# Exploring farmers' attitudes and preferences to inform the development and implementation of breeding tools


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# Socioeconomic aspects of breeding programs

Farmers use of breeding tools

and participation in programs

**KEY**
for successful programmes

- Highly influenced by:
  1. Farmers preferences for animal traits
  2. Farmers attitudes towards breeding tools

## Outline

1. Trait preferences: Analysis of Australian dairy farmers

2. Attitudes: Development of a scale for measuring farmers attitudes

# Background. Why analyse farmers preferences?

1. There is no economic data (EW)

   Community based breeding programs

2. Farmers do not feel represented by selection indexes

   Miss important traits, disagree with weights

3. Preferences based on economic and non-economic criteria

   Farming style, type of animals (social and cultural identity)

# Background. How analyse farmers preferences?

1. Simplest method: Ranking or ad-hoc weights
2. Pairwise comparisons: AHP, *1000minds software
3. Choice experiments: Realistic but complex

**What is the aim of our research?**

# Analysis of AUS dairy farmers to inform development of selection indexes

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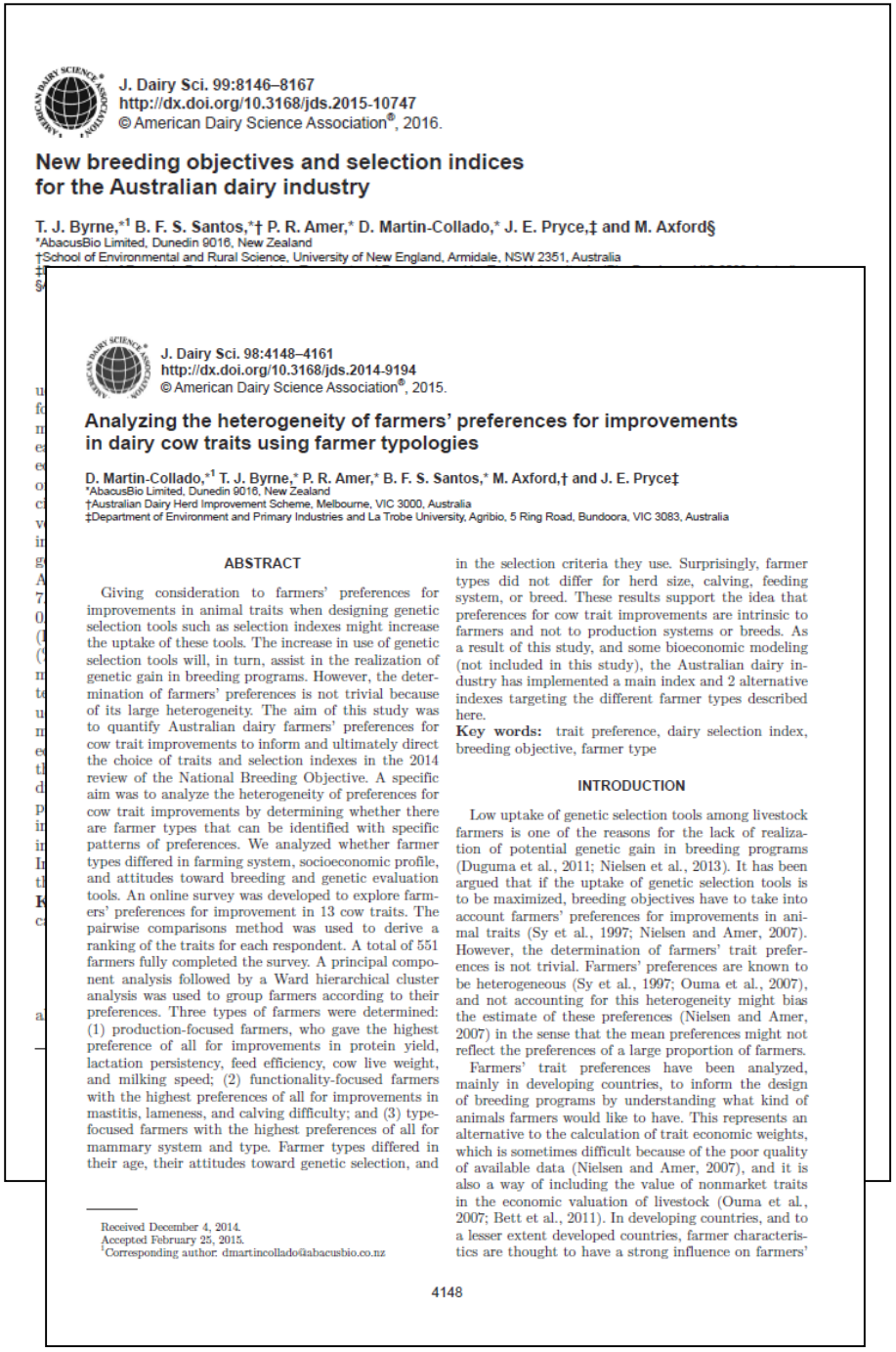

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New breeding objectives and selection indices for the Australian dairy industry

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Analyzing the heterogeneity of farmers' preferences for improvements in dairy cow traits using farmer typologies

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ABSTRACT

Giving consideration to farmers' preferences for improvements in animal traits when designing genetic selection tools such as selection indexes might increase the uptake of these tools. The increase in use of genetic selection tools will, in turn, assist in the realization of genetic gain in breeding programs. However, the determination of farmers' preferences is not trivial because of its large heterogeneity. The aim of this study was to quantify Australian dairy farmers' preferences for cow trait improvements to inform and ultimately direct the choice of traits and selection indexes in the 2014 review of the National Breeding Objective. A specific aim was to analyze the heterogeneity of preferences for cow trait improvements by determining whether there are farmer types that can be identified with specific patterns of preferences. We analyzed whether farmer types differed in farming system, socioeconomic profile, and attitudes toward breeding and genetic evaluation tools. An online survey was developed to explore farmers' preferences for improvement in 13 cow traits. The pairwise comparisons method was used to derive a ranking of the traits for each respondent. A total of 551 farmers fully completed the survey. A principal component analysis followed by a Ward hierarchical cluster analysis was used to group farmers according to their preferences. Three types of farmers were determined: (1) production-focused farmers, who gave the highest preference of all for improvements in protein yield, lactation persistency, feed efficiency, cow live weight, and milking speed; (2) functionality-focused farmers with the highest preferences of all for improvements in mastitis, lameness, and calving difficulty; and (3) type-focused farmers with the highest preferences of all for mammary system and type. Farmer types differed in their age, their attitudes toward genetic selection, and in the selection criteria they use. Surprisingly, farmer types did not differ for herd size, calving, feeding system, or breed. These results support the idea that preferences for cow trait improvements are intrinsic to farmers and not to production systems or breeds. As a result of this study, and some bioeconomic modeling (not included in this study), the Australian dairy industry has implemented a main index and 2 alternative indexes targeting the different farmer types described here.

**Key words:** trait preference, dairy selection index, breeding objective, farmer type

INTRODUCTION

Low uptake of genetic selection tools among livestock farmers is one of the reasons for the lack of realization of potential genetic gain in breeding programs (Duguma et al., 2011; Nielsen et al., 2013). It has been argued that if the uptake of genetic selection tools is to be maximized, breeding objectives have to take into account farmers' preferences for improvements in animal traits (Sy et al., 1997; Nielsen and Amer, 2007). However, the determination of farmers' trait preferences is not trivial. Farmers' preferences are known to be heterogeneous (Sy et al., 1997; Ouma et al., 2007), and not accounting for this heterogeneity might bias the estimate of these preferences (Nielsen and Amer, 2007) in the sense that the mean preferences might not reflect the preferences of a large proportion of farmers.

