# Overall type traits
# - optimally combined udder

## NAV workshop

## Copenhagen, January 2014


## Ulrik Sander Nielsen and Anders Fogh



Ministeriet for Fødevarer, Landbrug og Fiskeri

Den Europæriske Landbrugsfond for Udvikling af Landdistrikterne

Naturerhverv.dk

Danmark og EU investerer i landdistrikterne.

STØTTET AF
mælkeafgiftsfonden

Se "European Agricultural Fund for Rural Development" (EAFRD)

# What is a good udder?

- Beautifull
- Work friendly
- Functional (healthy and long lasting)

Current index do probably include all aspects!

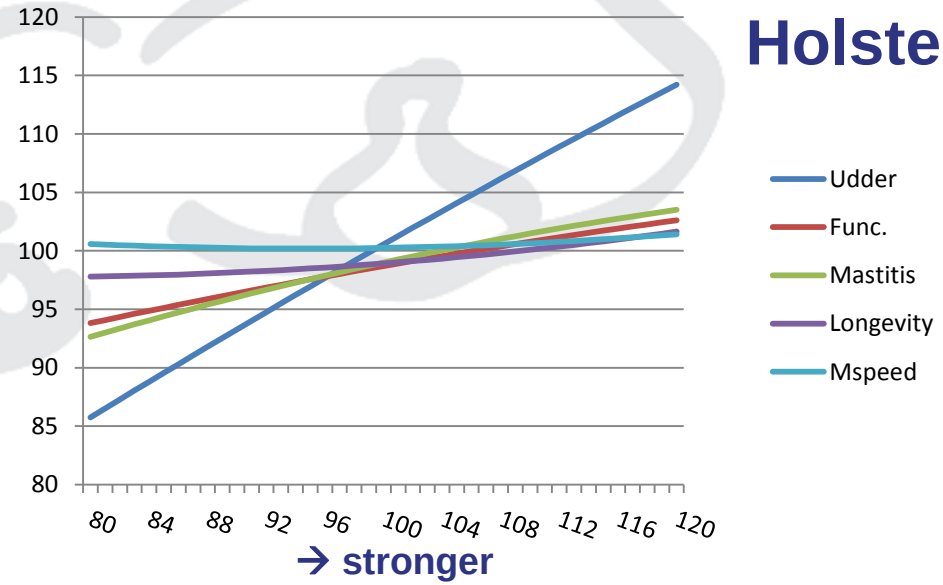
This presentation shows effect of other scenarios

# Impact of linear udder traits

- What is the effect of an increase in EBV from 80 to 120 on:
  - Current composite udder
  - Functional trait (0.5 mastitis and 0.5 longevity)
  - Mastitis
  - Longevity
  - Milking speed

# Higher index for fore udder attachment

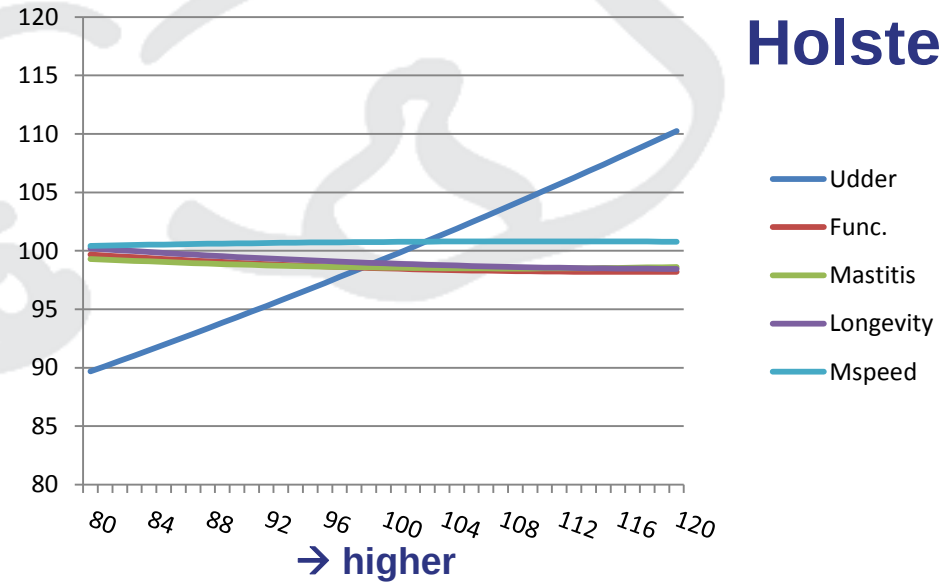
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 28.5*** | 8.8*** | 10.9*** | 3.8*** | 0.8 |
| RDC | 25.2*** | 10.0*** | 10.5*** | 6.1*** | 3.1* |
| Jersey | 32.0*** | 9.6*** | 9.1*** | 7.0 | 2.8 |

