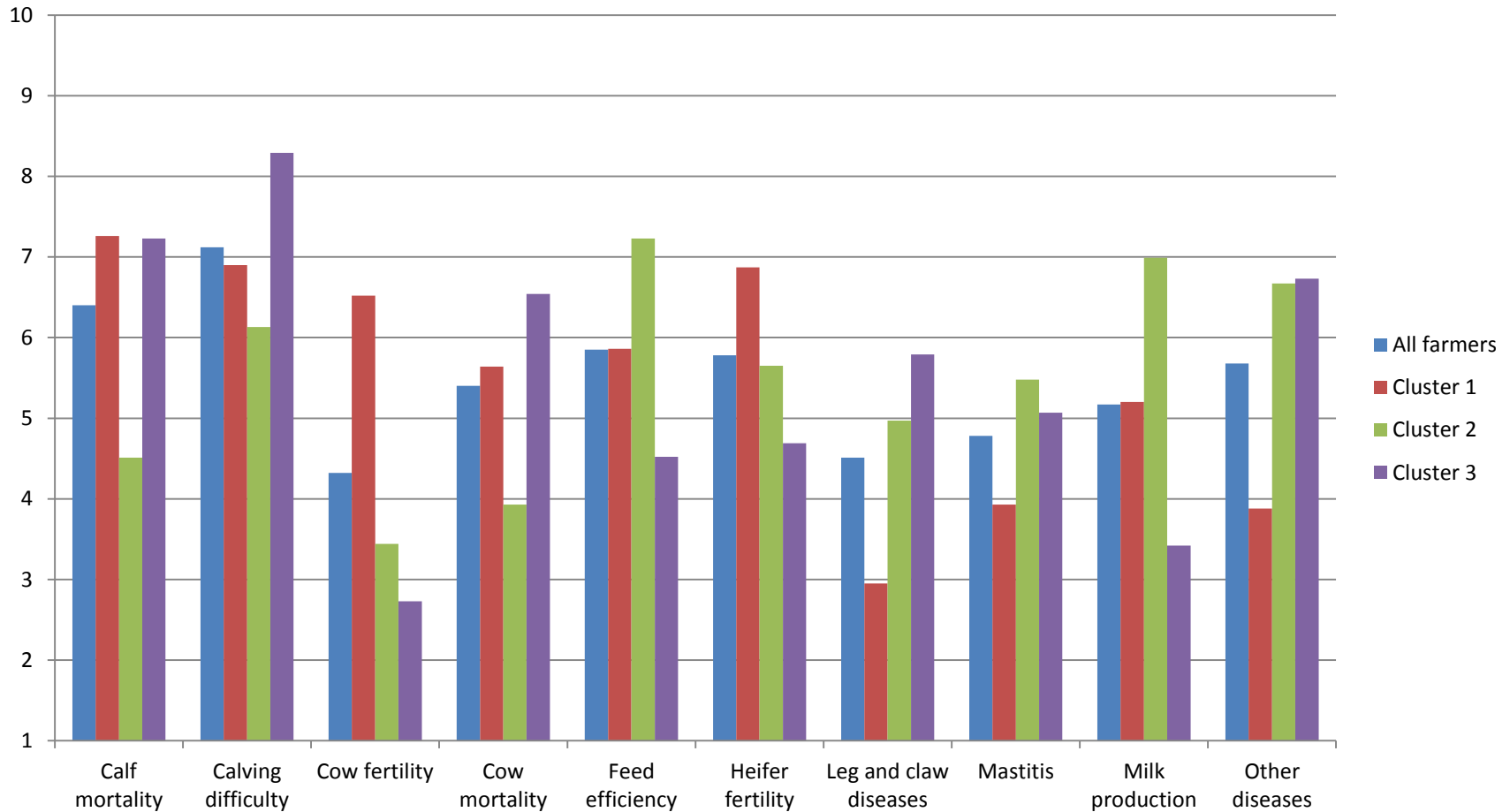
# Conventional Holstein



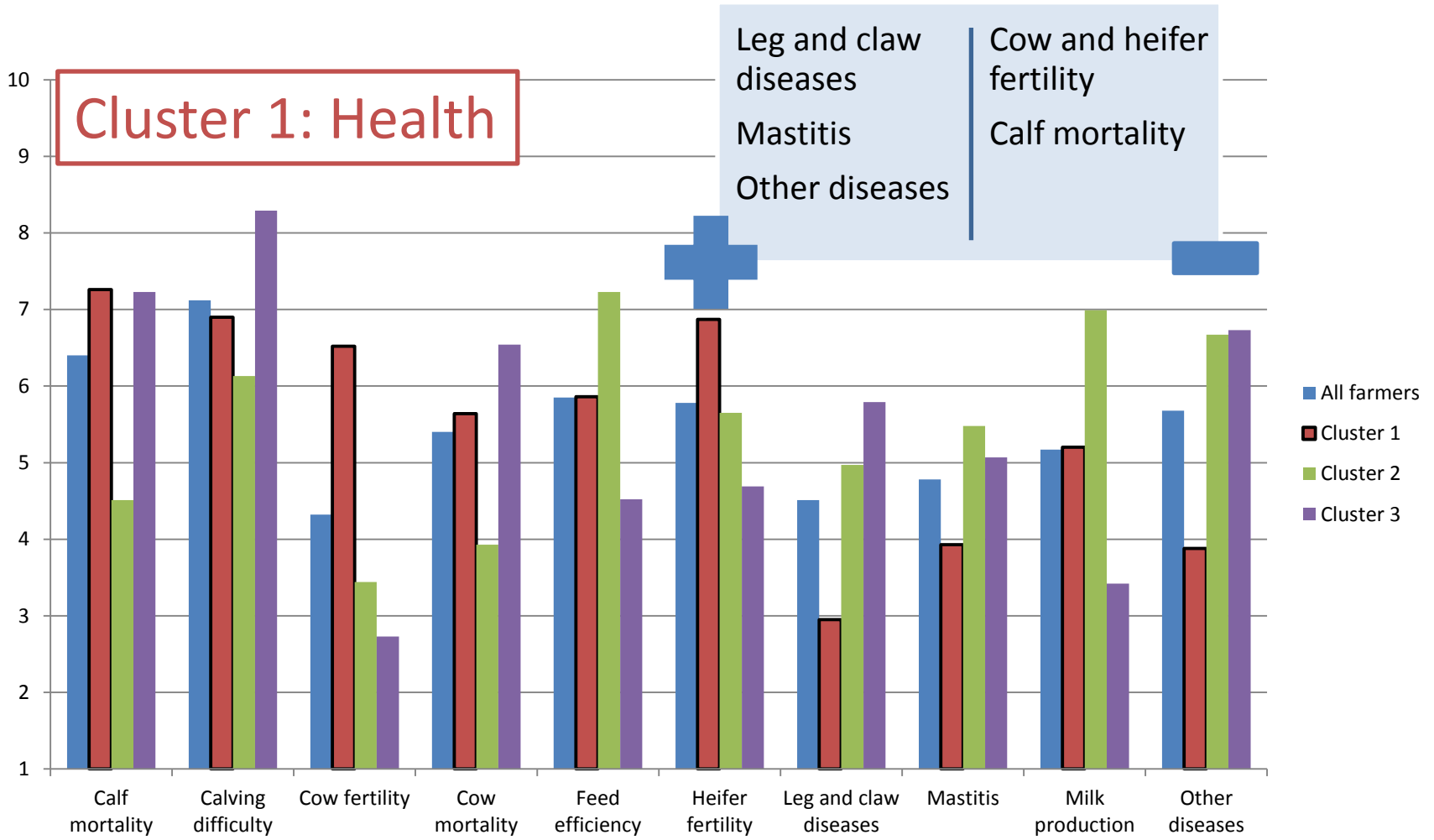
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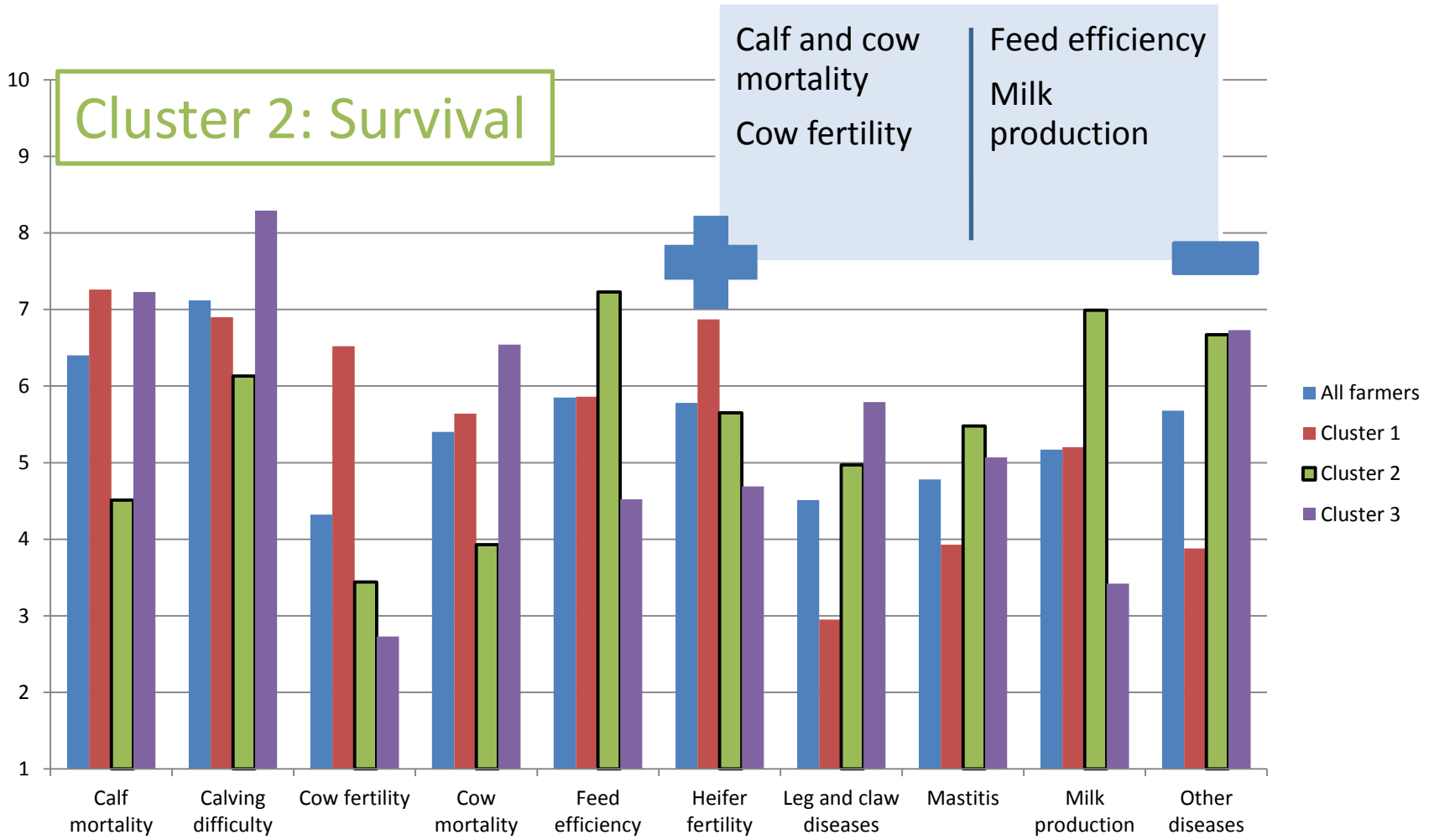
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# Conventional Holstein