Farmers' trait preferences have been analyzed, mainly in developing countries, to inform the design of breeding programs by understanding what kind of animals farmers would like to have. This represents an alternative to the calculation of trait economic weights, which is sometimes difficult because of the poor quality of available data (Nielsen and Amer, 2007), and it is also a way of including the value of nonmarket traits in the economic valuation of livestock (Ouma et al., 2007; Bett et al., 2011). In developing countries, and to a lesser extent developed countries, farmer characteristics are thought to have a strong influence on farmers'

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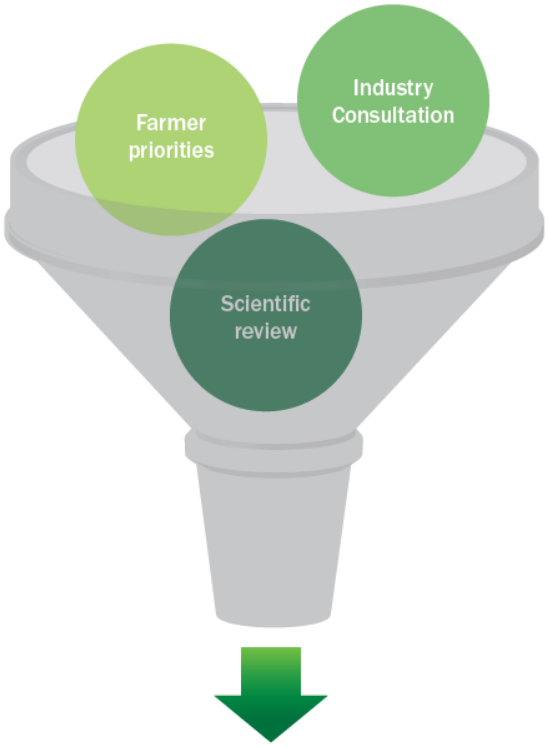
# Review of the AUS dairy selection index. Aims

1. Engage the industry and boost adoption
2. Ensure NBO remains relevant on driving on-farm profit
3. Index(s) based on scientific principles but in line with farmer preferences:

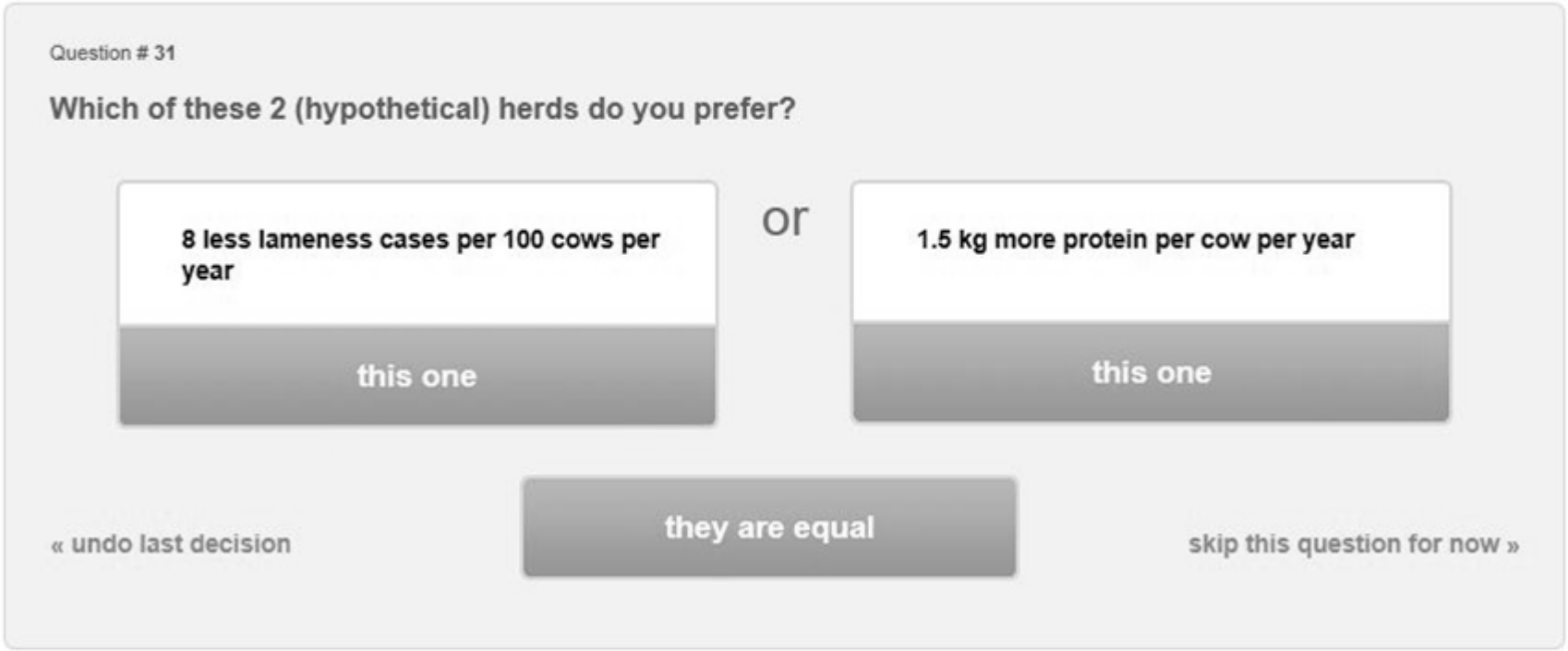
Combining
- Economic principles
- Farmer desired gains