# Higher index for rear udder height

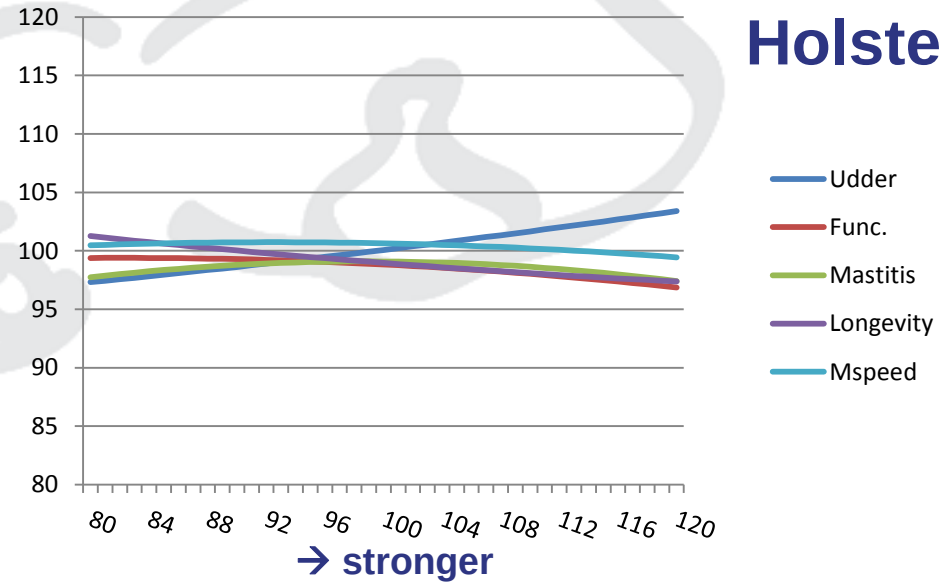
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 20.6*** | -1.5 | -0.7 | -1.8 | 0.4 |
| RDC | 19.3*** | 0.2 | 0.6 | 2.9 | -1.1 |
| Jersey | 19.6*** | 4.8* | 4.6* | 3.5 | 3.3 |

# Higher index for udder cleft

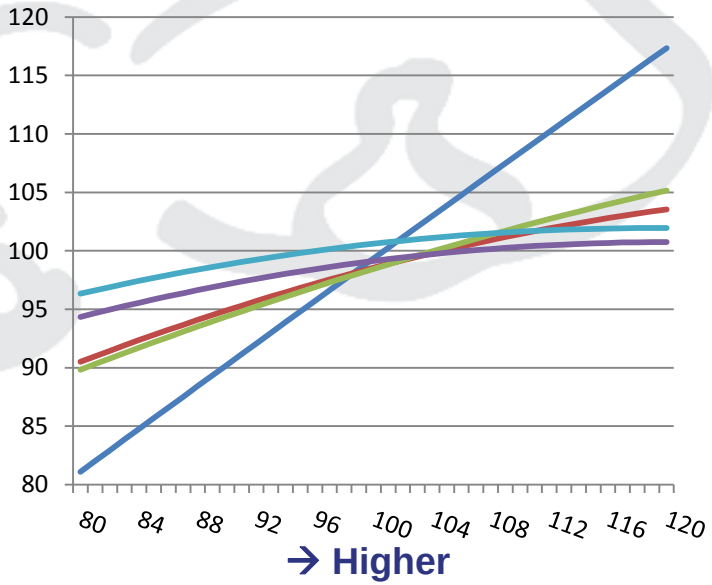
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| **Holstein** | 6.1*** | -2.5* | -0.3 | -3.9*** | -1.0 |
| **RDC** | 10.0*** | 2.8 | 1.9 | 2.7* | -0.3 |
| **Jersey** | 8.2*** | 3.3 | 3.6 | 2.0 | 7.5* |