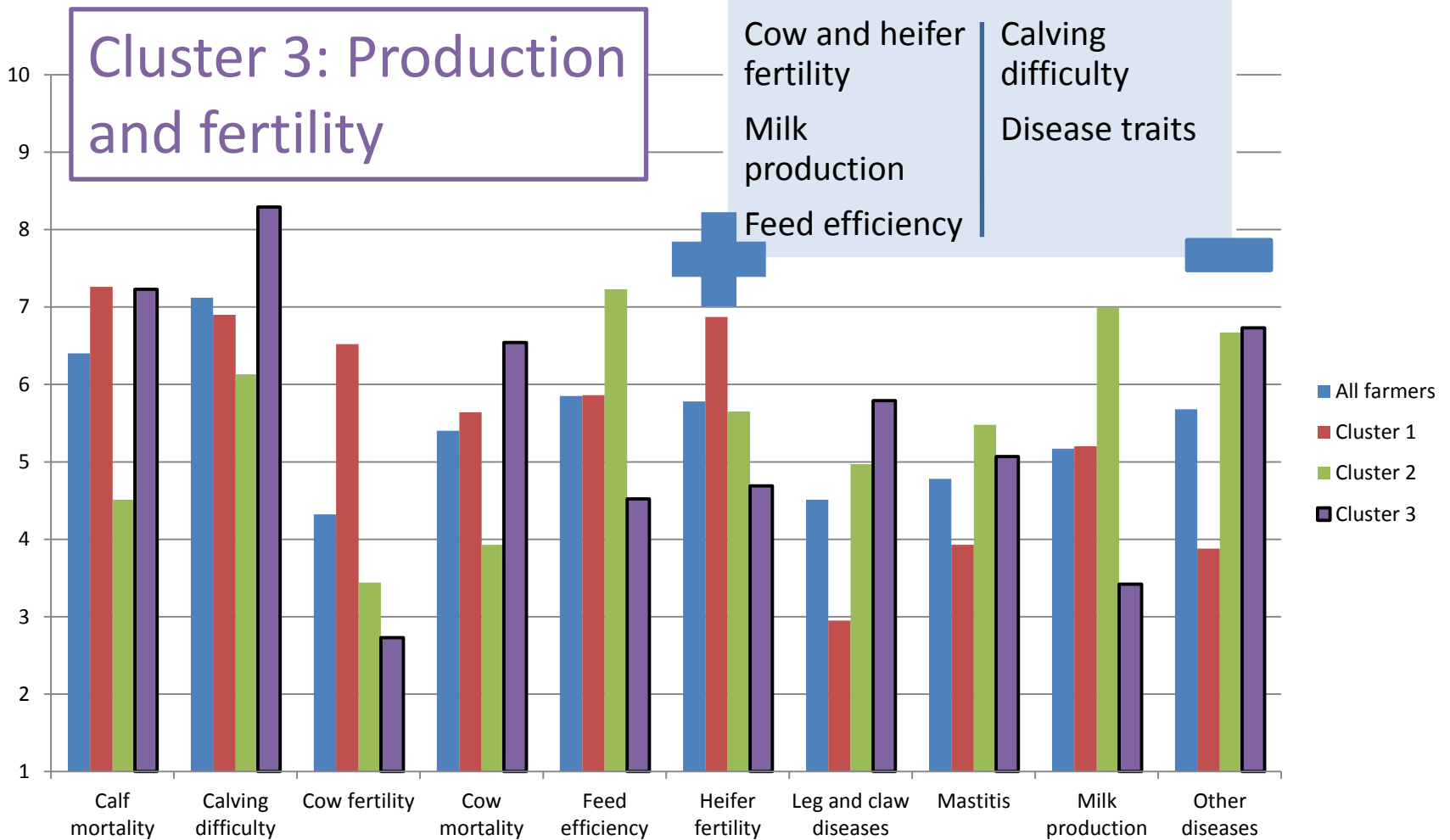


# Conventional Holstein





# Conventional Holstein



# Conventional Holstein

- Cluster 1: Health
- Cluster 2: Survival
- Cluster 3: Production and fertility
  - Comparable to cluster 3 organic Holstein
- Differences in herd characteristics
  - Statement 4, 5 and 6

# Conventional Holstein

4. The present level for feet and leg conformation among my cows fits my production system.
5. The present level for body conformation among my cows fits my production system.
6. Uniformity with regard to the cows' size is an important trait.

Item	All farmers	Cluster 1: Health	Cluster 2: Survival	Cluster 3: Production and fertility	Kruskal-Wallis p-value
Statement 4	2.70	2.89	2.71	2.46	0.03
Statement 5	2.60	2.43	2.61	2.78	0.07
Statement 6	2.33	2.36	2.52	2.08	0.06

Ranked leg and claw diseases the highest!

1: strongly agree; 5: strongly disagree

# Conventional Holstein

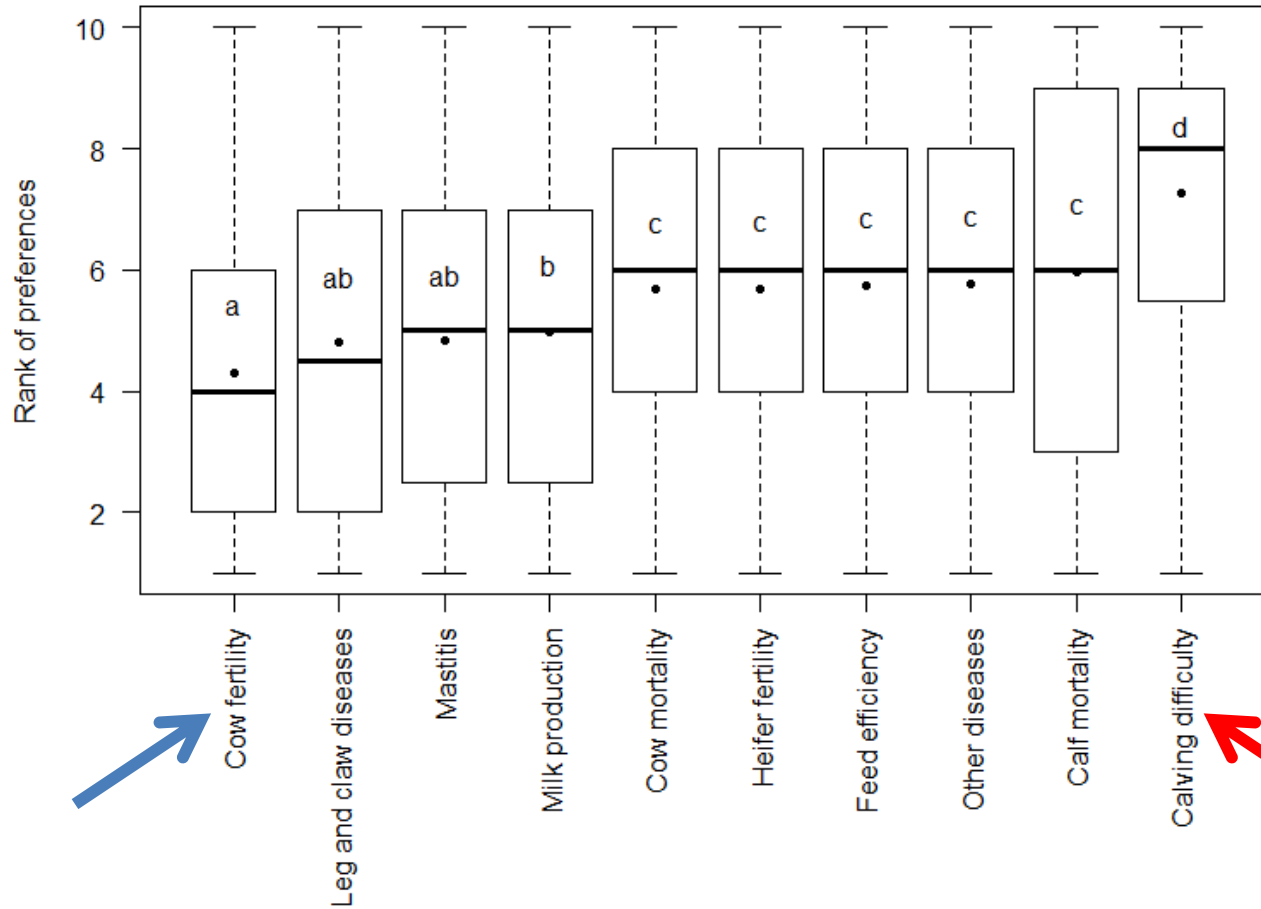
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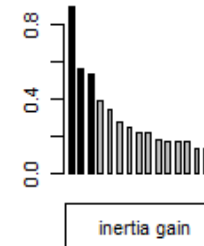
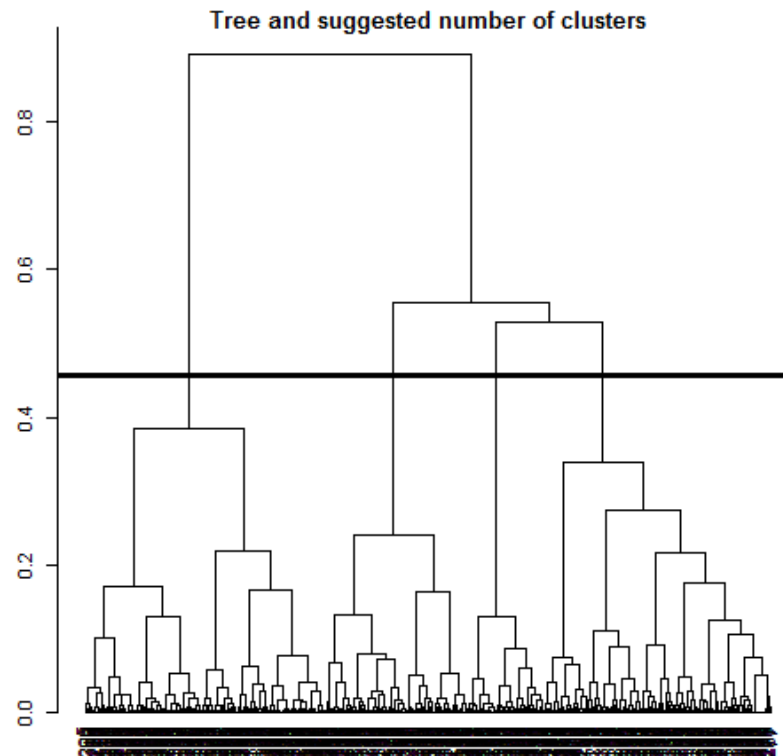
Production and fertility related to uniformity and body conformation?