**National Breeding Objective**

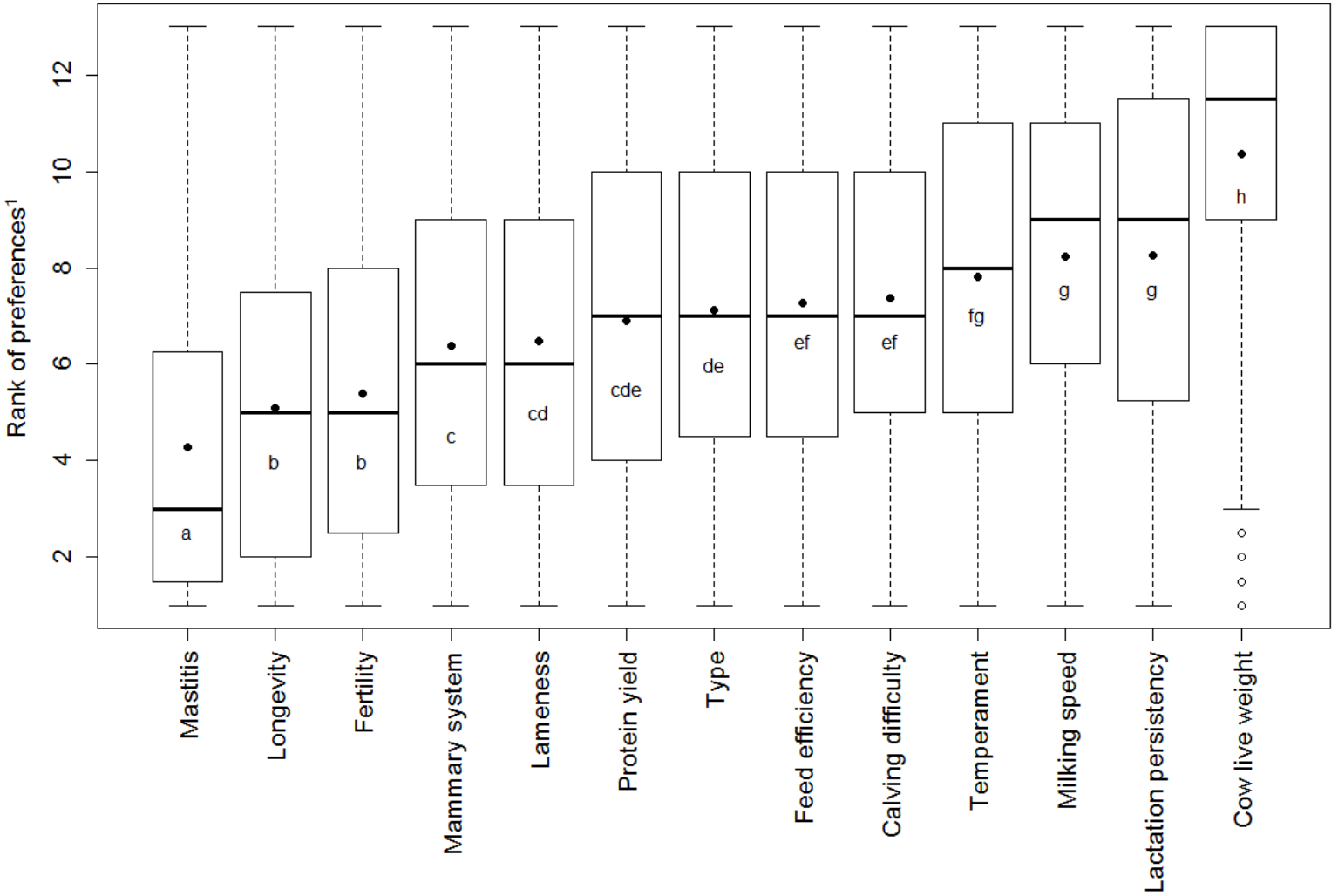
# Survey method. Question example

1000minds (Hansen and Ombler, 2009)

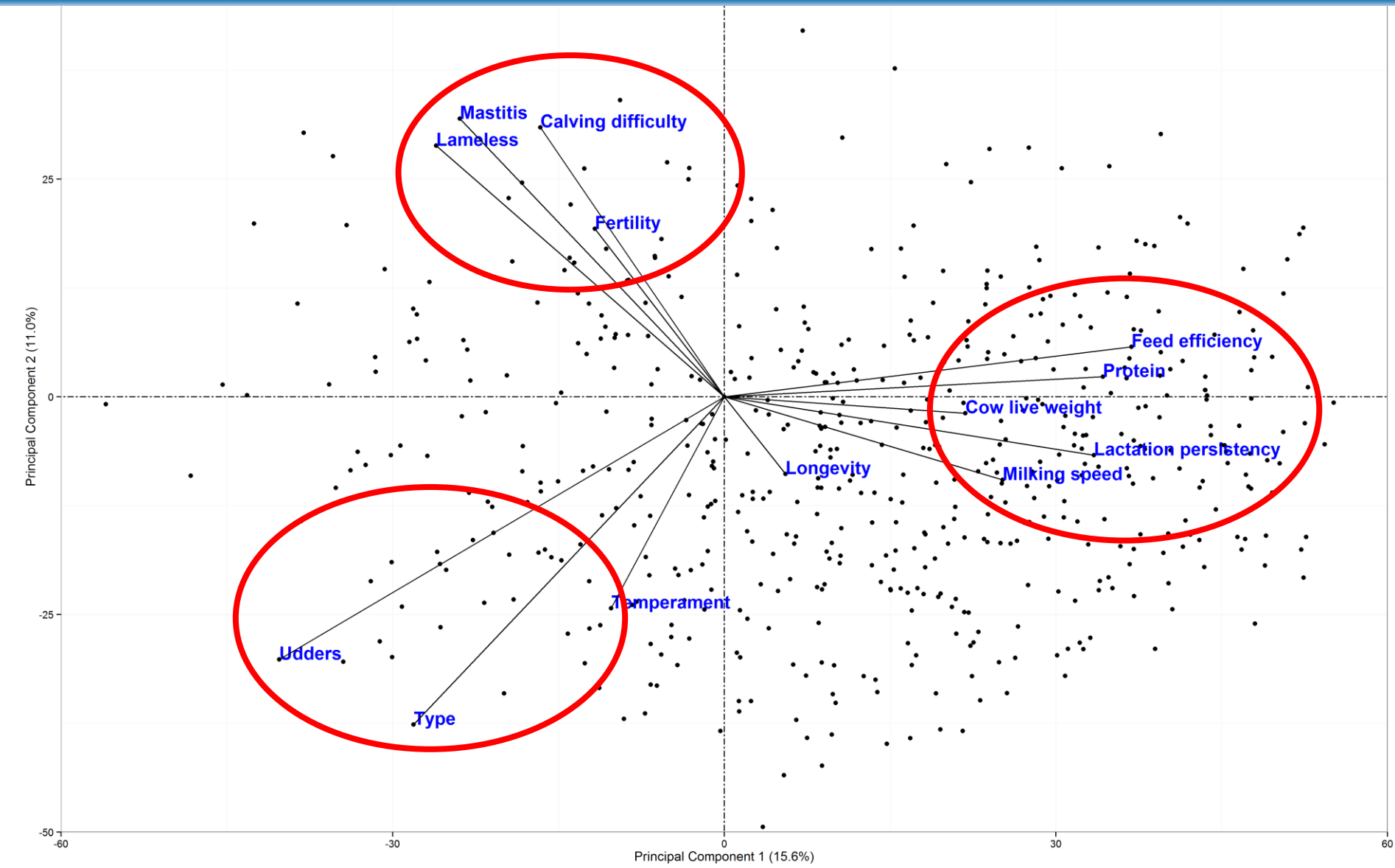



- Preferences for improvements rather than for traits per se
- Non-economic component

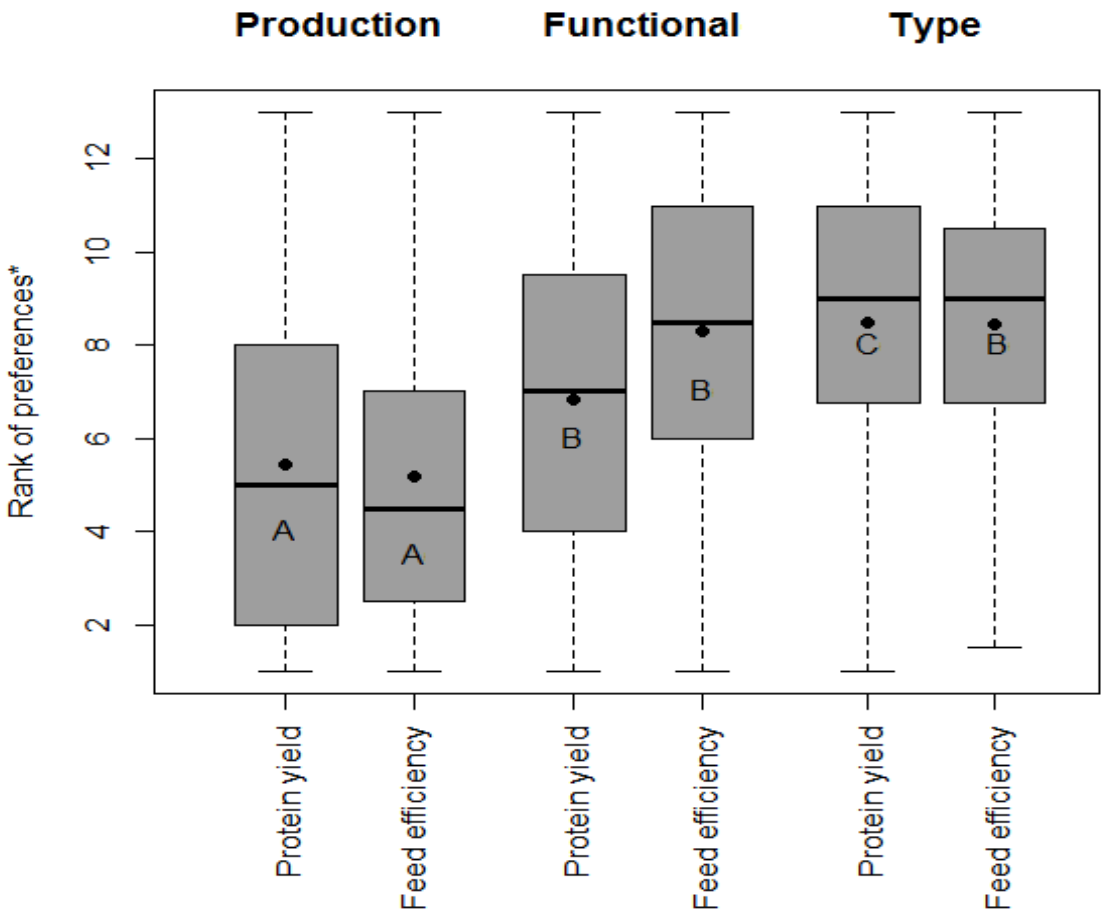
# Survey outcomes. Average farmer preferences



