Derivation of economic values for breeding goal traits in four different production systems (The optimal cow)

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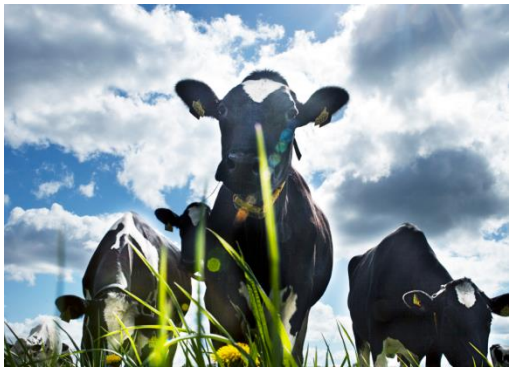



Breeding goal - theory

- The ideal way:
  - Derive marginal economic value, keeping the remaining traits constant

- Wolfova and Wolf (2013, Animal)
  - On the issue of double counting
    - Do not include genetic correlations in the derivation
    - Include structural changes in the derivation

Structural relationships an example

Improved health

Longer lasting cows

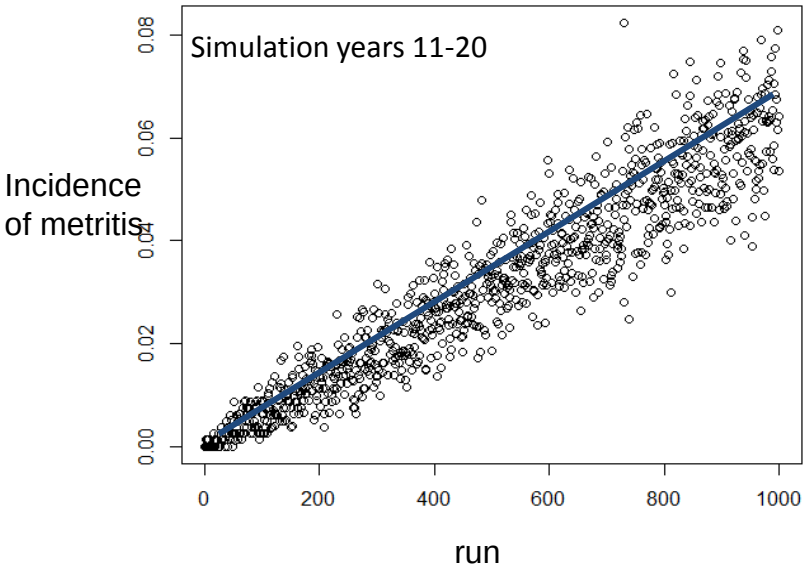
The consequence is lower weight on longevity, because the weights is put were it belongs to.

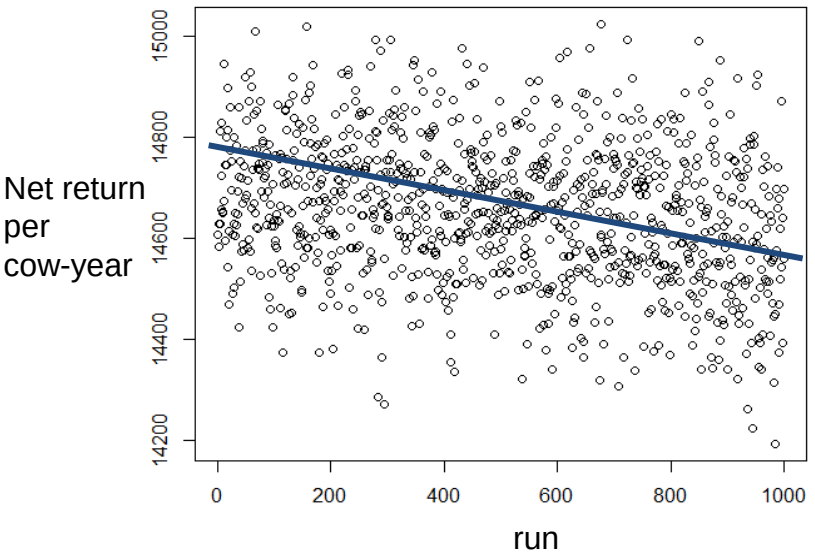
Breeding goal - practice

- Experience from the NTM work:
  - Interactions between **yield**, **functional traits** and **longevity** are difficult to handle.