# Org. + Conv. Holstein

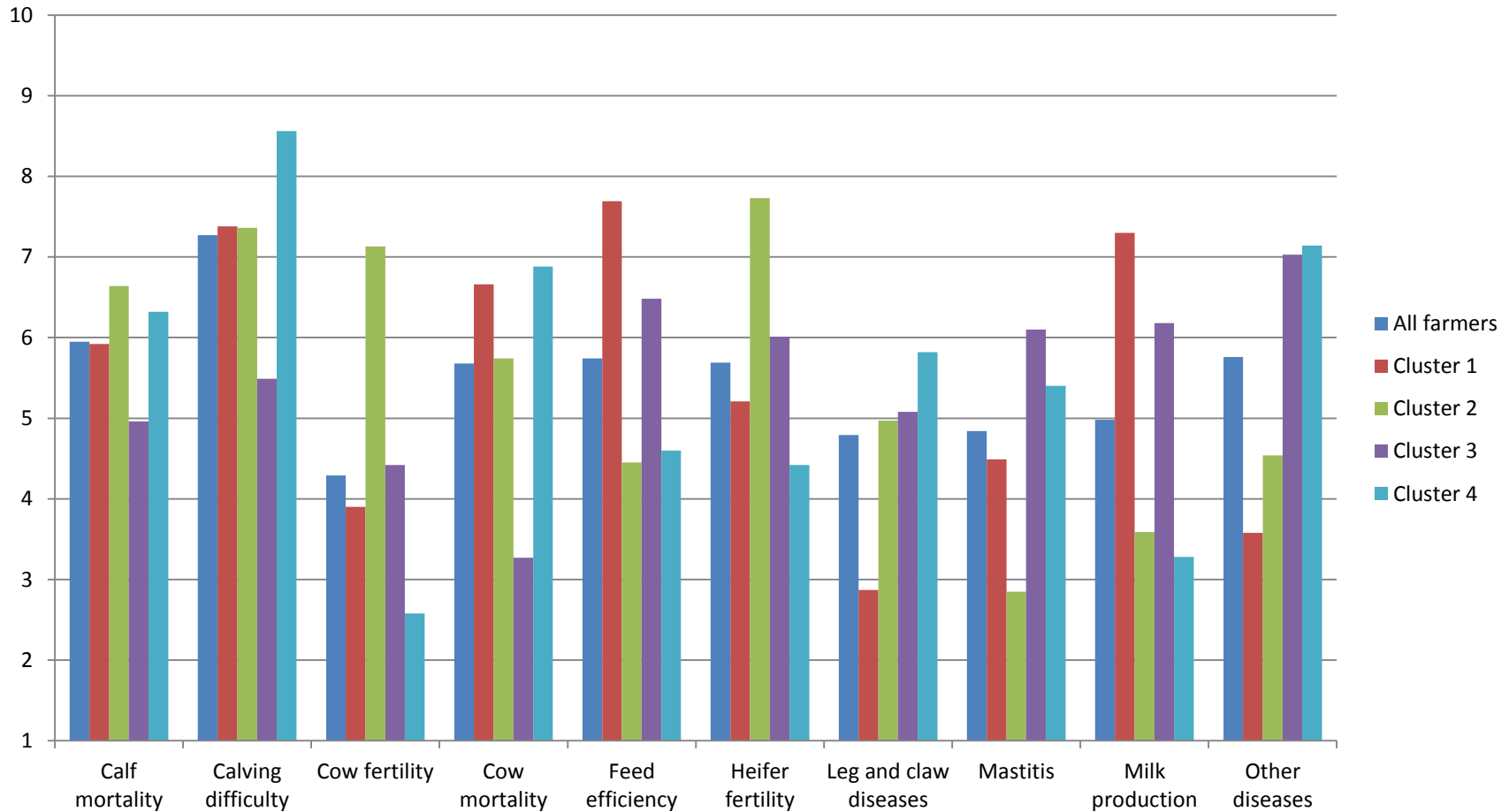


# Org. + Conv. Holstein

## Hierarchical Clustering



# Org. + Conv. Holstein

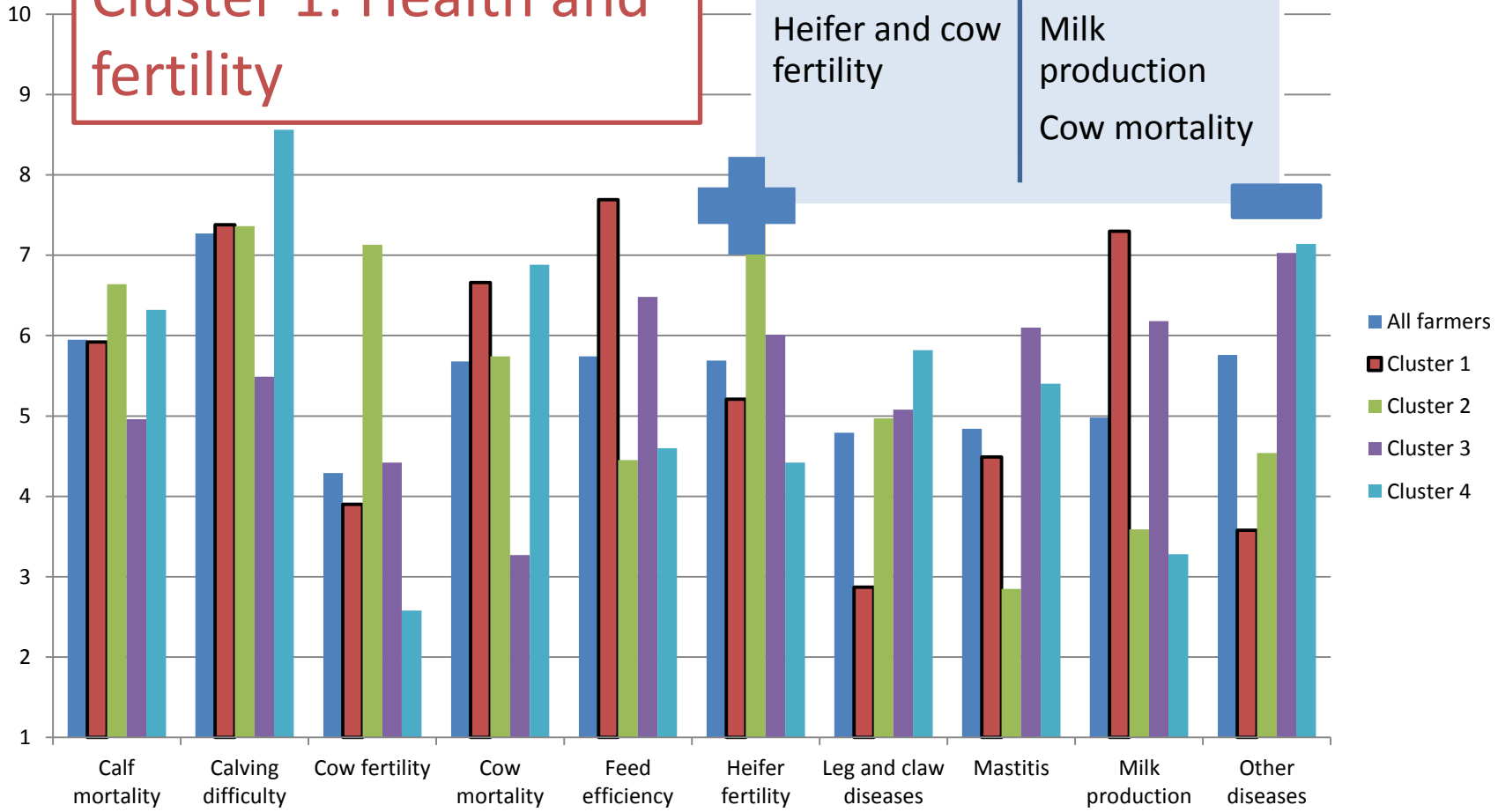


# Org. + Conv. Holstein

Cluster 1: Health and fertility

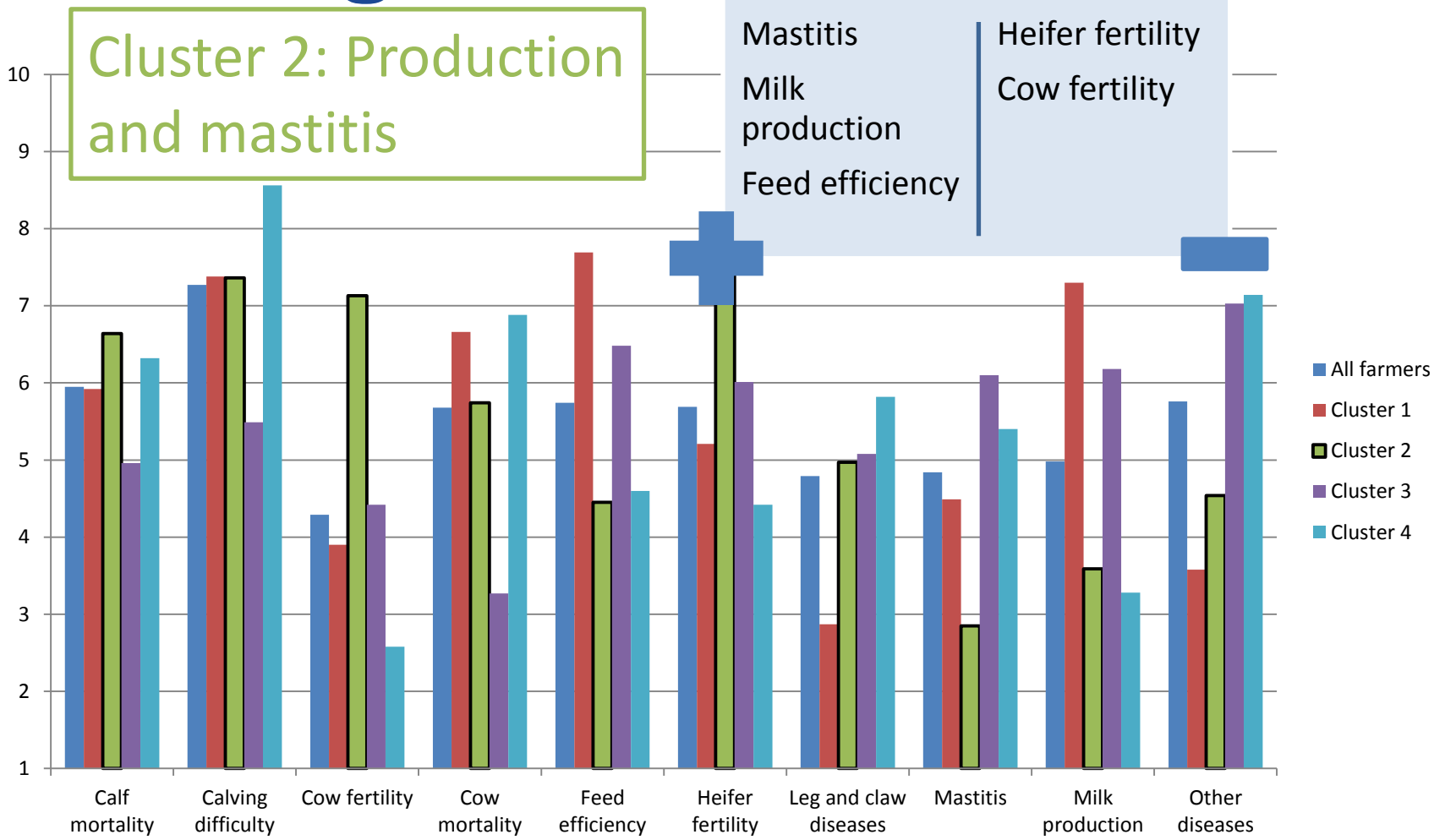
Disease traits  
Heifer and cow fertility