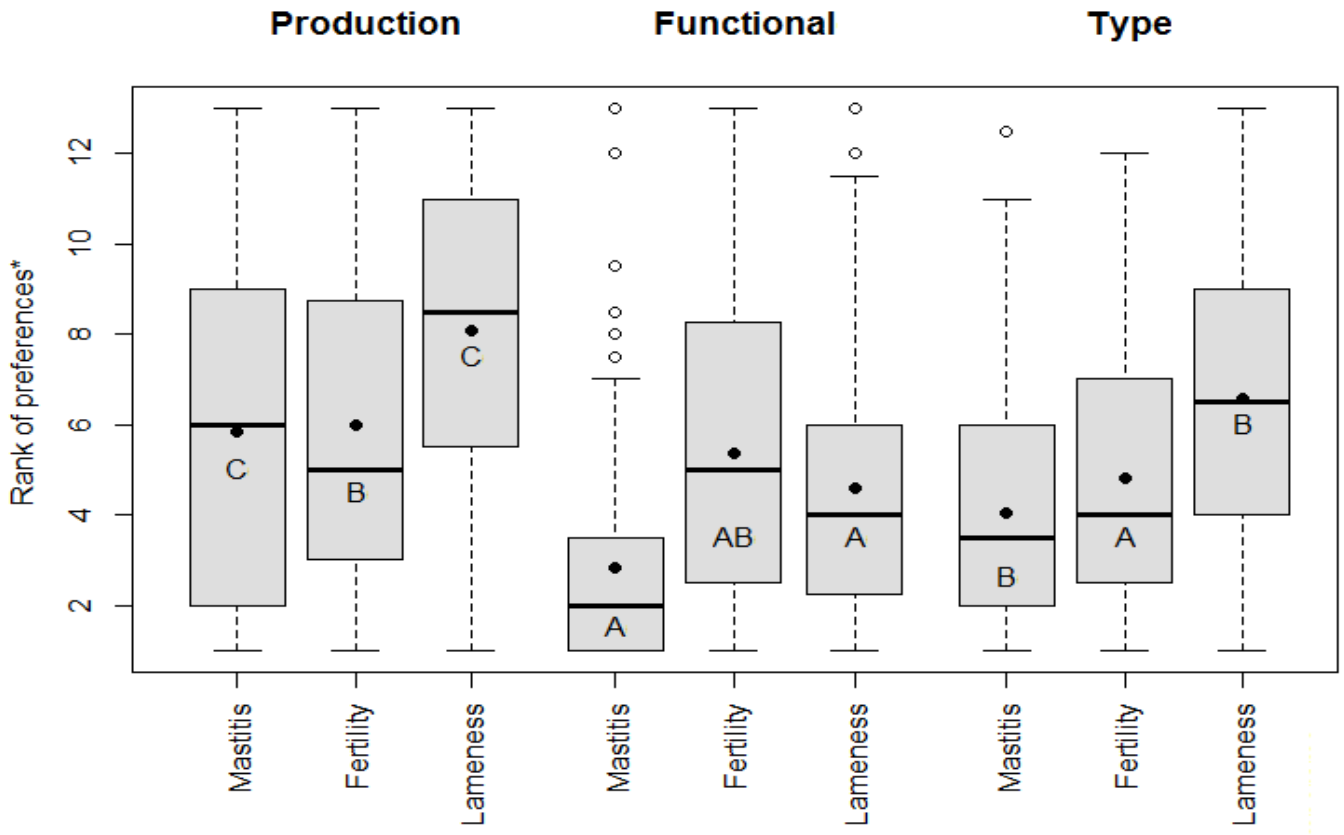
# Survey outcomes. Preferences PCA



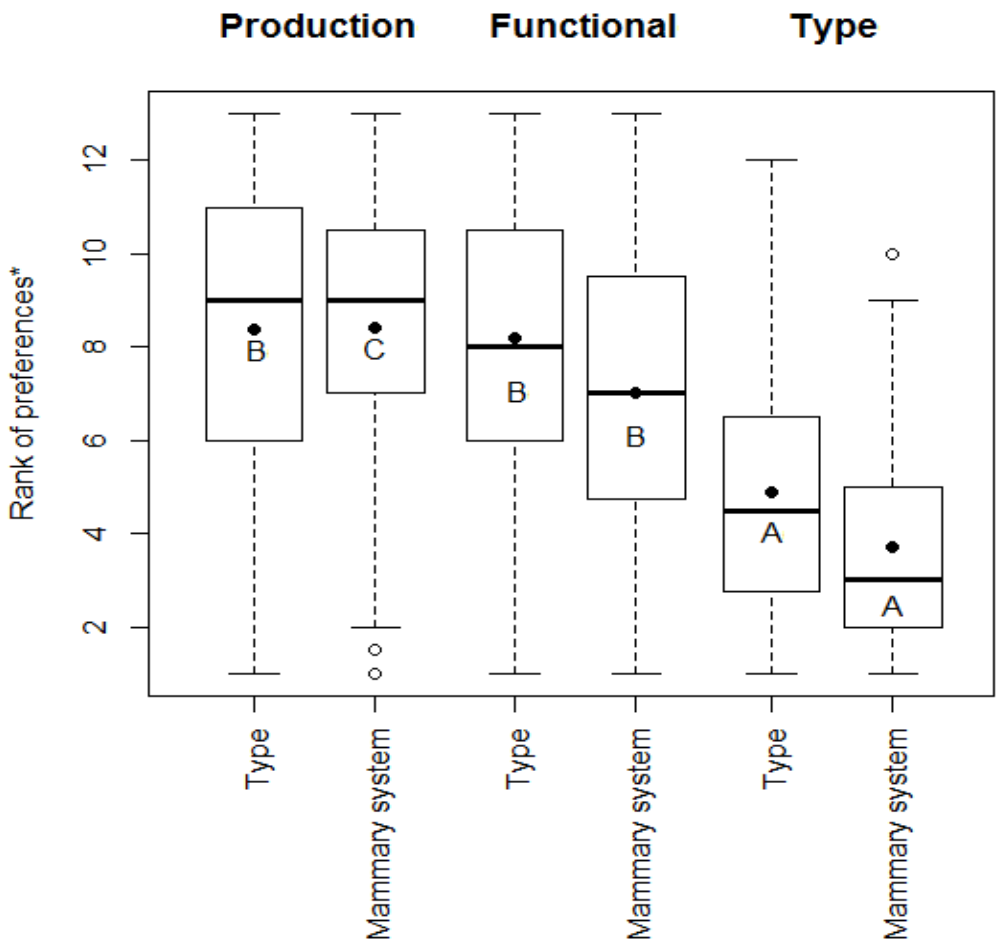
# Production focused farmers



# Functional focused farmers



# Type focused farmers



# Selection Indexes

## Balanced Performance Index (BPI)

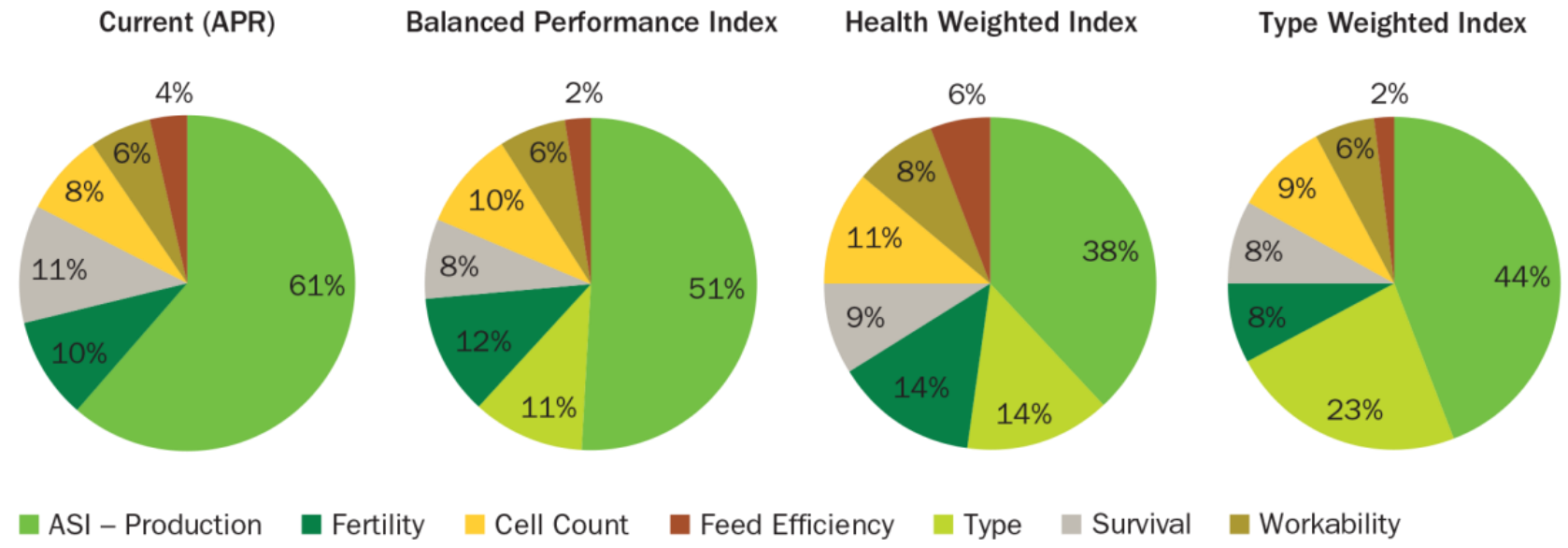
- Economic index
- Blends production, type and health traits for maximum profit
- In line with farmer preferences

## Health Weighted Index (HWI)

- Fast track fertility and mastitis resistance

## Type Weighted Index (TWI)

- Fast track type



# Future research questions

**Are stated preferences different from real farmer choices?**

**How different are they?**

# Development of a reference measure of farmers' attitude towards breeding tools

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**PLEASE, INDICATE HOW MUCH YOU AGREE/DISAGREE WITH EACH OF THEM.**

**j) The appearance of progeny fully indicates how good the bull/cow is.**

- ○ Totally disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Totally agree

**b) Using genetic merit (breeding value) to select bulls/cows improves the performance of cattle better and faster than other ways of selecting.**

- ○ Totally disagree
- ○ Disagree
- ○ Somewhat disagree
- ○ Somewhat agree
- ○ Agree
- ○ Totally agree
- ○ (I do not know / I do not have an opinion on this)

# Background

- To analyse attitudes we have to measure them
- Psychometry: clear and tested methods (Thurstone, 1928)
- We aim to develop a reference measure of attitudes
- Other fields:

  New Environmental Paradigm (Dunlap et al., 2000)

# Attitudinal scales design

- Fixed set of statements (items); agreement scores