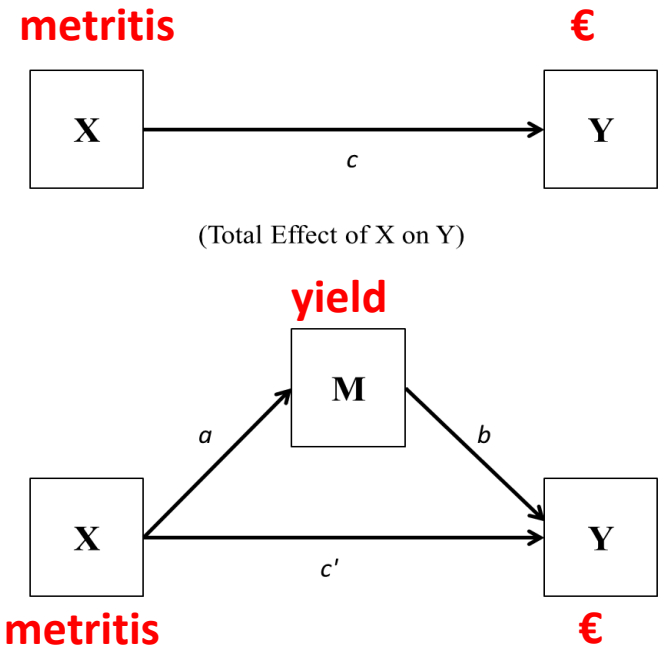
Method

- Mechanistic, dynamic and stochastic simulation in **SimHerd** (Østergård et al., 2014, Østergård et al., 2016 (JDS))
  - Phenotypic correlations included
  - Structural interactions included





Method



- direct effect of X on Y = c
- indirect effect of X on Y = a * b
- direct effect of X on Y **with the effect of the mediator removed** = c'

Fairchild and MacKinnon, 2009

Investigated production systems

- Conventional
  - Average Danish, conventional dairy herd in term of production, reproduction and health
- Organic
  - Organic milk level, slightly better health, higher prices for milk and feed
- Environment
  - High management level and use of beef semen to reduce young stock herd
- Hi-Tec
  - High management level due to low disease treatment threshold and automatic heat detection

Results – Selected traits for HF

Relative economic values across environments within traits

Trait	Conv.	Organic	Hitec	Env.
Yield	100	121	93	98
Feed efficiency	100	123	103	101
Cow mortality	100	102	112	114
Milk fewer	100	338	202	99
Mastitis (infectious)	100	205	109	108
Digetal Dermititis	100	101	81	100
Conception rate, cows	100	48	82	133
Conception rate, heifers	100	110	106	65
Longevity	100	108	121	135

Explanations - yield

Trait	Conv.	Organic	Hitec	Env.
Yield	**100**	**121**	**93**	**98**
Feed efficiency	**100**	**123**	**103**	**101**

- Organic: High EV's because of higher prices for organic milk and higher costs for organic feed

Explanations - Health

Trait	Conv.	Organic	Hitec	Env.
Milk fever	100	338	202	99
Mastitis (infectious)	100	205	109	108
Digital Dermititis	100	101	81	100

- Organic: High EVs due to restrictions on use of antibiotics
- Hitec: High EV for milk fewer because of more older cows

Conclusion

- The derived EV's are VERY dependent on production assumptions
- The estimated correlations between the four different breeding goals are quite high
- Including farmer preferences may alter this
- Including G*E interactions may alter this
- YES this can in combination with the present excel sheet be used for an update of NTM
- Division of breeds in lines require more investigations (e.g. SOBcows)

SOBcows

Specialized Organic Breeding goals and Breeding schemes within dairy production

26th of April 2016

M. Kargo, L. Hjortø, M. Slagboom, J. R. Thomasen, A. Buitenhuis, L. Hein, J. Pedersen, A Munk and others

STØTTET AF promilleafgiftsfonden for landbrug

Undersøgelsen er en del af Organic RDD 2-projektet SOBcows

Overall goal

- To enhance the size and the profitability of the organic dairy production
  - By adapting the breeding material to organic production circumstances
  - By indicating sustainable methods for sustainable niche production based on animals with specific genetic characteristics