Feed efficiency  
Milk production  
Cow mortality

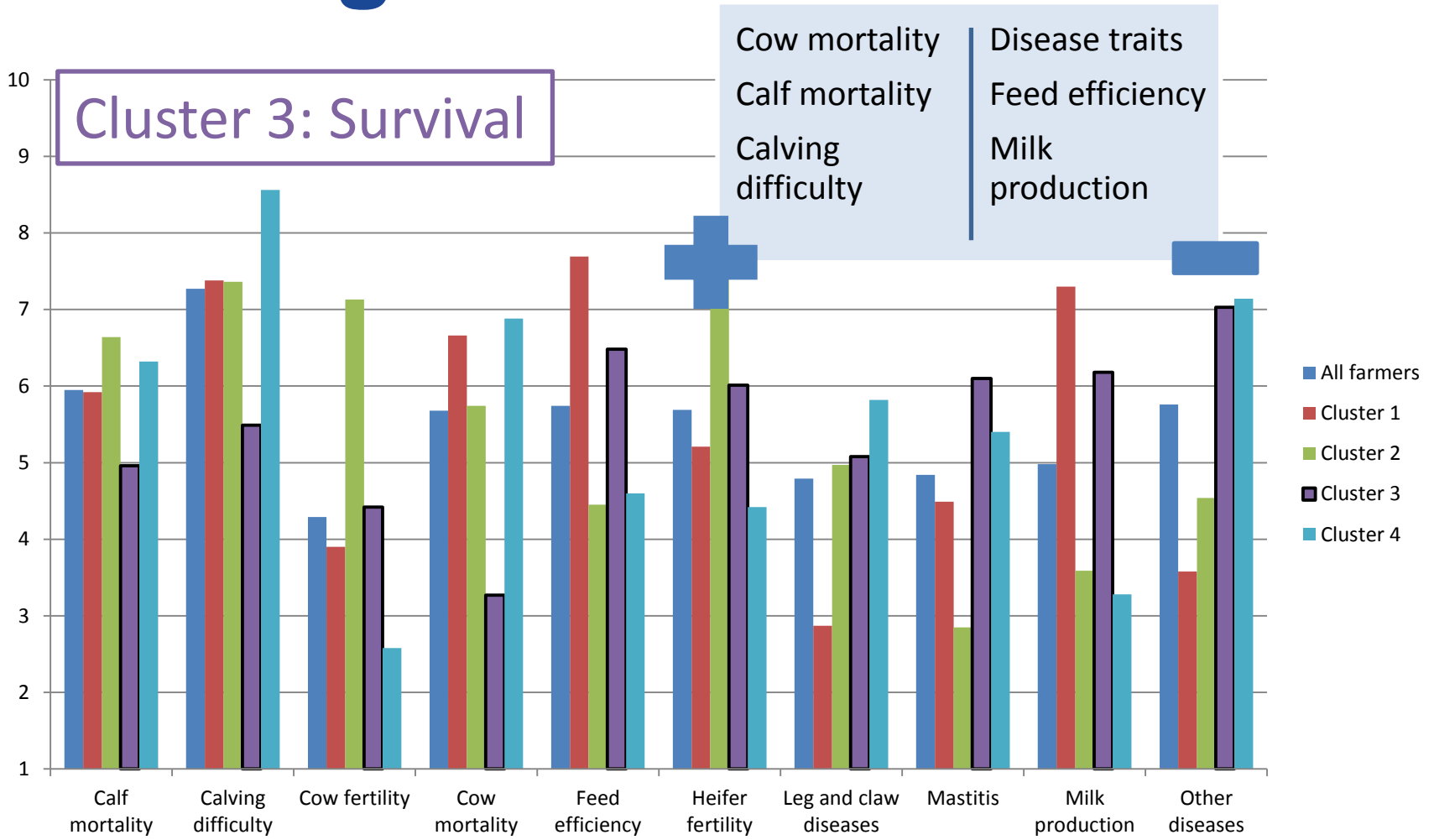




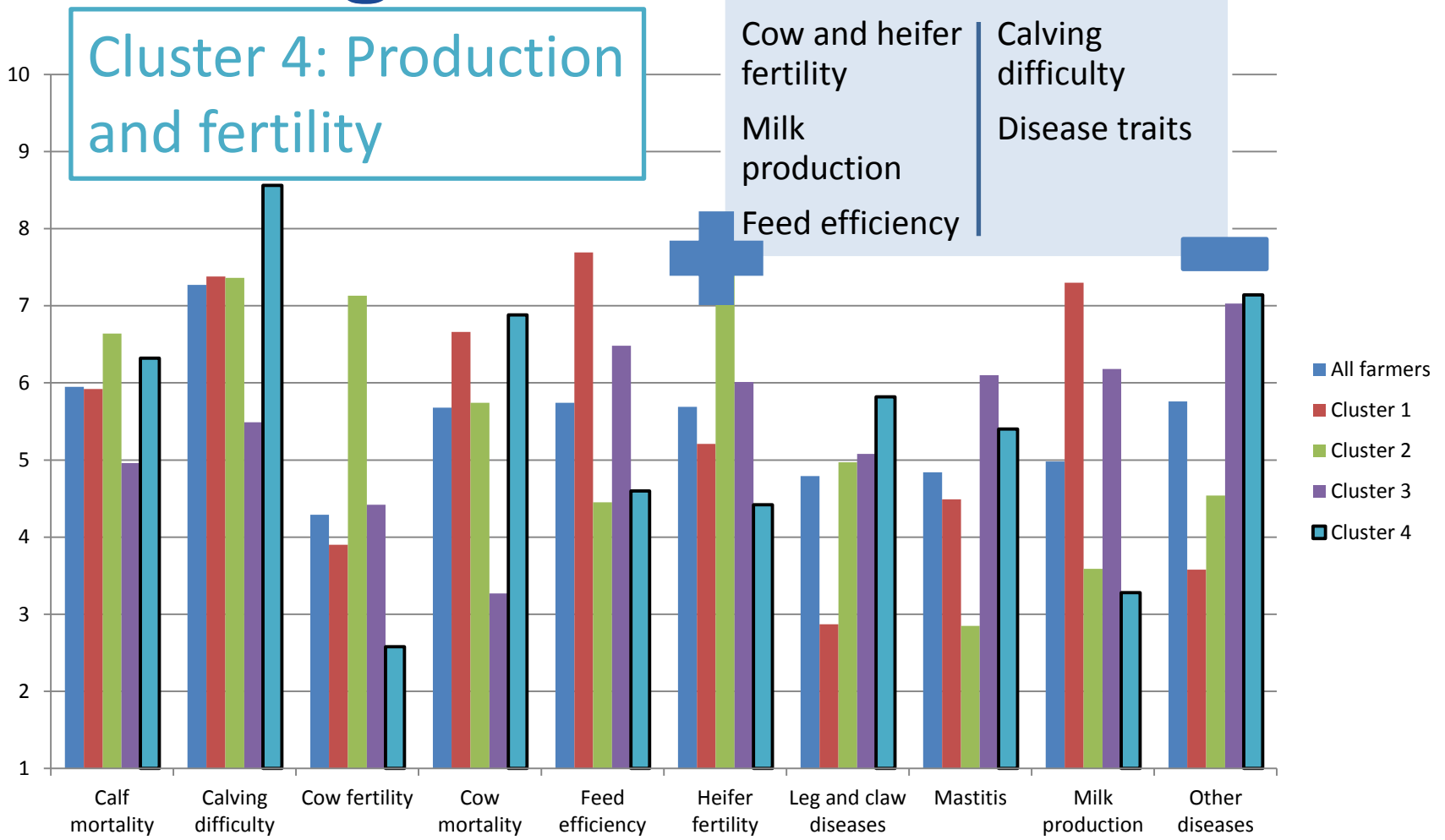
# Org. + Conv. Holstein



# Org. + Conv. Holstein



# Org. + Conv. Holstein



# Org. + Conv. Holstein

- Cluster 1: Health and fertility
- Cluster 2: Production and mastitis
  - Comparable to cluster 2 organic Holstein
- Cluster 3: Survival
  - Comparable to cluster 3 conventional Holstein
- Cluster 4: Production and fertility
  - Comparable to cluster 3 organic and conventional Holstein

# Org. + Conv. Holstein

- Differences in herd characteristics
  - ECM
  - Percentage of organic farmers

Item	All farmers	Cluster 1: Health and fertility	Cluster 2: Production and mastitis	Cluster 3: Survival	Cluster 4: Production and fertility	Kruskal-Wallis p-value
ECM	10111	10389	9879	10132	10043	0.05
Organic	20%	13%	22%	20%	25%	0.00

Ranked production traits the lowest

Ranked production traits the highest

# Org. + Conv. Holstein

- Differences in herd characteristics
  - ECM
  - Percentage of organic farmers

Item	All farmers	Cluster 1: Health and fertility	Cluster 2: Production and mastitis	Cluster 3: Survival	Cluster 4: Production and fertility	Kruskal-Wallis p-value
ECM	10111	10389	9879	10132	10043	0.05
Organic	20%	13%	22%	20%	25%	0.00

Lowest percentage of organic farmers

Highest percentage of organic farmers

# Summary Holstein

- Clear farmer types found
- Roughly the same farmer types for organic, conventional and organic + conventional
- Organic farmers more emphasis on production traits
- Some differences in herd characteristics