# Higher index for udder depth

## What happens to other traits?

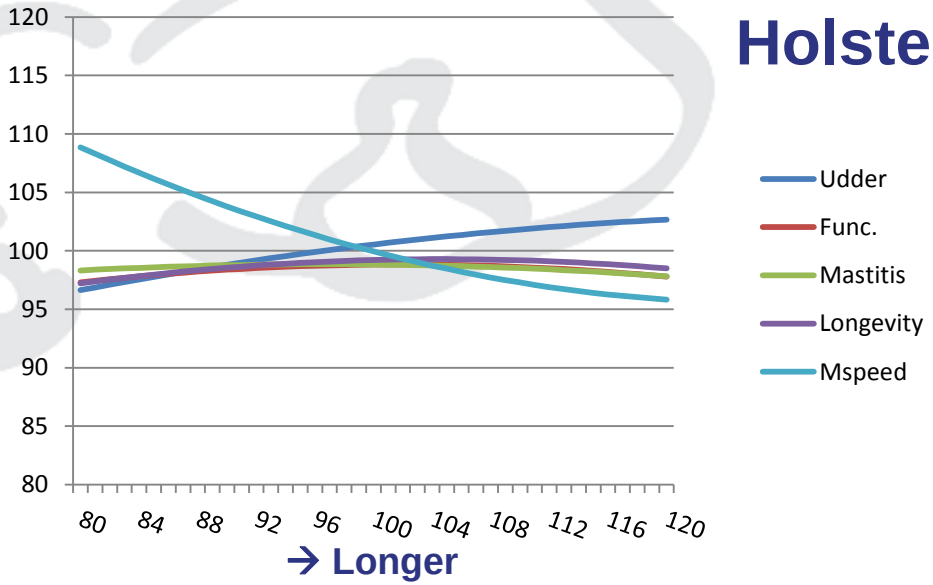



**Holstein**

| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| **Holstein** | 36.2*** | 13.0*** | 15.3*** | 6.4*** | 5.6*** |
| **RDC** | 30.6*** | 13.8*** | 14.8*** | 8.2*** | 4.6* |
| **Jersey** | 29.6*** | 12.3*** | 12.5*** | 8.0*** | 4.4 |

# Higher index for teat length

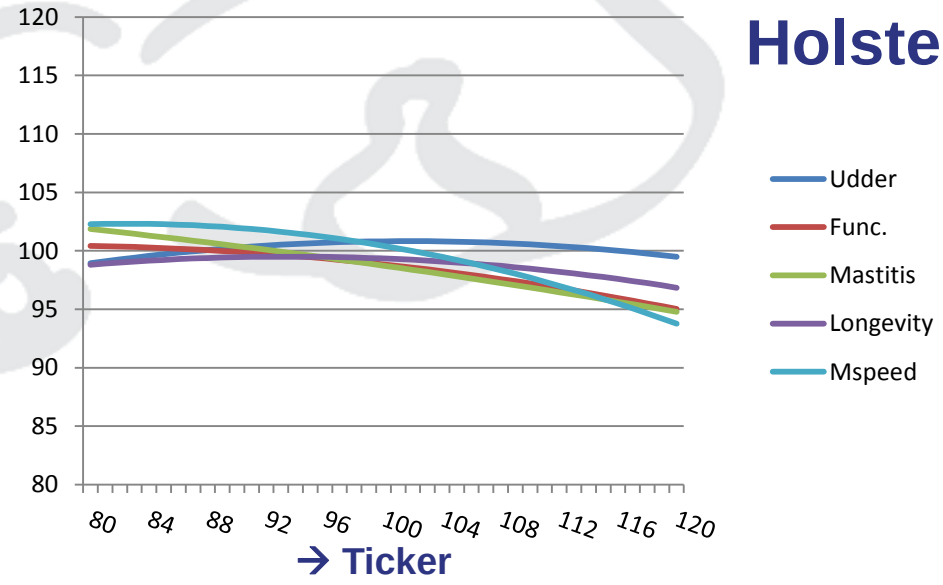
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| **Holstein** | 6.0*** | 0.5 | -0.5 | 1.3 | -13.0*** |
| **RDC** | 12.0*** | -4.2*** | -0.2 | -6.8*** | -8.2*** |
| **Jersey** | 5.0* | -8.0*** | -7.2*** | -6.2** | -2.6 |