Likert scales (Likert, 1932)

# Attitudinal scales design development

1. Item construction: designed to cover all relevant aspect
2. Psychometric properties evaluation:
    - ❖ Reliability (Cronbach´s α )
    - ❖ Validity
3. Dimensionality of the scale: Factor analysis

# Animal breeding paradigms

- A priori dimensions covering 3 breeding paradigms:

1. Traditional breeding: animal appraisal
2. Genetic breeding: EBVs selection
3. Genomic breeding: gEBVs

# Statements

| | |
|---|---|
| **Traditional** | The appearance of a bull/cow is sufficient for telling its performance. |
| | The appearance of progeny fully indicates how good the bull/cow is. |
| | … |
| **Genetic** | Using genetic merit (breeding value) to select bull/cows improves the performance of beef better and faster than other ways of selecting. |
| | … |
| | … |
| **Genomic** | … |
| | It is important that opportunities for selection of beef with genomic and DNA/gene information are fully utilized. |
| | Genomic and DNA/gene information will be the only information used to select bull/cows in the future. |
| | … |

- 14 initial items → Cronbach´s α → 8 final items

# Sheep and beef farmer population sample

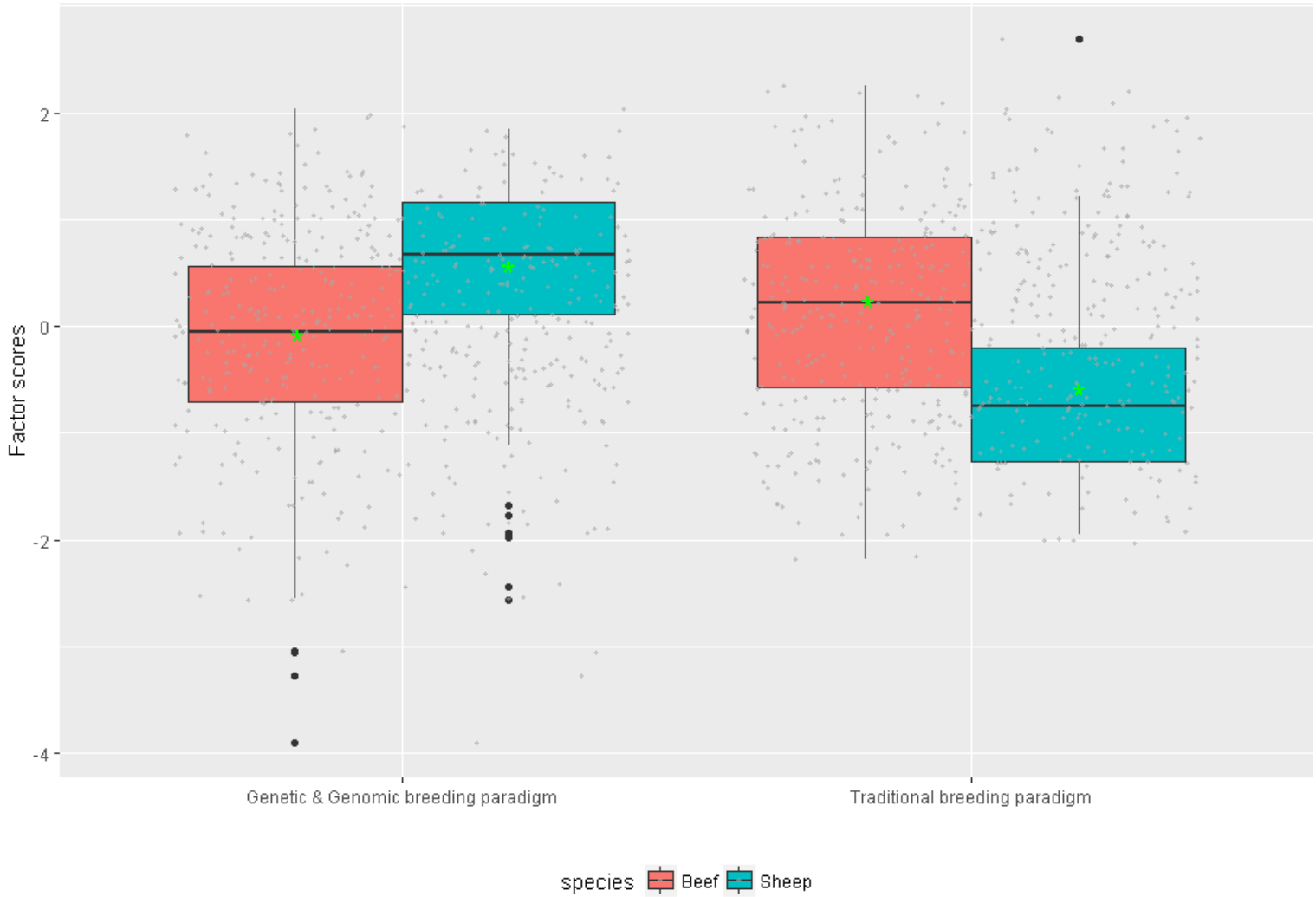
| Country | Breeds | n |
|---|---|---|
| | **Beef** | **498** |
| Australia | International 1 | 57 |
| | International 2 | 23 |
| New Zealand | International 3 | 23 |
| Spain | Local 1 | 59 |
| | Local 2 | 26 |
| | Local 3 | 7 |
| | Local 4 | 67 |
| | Local 5 | 77 |
| | Local 6 | 4 |
| | Local 7 | 149 |
| | Crossbreed | 6 |
| | **Dairy sheep** | **120** |
| Spain | International 4 | 32 |
| | Local 8 | 11 |
| | Local 9 | 36 |
| | Local 10 | 41 |