# RDM

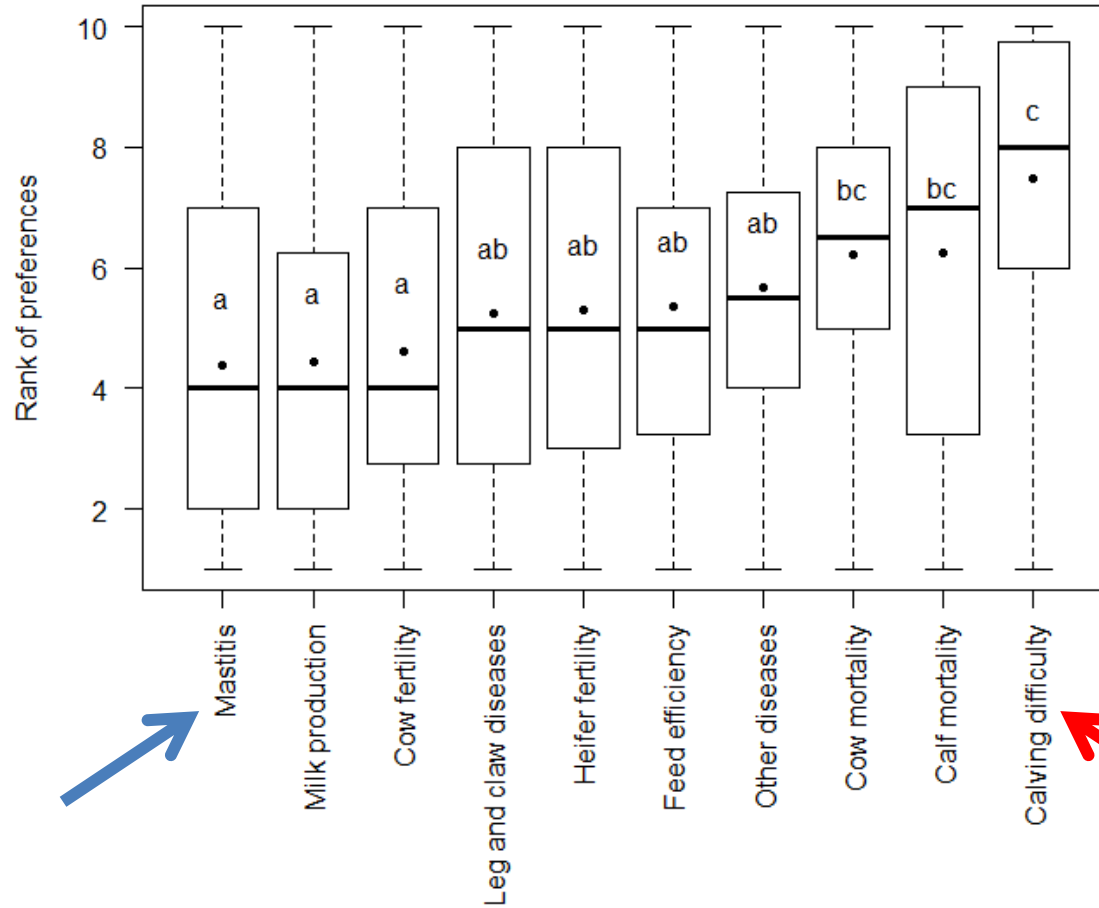




# RDM

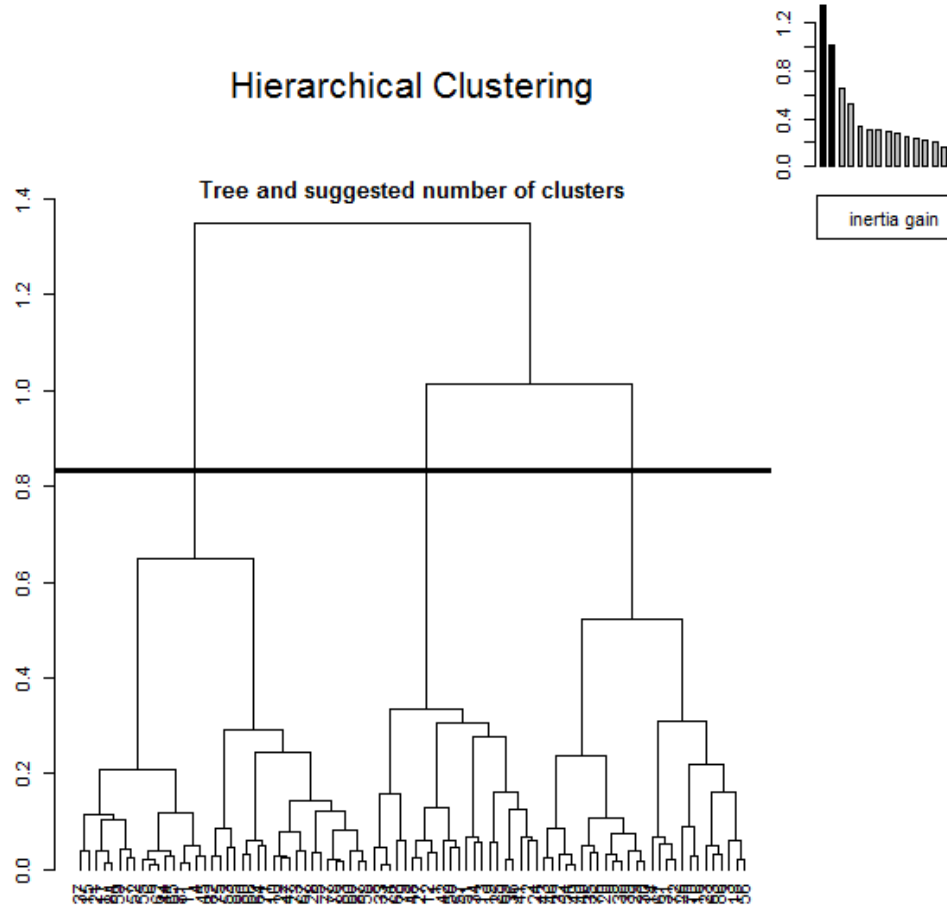
- Different weights in the survey
    - Based on economic weights for a RDM herd
  - 29 Organic herds
  - 58 Conventional herds
- } Low number of herds!
- ↓
- Organic and conventional  
analysed together