# Higher index for teat thickness

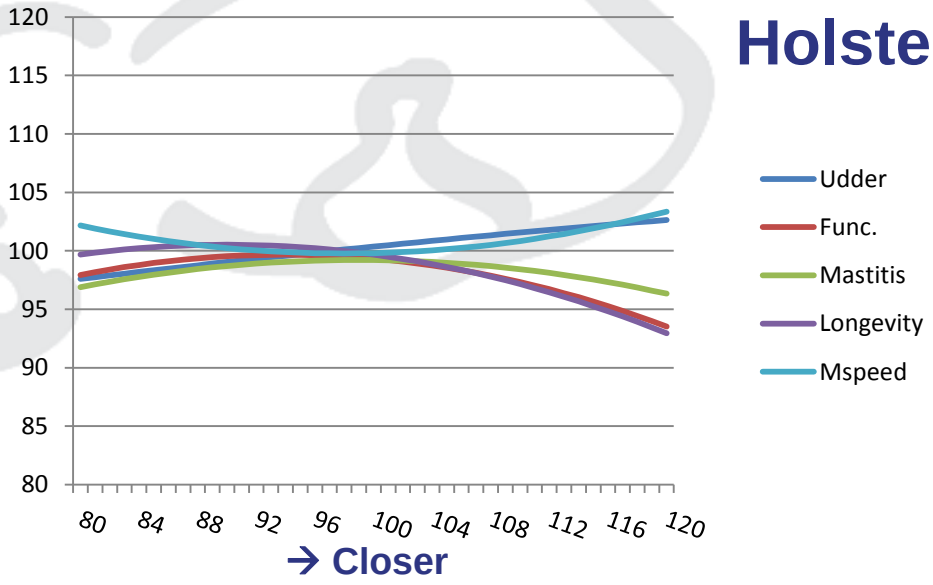
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 0.6 | -5.4*** | -7.1*** | -2.0 | -8.5*** |
| RDC | 8.6*** | -7.6*** | -6.4*** | -6.2*** | -5.3*** |
| Jersey | 2.5 | -8.4*** | -10.7*** | -3.2 | -4.8 |

# Higher index for teat placement, front

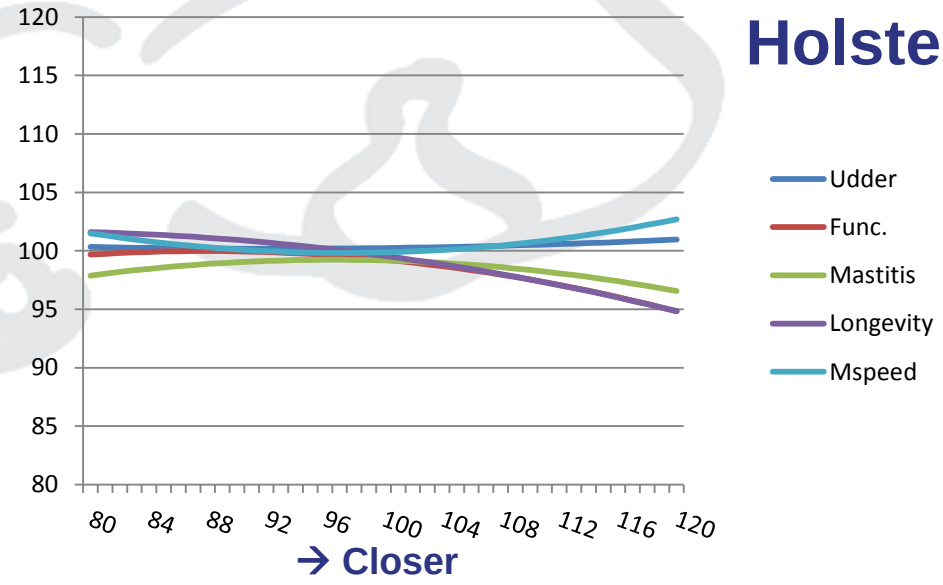
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 5.0*** | -4.4*** | -0.6 | -6.7*** | 1.2 |
| RDC | 12.6*** | 5.1*** | 5.3*** | 3.2* | 3.1 |
| Jersey | 12.4*** | 0.4 | 1.2 | -0.4 | -3.6 |