Definition of organic breeding goals

- **Margots presentation**

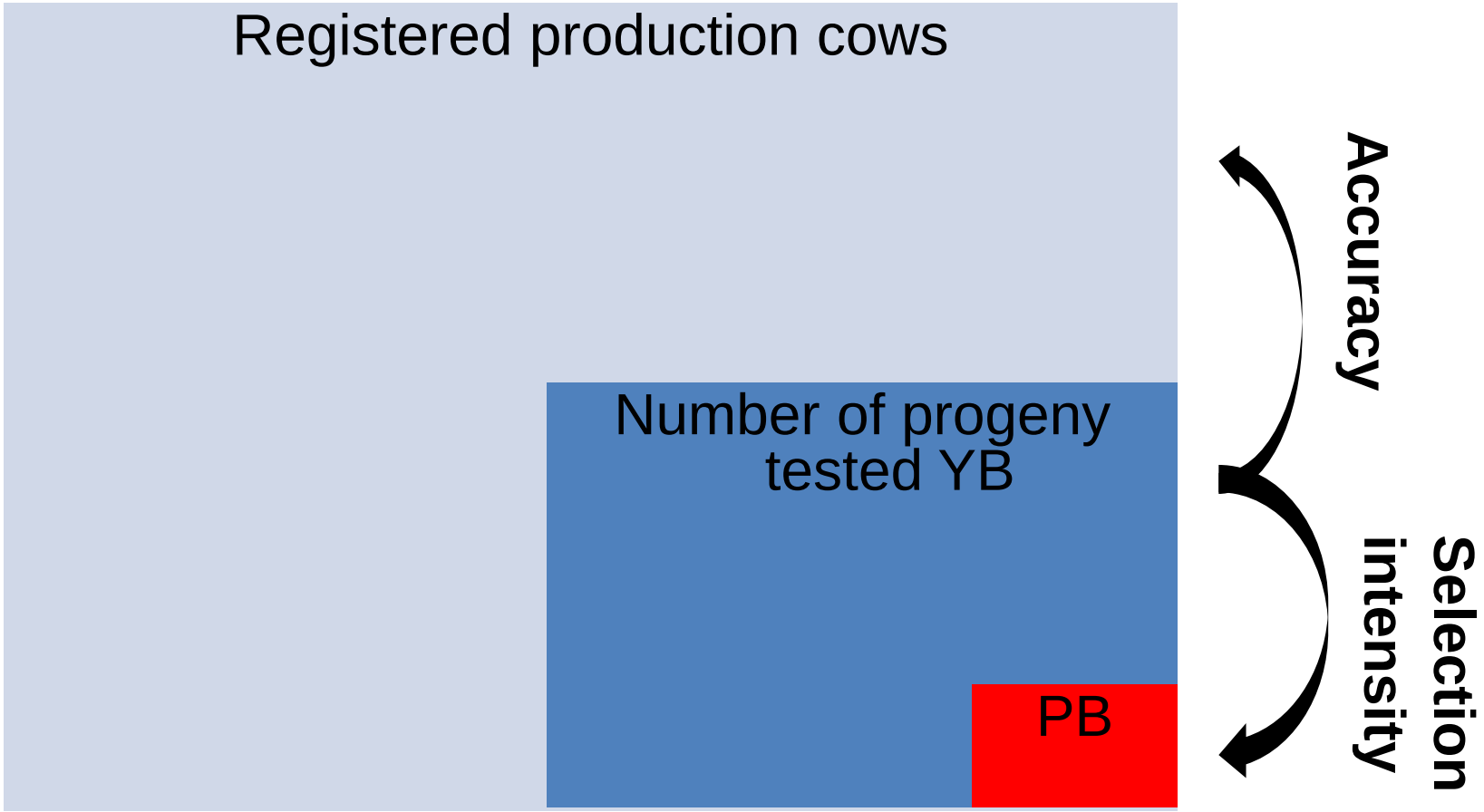
Breeding Schemes

- **Can one or more of the breeds be divided in more lines?**
  - **Are the breeding goals sufficiently different?**
  - **Are the populations big enough?**
- **Criteria:**
  - **Genetic gain**
  - **Rate of inbreeding**

Division of dairy cattle breeding goal?