# RDM

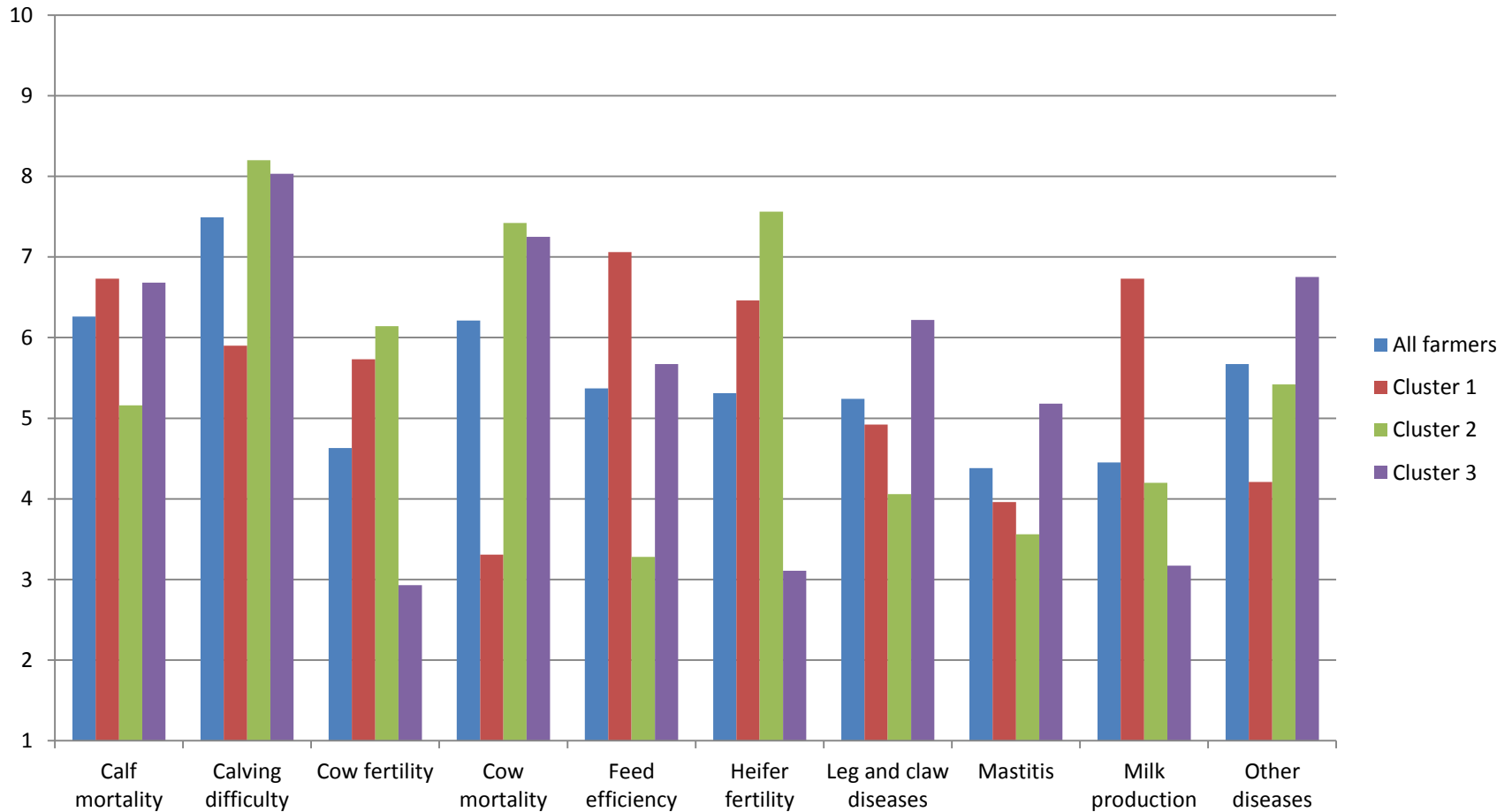


# RDM

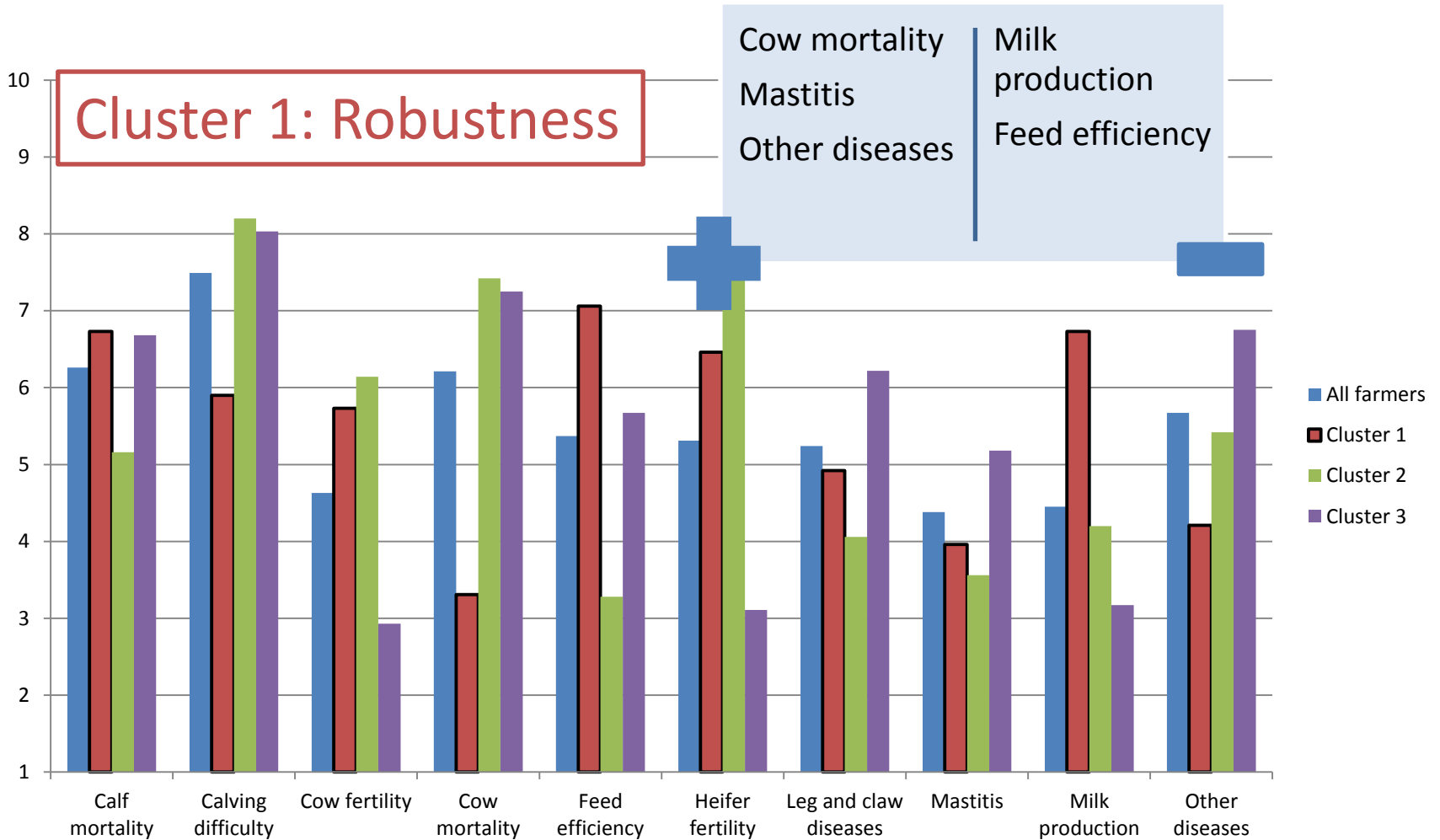
## Hierarchical Clustering



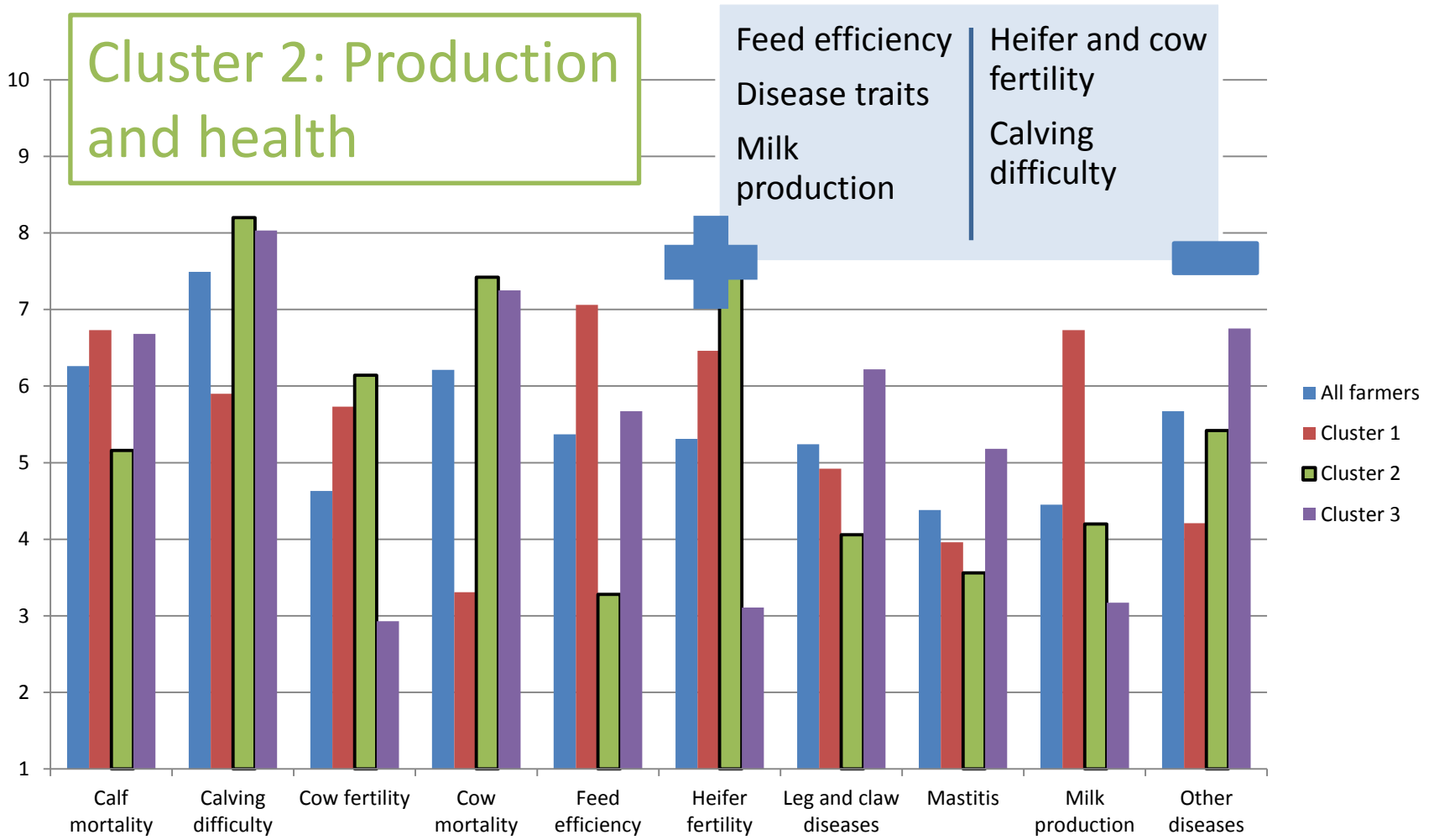
# RDM



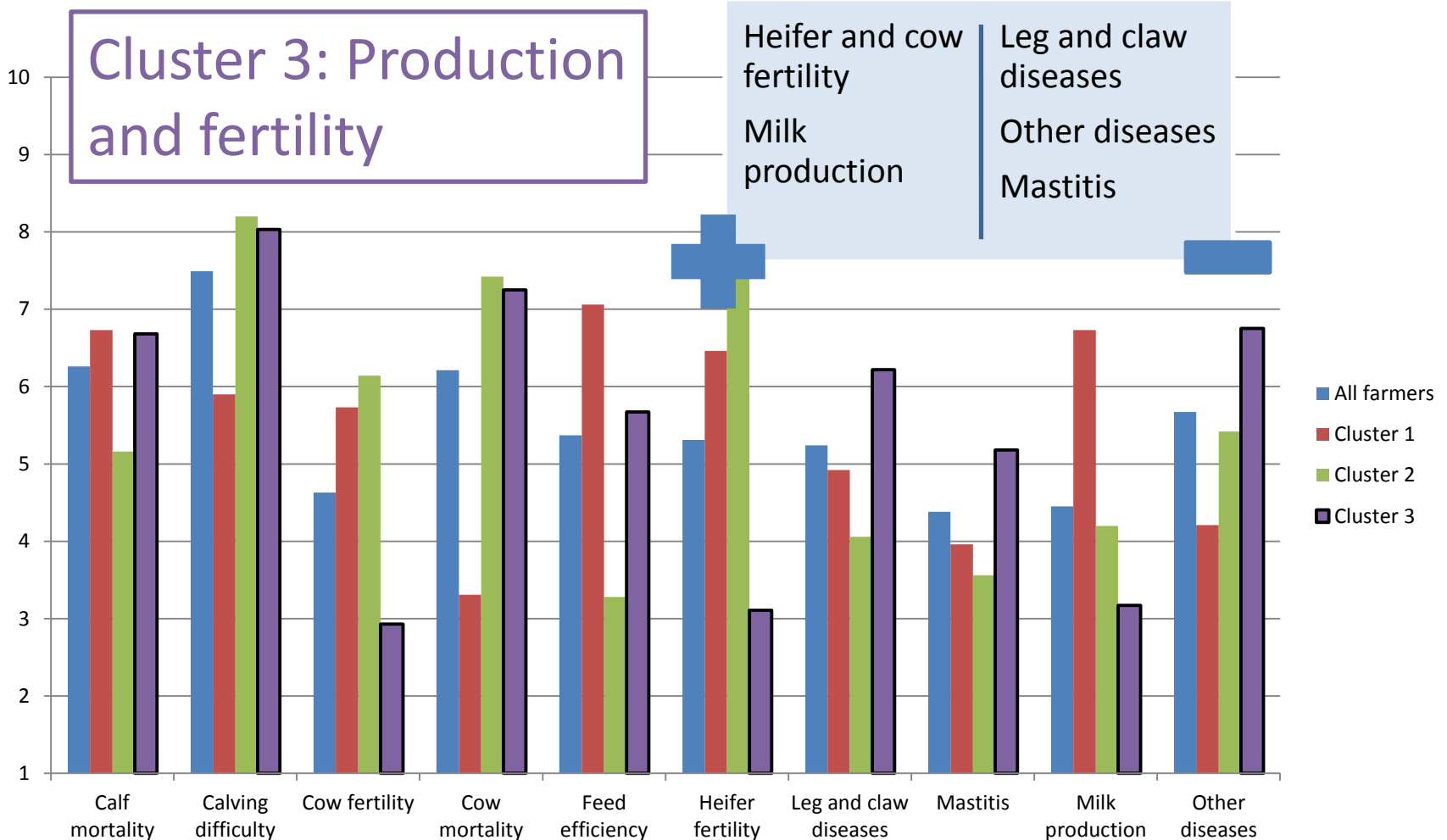
# RDM



# RDM



# RDM



# RDM

- Cluster 1: Robustness
- Cluster 2: Production and health
- Cluster 3: Production and fertility



# RDM

- Differences in herd characteristics
  - Crossbreeding between dairy breeds
  - ECM
  - Herd size
  - Percentage of organic farmers

More robust cows,  
more crossbreeding?

Item	All farmers	Cluster 1: Robustness	Cluster 2: Production and health	Cluster 3: Production and fertility	Kruskal-Wallis p-value
Crossbreeding	16%	33% ←	17%	6%	0.04
ECM	9167	9723	9322	8733	0.01
Herd size	137	153	156	113	0.05
Organic	33%	17%	24%	50%	0.01

# RDM

- Differences in herd characteristics
  - Crossbreeding between dairy breeds
  - ECM
  - Herd size
  - Percentage of organic farmers

Rank production trait the lowest

Item	All farmers	Cluster 1: Robustness	Cluster 2: Production and health	Cluster 3: Production and fertility	Kruskal-Wallis p-value
Crossbreeding	16%	33%	17%	6%	0.04
ECM	9167	9723	9322	8733	0.01
Herd size	137	153	156	113	0.05
Organic	33%	17%	24%	50%	0.01

# RDM

- Differences in herd characteristics
  - Crossbreeding between dairy breeds
  - ECM
  - Herd size
  - Percentage of organic farmers

Lowest percentage  
of organic farmers

Item	All farmers	Cluster 1: Robustness	Cluster 2: Production and health	Cluster 3: Production and fertility	Kruskal-Wallis p-value
Crossbreeding	16%	33%	17%	6%	0.04
ECM	9167	9723	9322	8733	0.01
Herd size	137	153	156	113	0.05
Organic	33%	17%	24%	50%	0.01