Total
618

# Factor analysis results: Dimensions

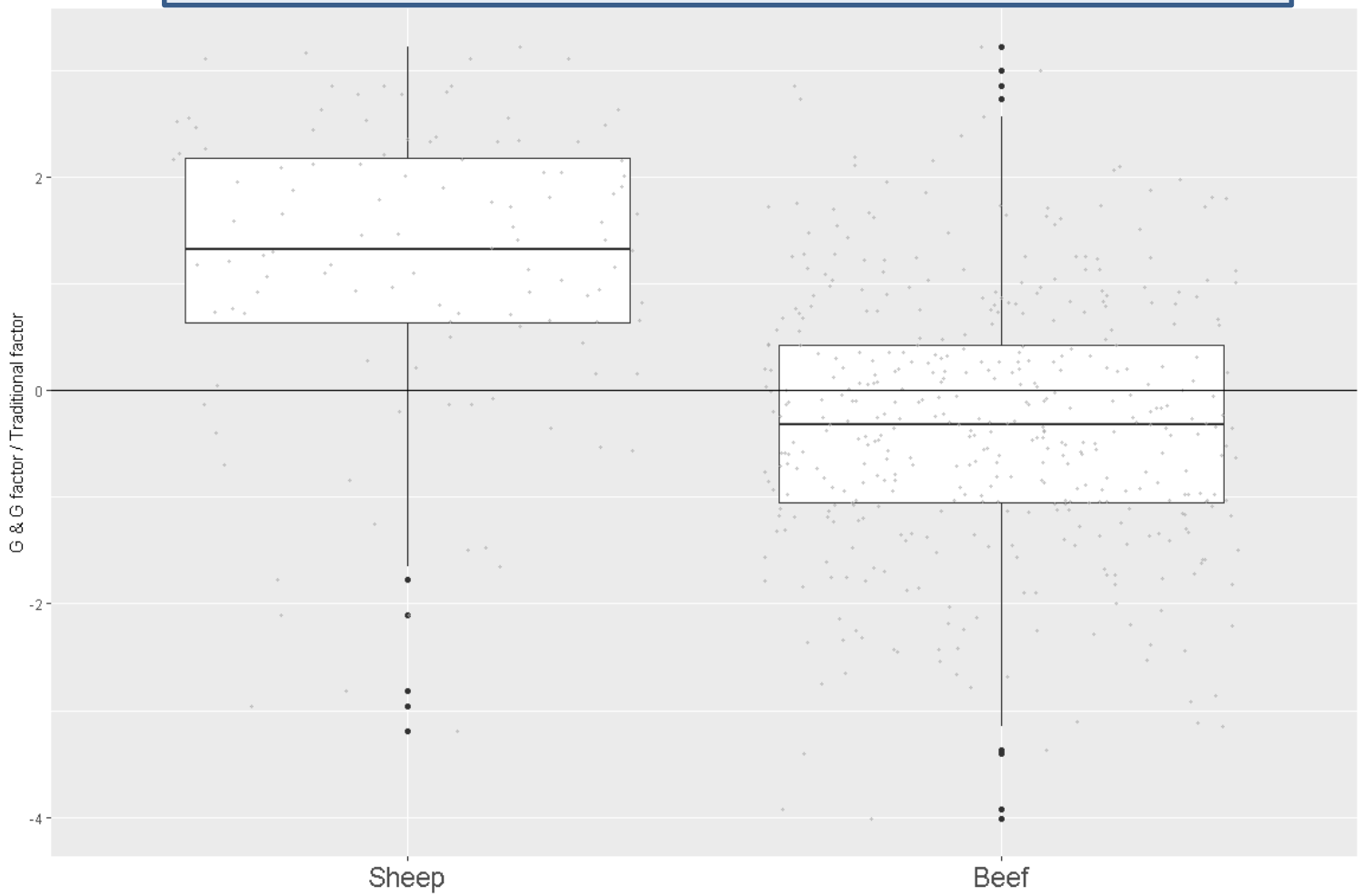
| Attitudinal paradigm | Items | Attitudinal dimension (Factor Analysis) | |
|---|---|---|---|
| | | 1 | 2 |
| Traditional breeding | The appearance of a bull/cow is sufficient for telling its performance. | 0.066 | **0.839** |
| | The appearance of progeny fully indicates how good the bull/cow is. | 0.085 | **0.787** |
| **Genetic & Genomic breeding** | Using genetic merit (breeding value) to select bull/cows improves the performance of beef better and faster than other ways of selecting. | **0.505** | 0.066 |
| | Combining information from several traits into selection indices is the best way to summarise genetic merit information (breeding values). | **0.570** | 0.041 |
| | The use of genomic and DNA/gene information to select bull/cows will improve the performance of sheep better and faster than any other method. | **0.736** | -0.147 |
| | It is important that opportunities for selection of beef with genomic and DNA/gene information are fully utilized. | **0.712** | -0.100 |
| | Genomic and DNA/gene information will be the only information used to select bull/cows in the future. | **0.614** | 0.064 |
| | It is important that opportunities for selection of beef cattle with new genetic developments (transcriptomics, epigenetics, gene regulation networks and metagenomic) are fully utilized. | **0.733** | -0.204 |