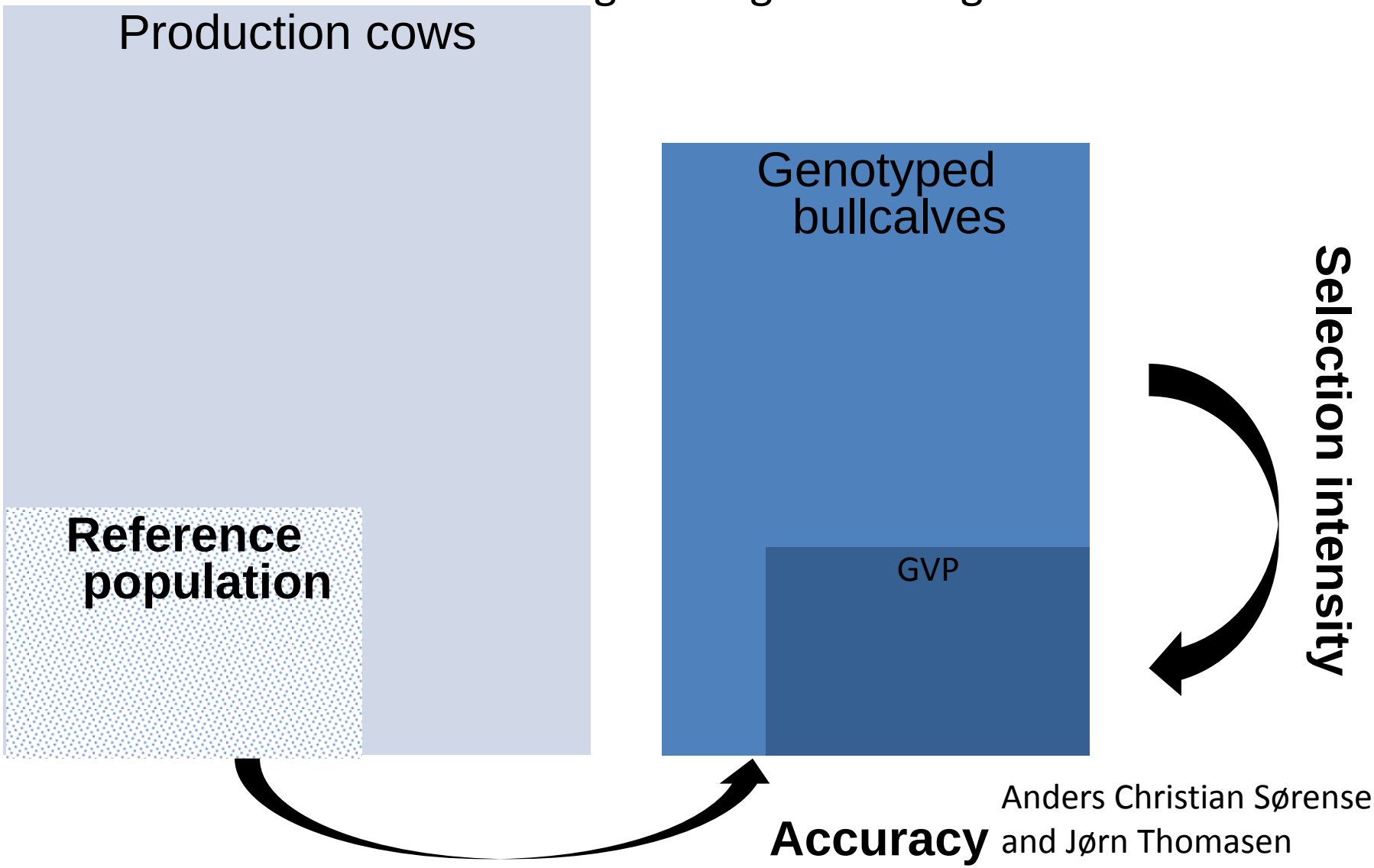
- **Before the genomic era**
  - Many progeny tested bulls needed for substantial ΔG
  - Big populations needed
  - Break-even correlation appr. 0.85 (Depending on pop. size)
- **Today**
  - Good reference populations needed
    - Much smaller than the number of test daughters needed before
  - Genomic tests cost money
  - Break-even correlation >> 0.85