# Higher index for teat placement, back

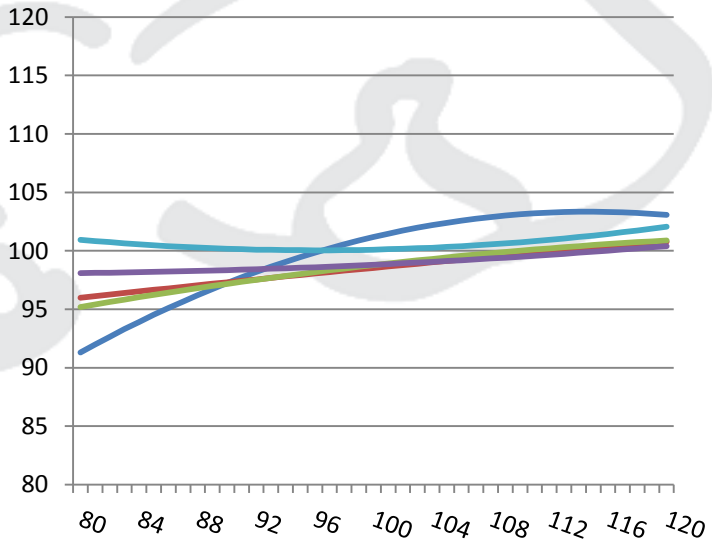
## What happens to other traits?




| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 0.6 | -4.8*** | -1.3 | -6.8*** | 1.2 |
| RDC | 8.0*** | 3.5* | 3.5* | 2.3 | 2.4 |
| Jersey | 10.0*** | -0.7 | -0.7 | -0.2 | -1.4 |

# Higher index for udder balance

## What happens to other traits?




### Holstein

| Index units | Udder | Func. | Mastitis | Longevity | Mspeed |
|---|---|---|---|---|---|
| Holstein | 11.8*** | 4.8*** | 5.7*** | 2.3 | 1.1 |
| RDC | 15.7*** | 1.9 | 3.6 | -0.5 | 3.8* |
| Jersey | 14.4*** | -0.8 | 0.5 | -1.7 | 10.4*** |

# Consequences of different scenarioes

- Current udder index: **weight factors used today**
- Strict udder index: **Maximal correlation with combined udder health/longevity index**
- Customized strict udder index: **as above but few political consideration**

# Relation between udder and ”functional index” for Holstein

- Current $R^2 = 0.09$
- Strict $R^2 = 0.20$
- Strict, but not teats $R^2 = 0.19$
- Strict, but not teats and against expectation $R^2 = 0.15$

**Only significant traits without teats**

- .08 · fore udder + .3 · depth – .19 · plac. b. $R^2 = 0.15$

**Political wish about udder cleft:**

- .15 · fore udder + .15 · cleft + .46 · depth – .24 plac. b. $R^2 = 0.14$

# Optimal combined udder

**Includes fewer traits because:**

- **Not all traits have a positive effect on functionality**
- **Some trait are strongly correlated**

# Udder depth

(Correlations in brackets)

**Higher udders:**

- Stronger fore udders (0.5 - 0.65)
- Higher rear udders (0.3 - 0.45)
- Wider rear udders (0.1 - 0.2)
- Deeper front udder (0.25 - 0.35 )