# Results. Attitudes across sample; species

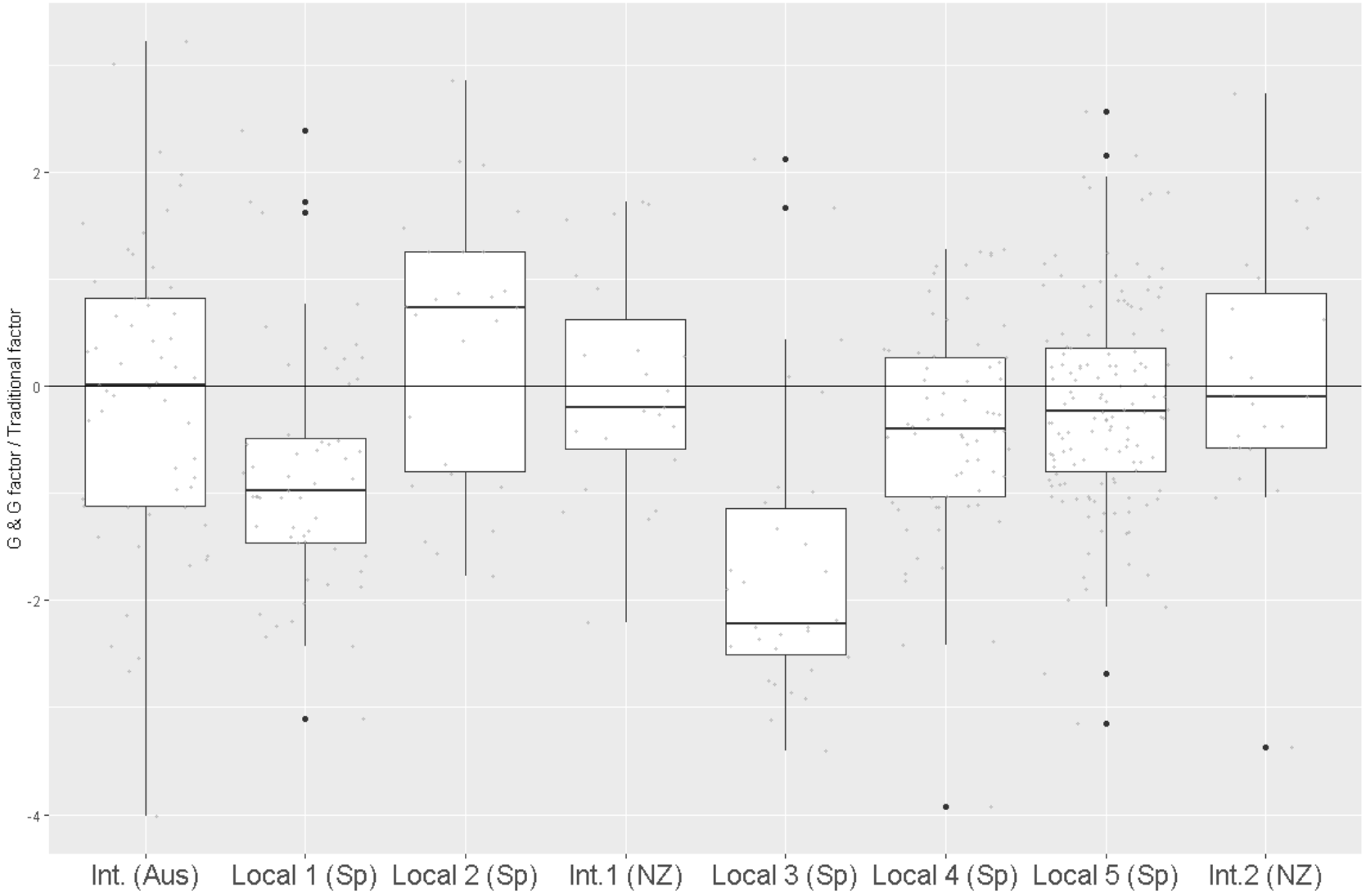


# Results. Species

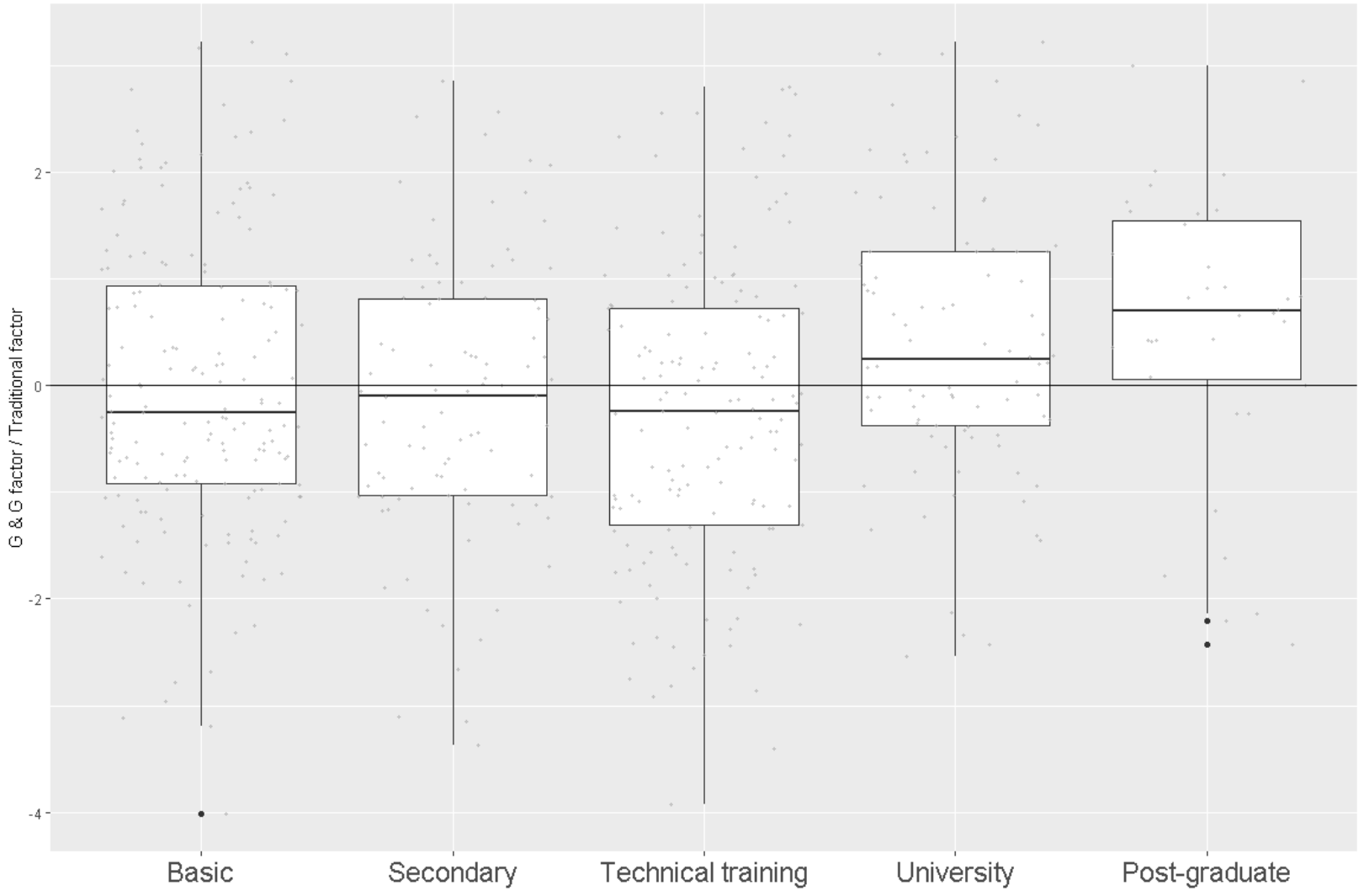
*G & G factor score – Tradicional factor score*