The drive of genetic gain – before GS



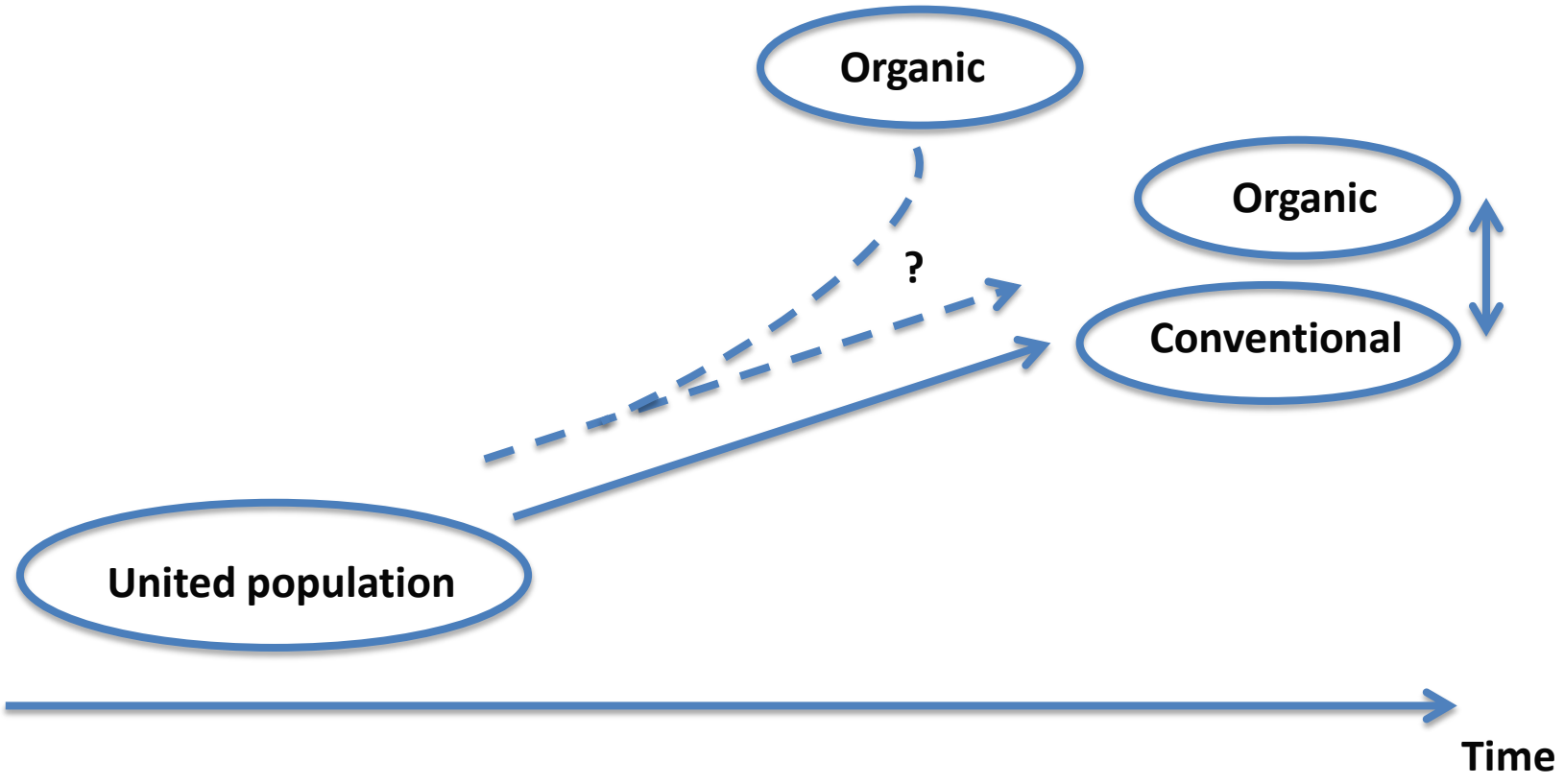
Genomic young bull scheme

The drive of genetic gain – using GS



Anders Christian Sørensen and Jørn Thomasen

Illustration of line division



Questions to be answered within each breed

- **Effect of breeding goal**
- **Effect of G by E interactions**
- **Reference population**
  - **Conventional**
  - **Conventional and Organic**
- **Recruitment strategy**
  - **Conventional**
  - **Conventional and Organic**