# Fore udder attachment

**Stronger fore udders:**

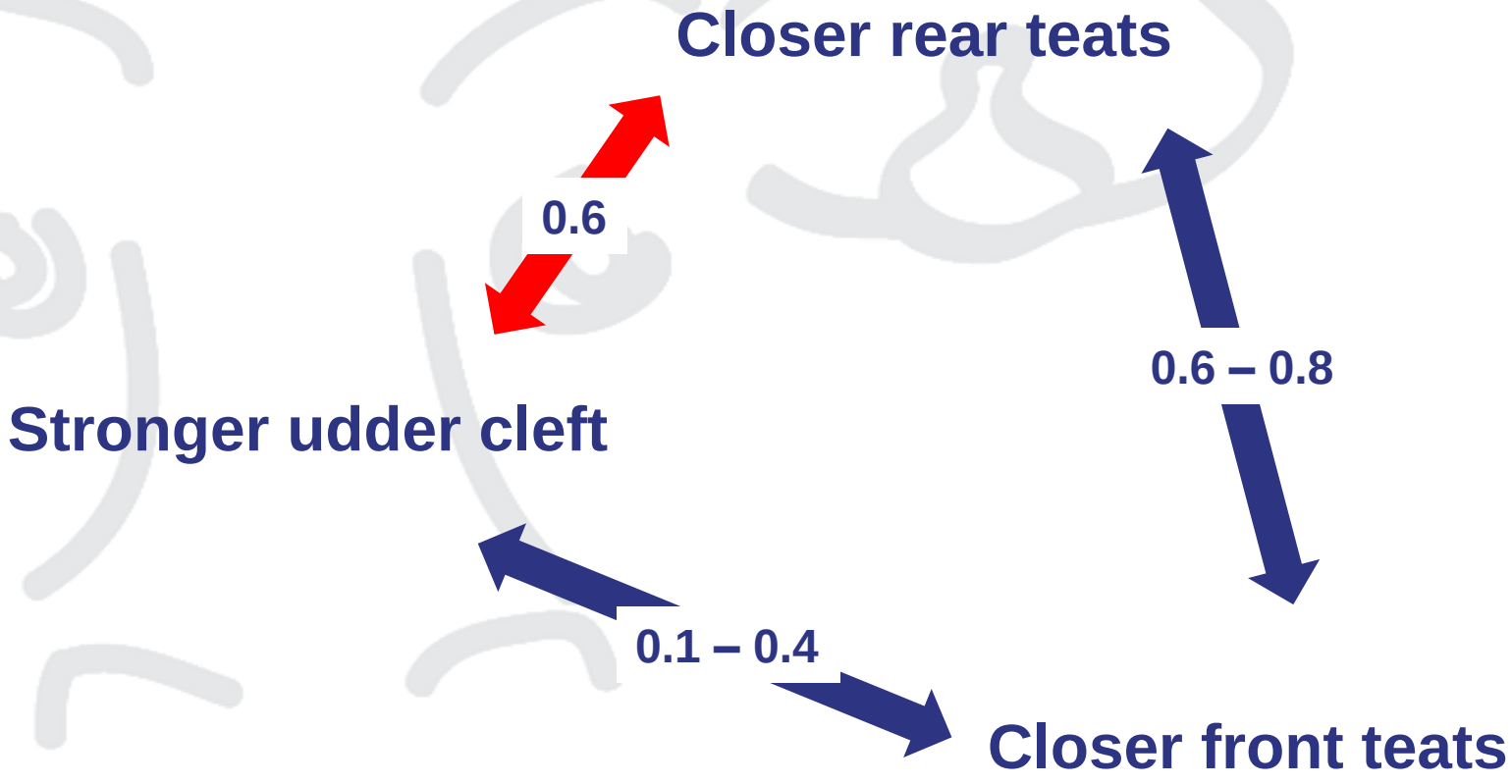
- **Higher rear udders (0.2 - 0.5)**
- **Wider rear udders (0.2 - 0.5)**
- **Higher udders (0.5 - 0.65)**
- **Deeper front udder (0.2 - 0.5)**