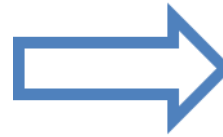
# Jersey



# Jersey

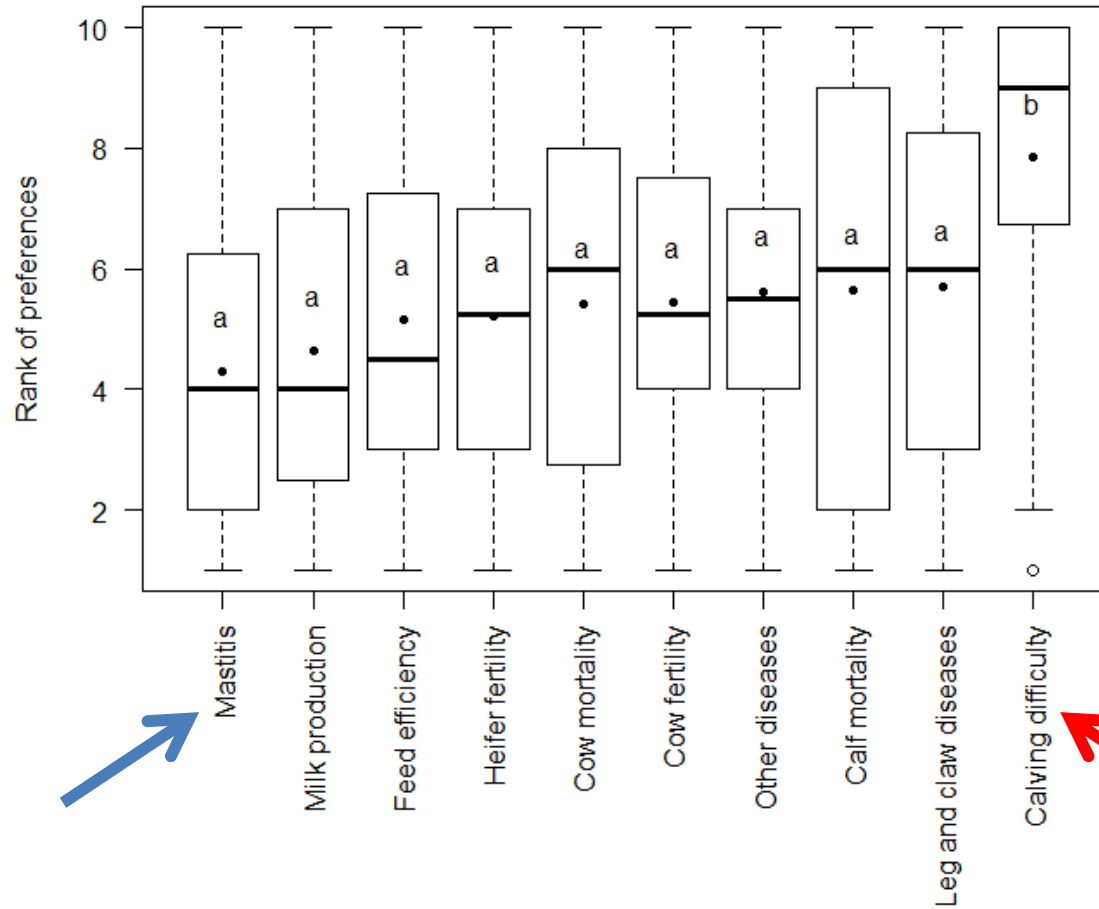
- Different weights in the survey
  - Based on economic weights for a Jersey herd