WP1 - Status

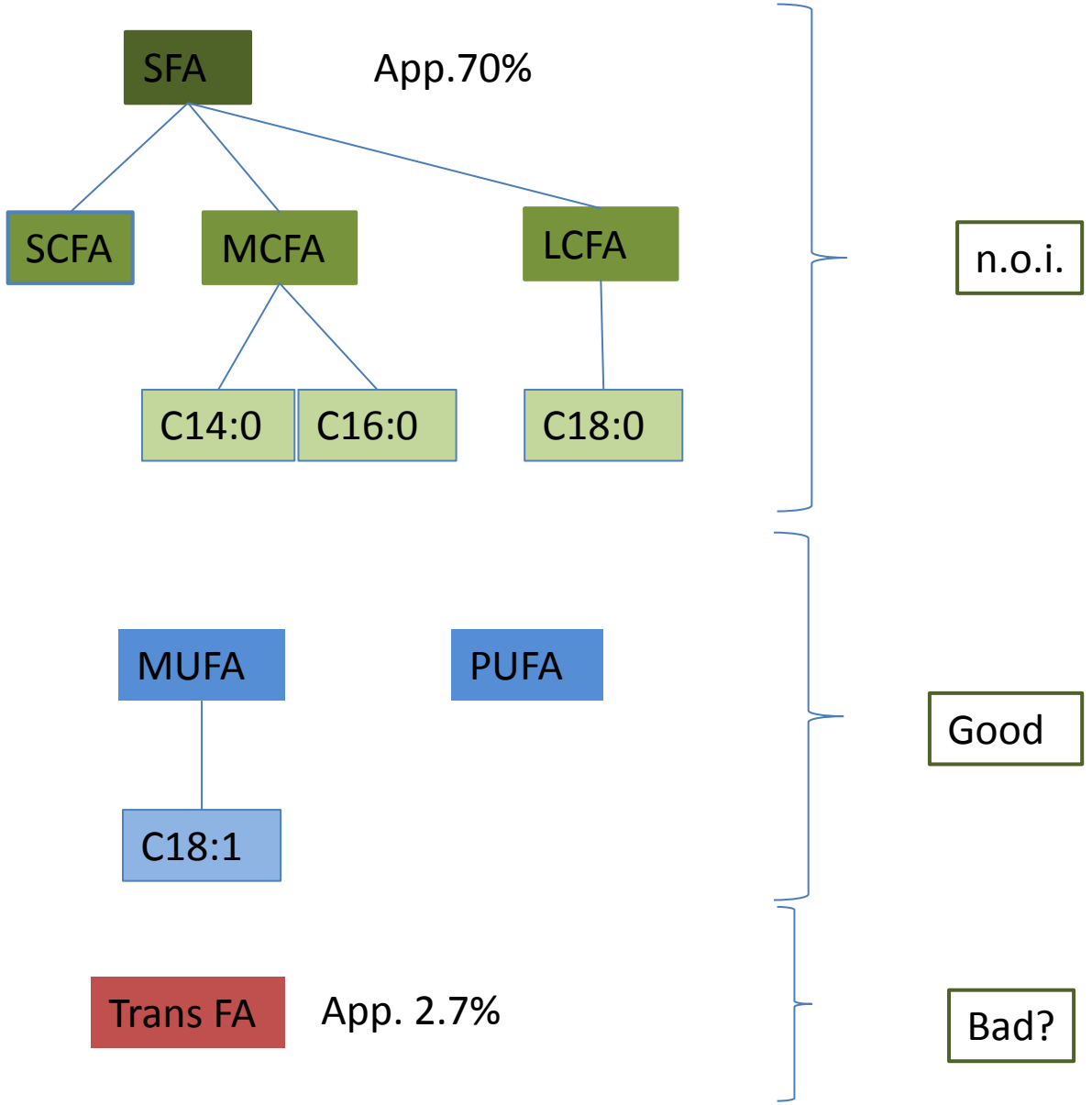
- Farmer survey finished
- In the process of defining breeding goals based on organic principles
- Gains for different BG will be simulated
- Based on that, BG' for further simulation will be selected
- Collaboration with SLU, Sweden