# Rear udder height

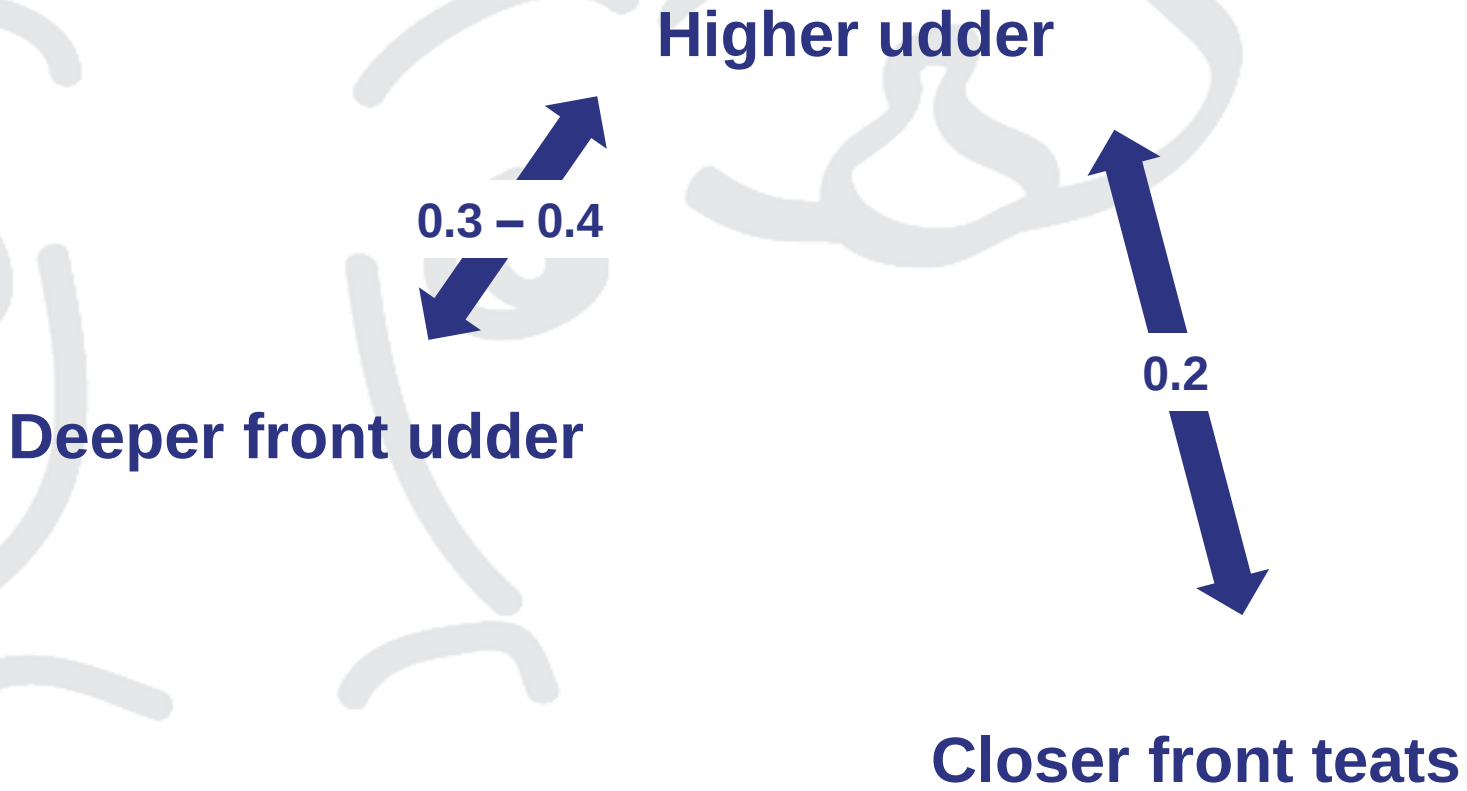
**Higher rear udders:**

- Wider rear udders (0.5 - 0.7)
- Stronger udder cleft (0.1 - 0.4)
- Higher udders (0.3 - 0,45)
- Closer teat placement back (0.2)
- Deeper front udder (0.3 - 0.35)

# Teat placement and udder cleft



# Udder depth


Higher udder
0.3 – 0.4
Deeper front udder
0.2
Closer front teats
(only RDC)