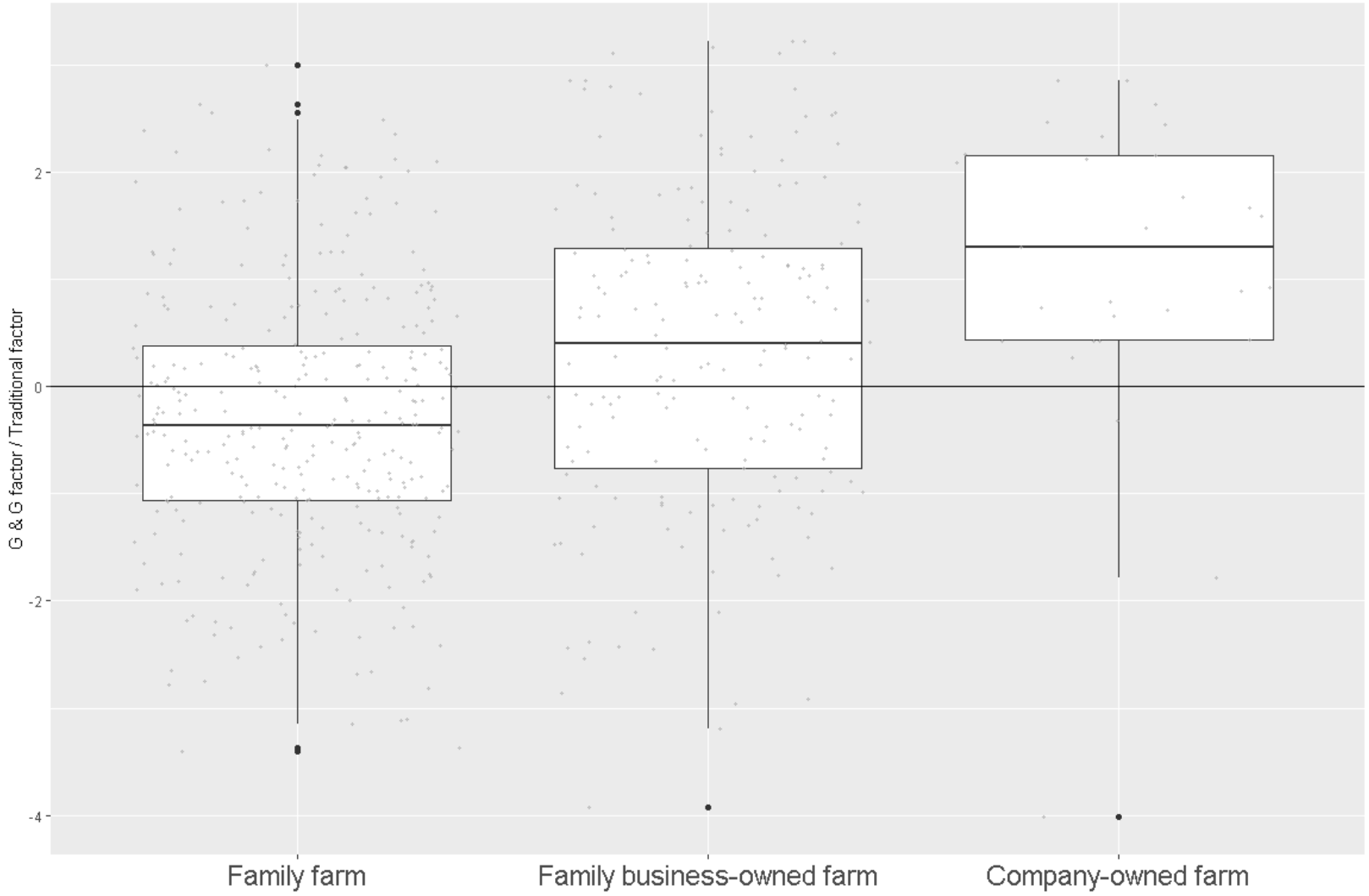
# Results. Beef breeds



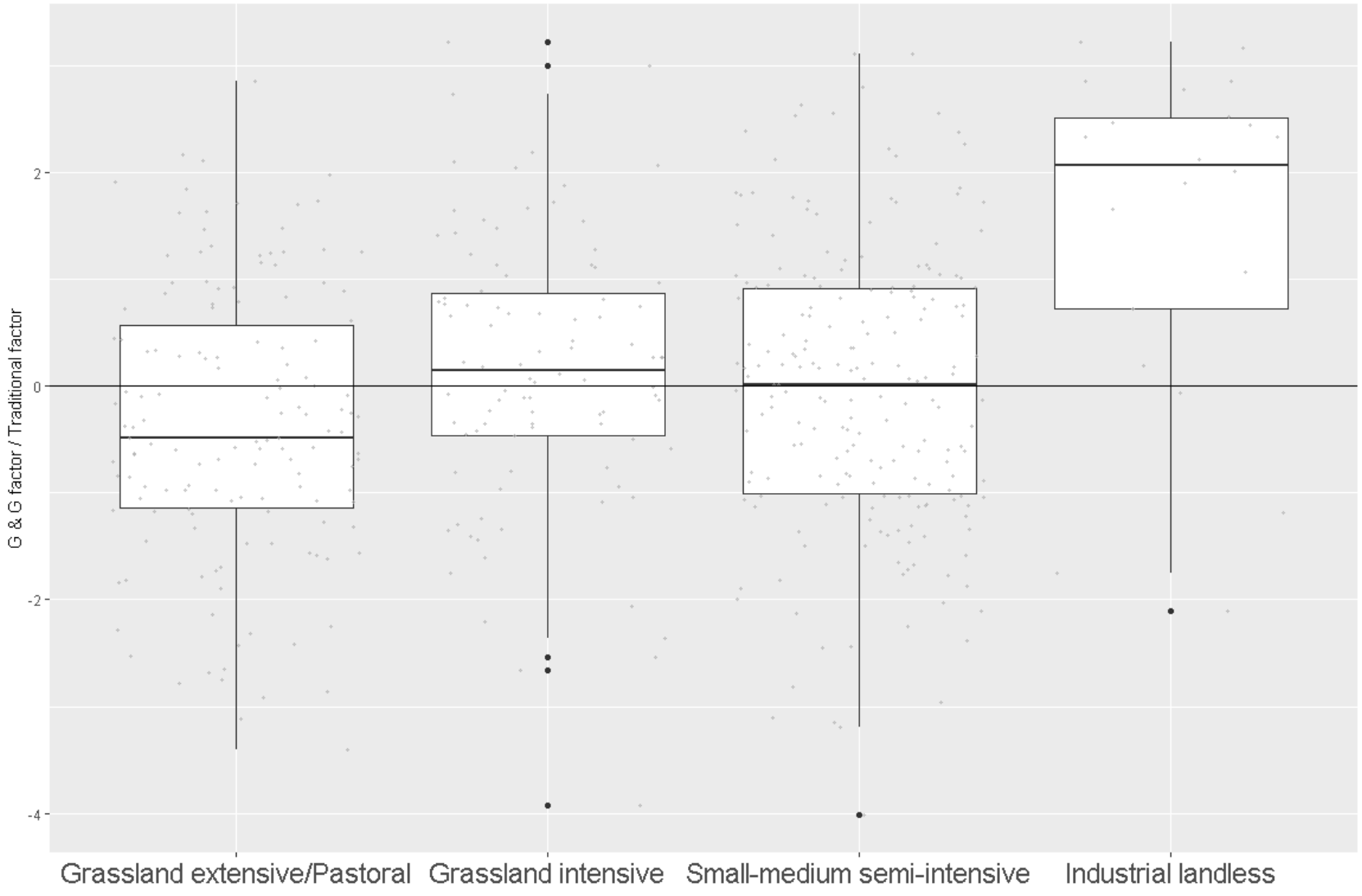
# Results. Education



# Results. Farm ownership structure



# Results. Production system



# Results. Farming family

# Uses of reference measure

- Benchmark farmers´ attitudes over time…
- …across groups of farmers, breeds, livestock species, countries and world region

- To design tailored extension activities
- Assess the impact of extension

# Exploring farmers' attitudes and preferences to inform the development and implementation of breeding tools

## Thank you!

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