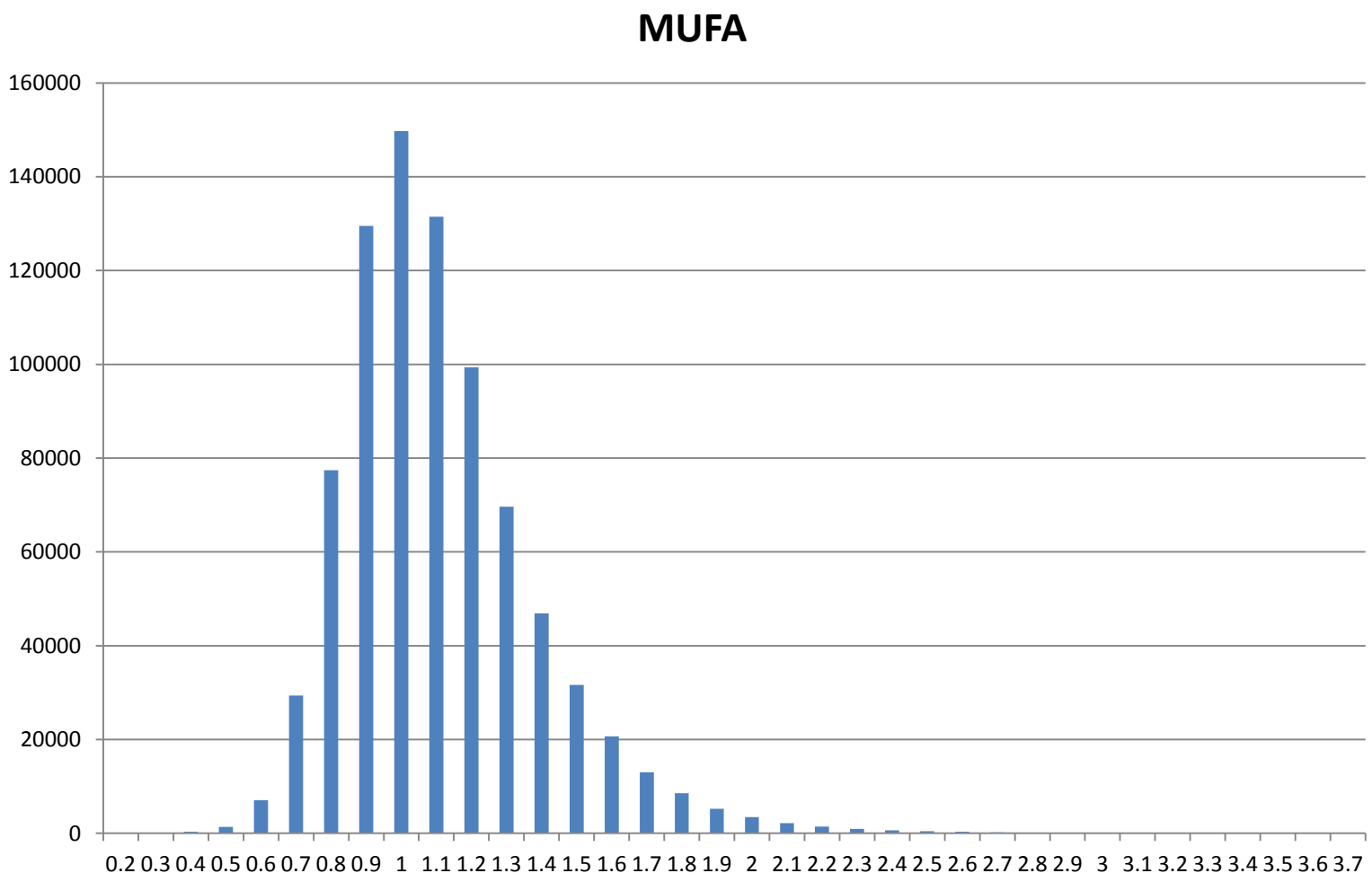
WP2

- Breeding values for Health promoting fatty acids
  - Traditional
  - Genomic
- Business plan for organic niche production based on health promoting fatty acids

Application note 64 FOSS

- C14:0
- C16:0
- C18:0
- C18:1
- SFA
- MUFA
- PUFA
- SCFA (C4,C6,C8&C10)
- MCFA (C12,C14&C16)
- LCFA (C18 or longer)
- Trans FA