# Teat thickness and length

**Longer teats** ⟵ **0.5 – 0.7** ⟶ **Thicker teats**

# Holstein

## Correlation between udder traits and 3 alternatives

| | Current | Strict | Customized strict |
|---|---|---|---|
| Fore udder attachment | 0.69 | 0.58 | 0.64 |
| Rear udder height | 0.54 | 0.30 | 0.38 |
| Udder cleft | 0.16 | -0.23 | 0.09 |
| Udder depth | 0.89 | 0.86 | 0.93 |
| Teat length | 0.14 | 0.04 | 0.04 |
| Teat thickness | 0.02 | -0.07 | -0.10 |
| Teat placement, front | 0.11 | -0.25 | -0.09 |
| Teat placement, back | 0.02 | -0.38 | -0.13 |
| Udder balance | 0.27 | 0.30 | 0.33 |
| Functionality | 0.29 | 0.39 | 0.37 |
| Udder health | 0.34 | 0.40 | 0.41 |
| Longevity | 0.15 | 0.25 | 0.20 |
| Milking speed | 0.03 | 0.07 | 0.07 |
| NTM | 0.29 | 0.35 | 0.33 |

# Relation between udder and ”functional index” for RDC

- Current $R^2 = 0.06$
- Strict $R^2 = 0.18$
- Strict, but not teats $R^2 = 0.16$
- Strict, but not teats and ….. $R^2 = 0.15$

**Only significant traits**

- .1 · fore udder + .3 · depth – .1 · balance $R^2 = 0.15$

**Udder balance not included:**

- .1 * fore udder + .3 * depth R2 = 0.15

# RDC

## Correlation between udder traits and 3 alternatives

| | Current | Strict | Customized strict |
|---|---|---|---|
| Fore udder attachment | 0.72 | 0.73 | 0.74 |
| Rear udder height | 0.50 | 0.23 | 0.29 |
| Udder cleft | 0.26 | 0.11 | 0.08 |
| Udder depth | 0.77 | 0.93 | 0.97 |
| Teat length | 0.31 | -0.09 | -0.07 |
| Teat thickness | 0.26 | -0.16 | -0.14 |
| Teat placement, front | 0.31 | 0.23 | 0.26 |
| Teat placement, back | 0.22 | 0.12 | 0.14 |
| Udder balance | 0.38 | 0.09 | 0.34 |
| Functionality | 0.24 | 0.38 | 0.38 |
| Udder health | 0.28 | 0.38 | 0.38 |
| Longevity | 0.11 | 0.24 | 0.23 |
| Milking speed | 0.00 | 0.08 | 0.10 |
| NTM | 0.29 | 0.33 | 0.32 |

# Relation between udder and ”functional index” for Jersey

- Current $R^2 = 0.07$
- Strict $R^2 = 0.24$
- Strict, but not teats $R^2 = 0.19$
- Strict, but not teats and ….. $R^2 = 0.18$

**Only significant traits**

- .13 · fore udder + .15 · cleft + .25 · depth
  – .1 · plac. b. - 0.14 · balance $R^2 = 0.18$

**Without udder balance** $R2 = 0.18$

# Jersey

## Correlation between udder traits and 3 alternatives

| | Current | Strict | Customized strict |
|---|---|---|---|
| Fore udder attachment | 0.85 | 0.67 | 0.78 |
| Rear udder height | 0.54 | 0.45 | 0.56 |
| Udder cleft | 0.25 | 0.32 | 0.38 |
| Udder depth | 0.83 | 0.89 | 0.91 |
| Teat length | 0.15 | -0,06 | -0.01 |
| Teat thickness | 0.07 | -0.21 | -0.19 |
| Teat placement, front | 0.34 | -0.08 | -0.04 |
| Teat placement, back | 0.28 | -0.03 | 0.09 |
| Udder balance | 0.40 | 0.03 | 0.39 |
| Functionality | 0.27 | 0.42 | 0.39 |
| Udder health | 0.28 | 0.42 | 0.39 |
| Longevity | 0.20 | 0.33 | 0.28 |
| Milking speed | 0.05 | 0.09 | 0.15 |
| NTM | 0.13 | 0.18 | 0.18 |

# Summary

- **Current udder index include many aspect – show, workability, functionality**
- **Possible to ”construct” a simpler udder index with higher relation to functionality**