- 27 Organic herds
- 49 Conventional herds

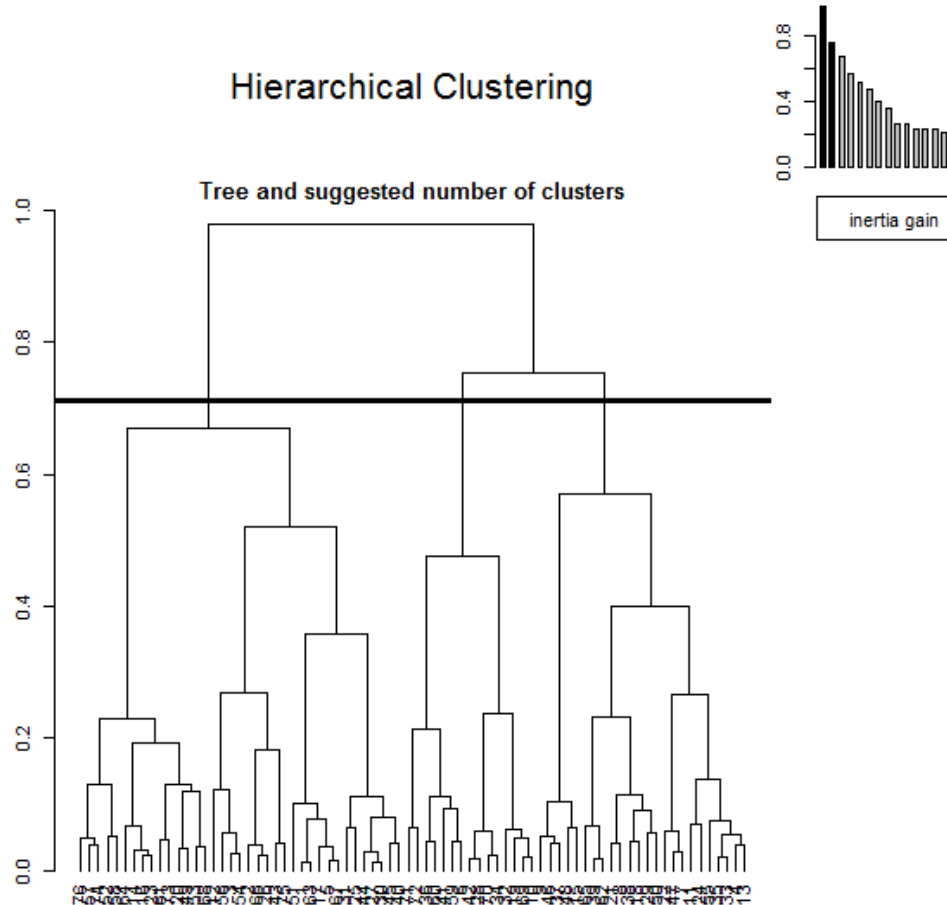


Organic and  
conventional  
analysed together

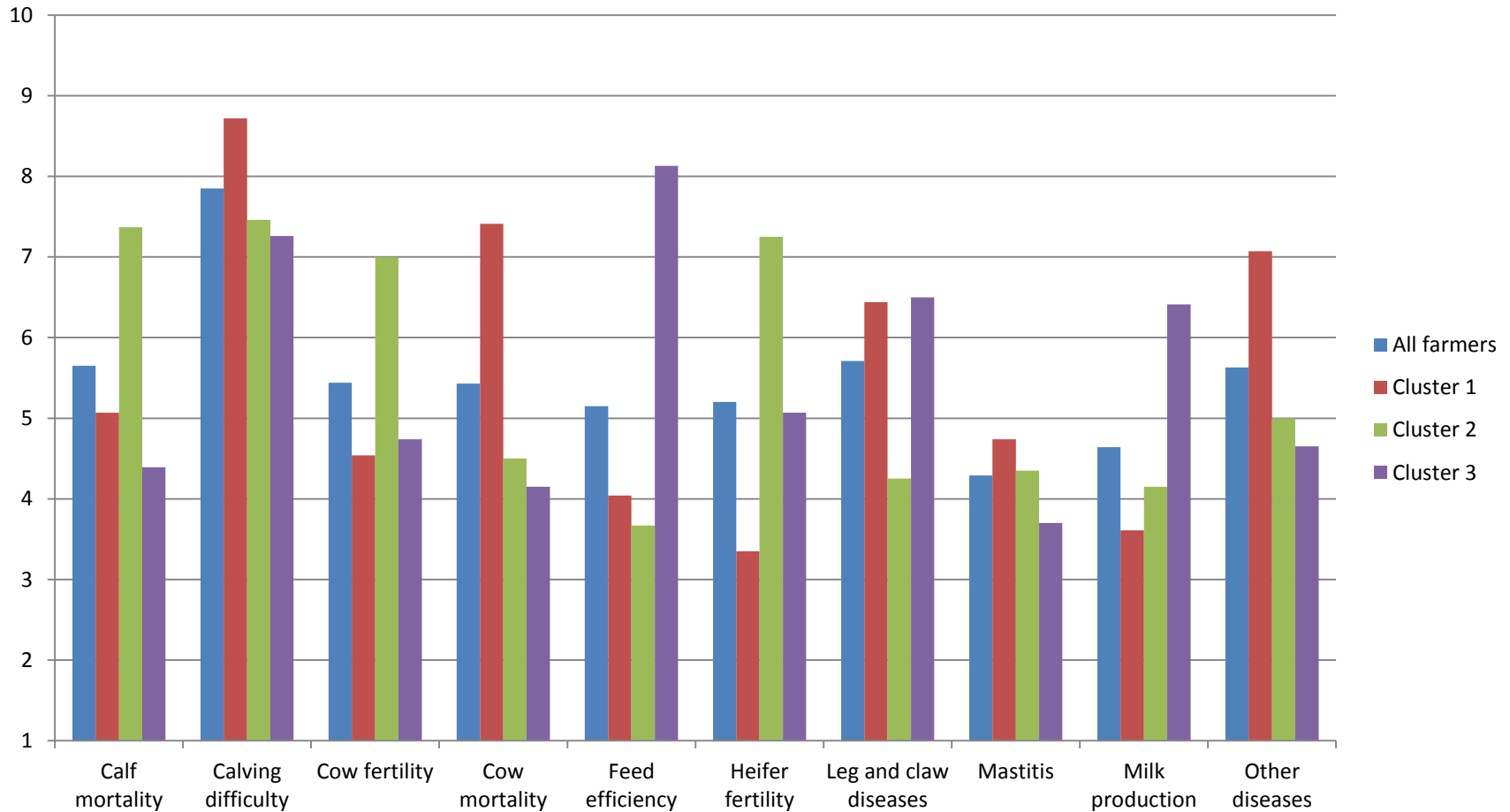
# Jersey



# Jersey

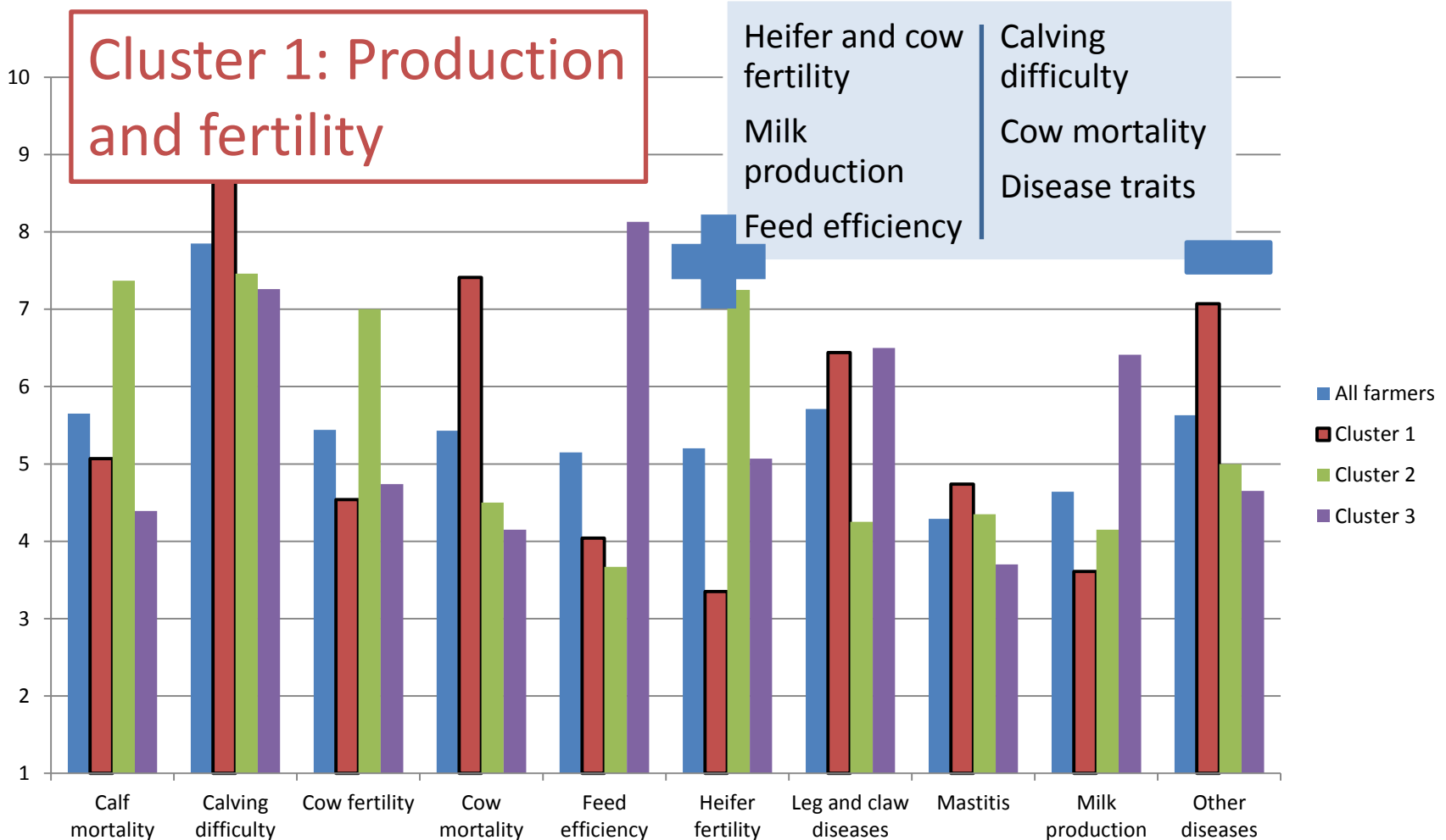


# Jersey

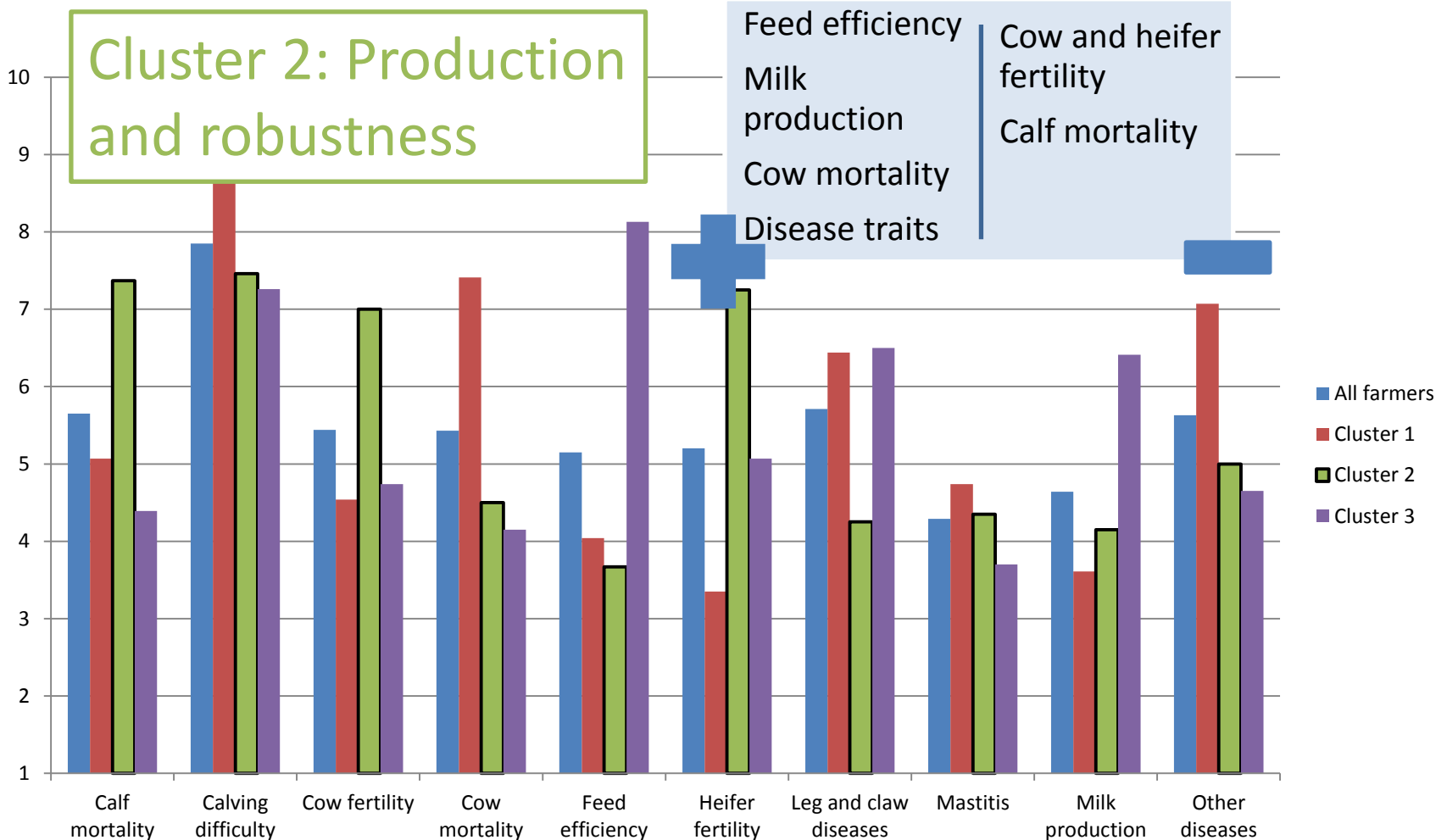




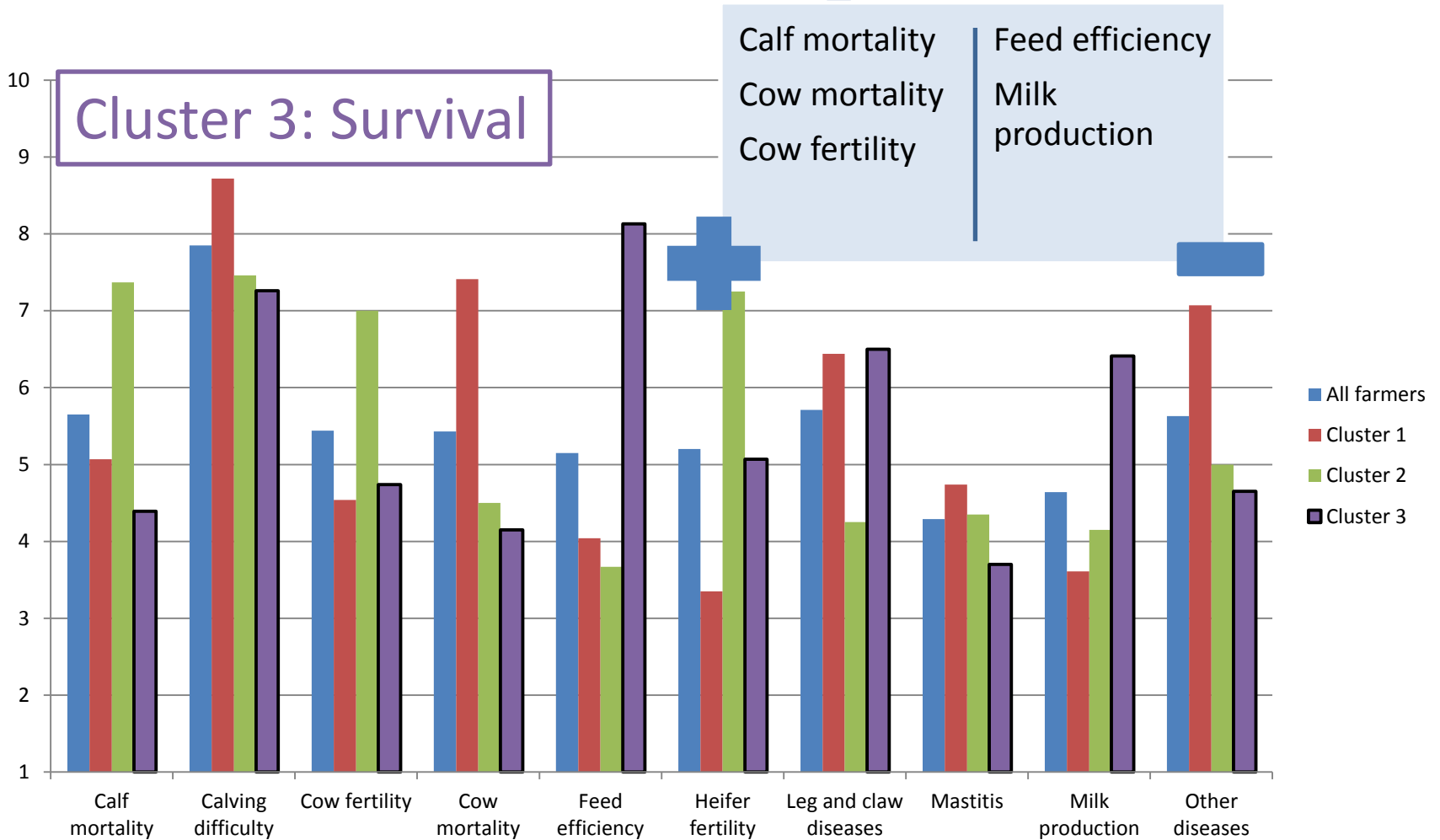
# Jersey



# Jersey



# Jersey



# Jersey

- Cluster 1: Production and fertility
- Cluster 2: Production and robustness
- Cluster 3: Survival

# Jersey

- Not all traits ranks significantly different
  - Calving difficulty and mastitis
- Differences in herd characteristics
  - Percentage of organic

Lowest percentage  
of organic farmers

Item	All farmers	Cluster 1: Production and fertility	Cluster 2: Production and robustness	Cluster 3: Survival	Kruskal-Wallis p-value
Organic	36%	44%	19% ←	43%	0.10

# Conclusions

- Heterogeneity exists within farmers' preferences
  - Clear groups of farmers found for all breeds
- Some herd characteristics can be linked to farmer groups
- Production system can be linked to farmer groups

# Further work

- Data from cattle database → more herd characteristics to compare between clusters
- Simulate long term effects for different breeding goals
- Customized breeding indices?
  - Increases ownership of the breeding goal
  - Martin-Collado *et al.*, 2015

# Questions?