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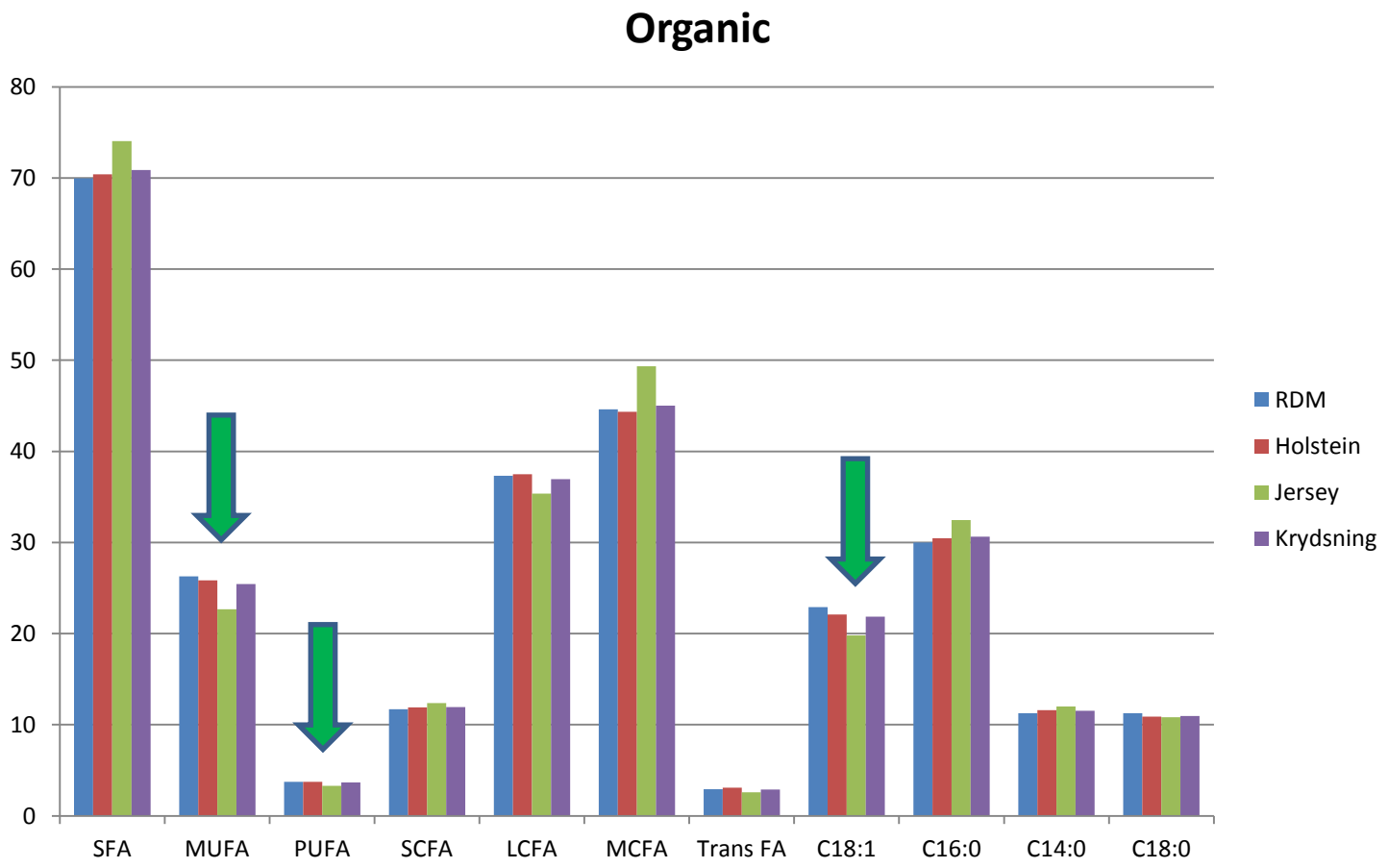
Means of fatty acids



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WP2

- Review on the value of fatty acids carried out
- Collection of fatty acids content in milk since May 2015
- Strategy for genomic test in place May 2016
- Report on fatty acids – May 2016
- Breeding values for fatty acids August 2016
- To be included in the BG
- Starting work on business plan for milk with health promoting qualities in the autumn

WP3

- 22 heifers of original Danish breeds transferred to 5 Naturmælk herd
  - Still 10 to be moved