Economic comparisons of RDM and Holstein

Morten Kargo

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Outline

- Simherd Comparisons
  - What is Simherd?
  - What is Simherd Crossbred?
  - Effect of changing from Holstein to RDC
- New Danish comparisons
- How to react in the Nordic Red organisations

Simherd

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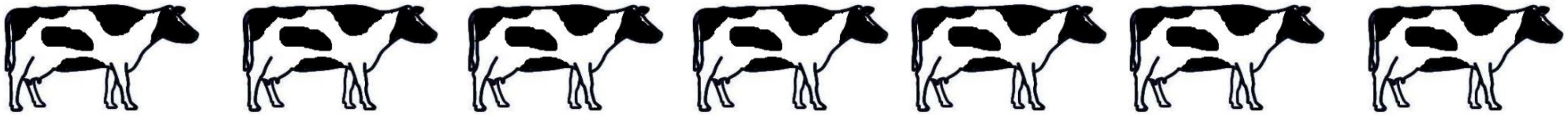
What is the SimHerd model
- and why is it useful

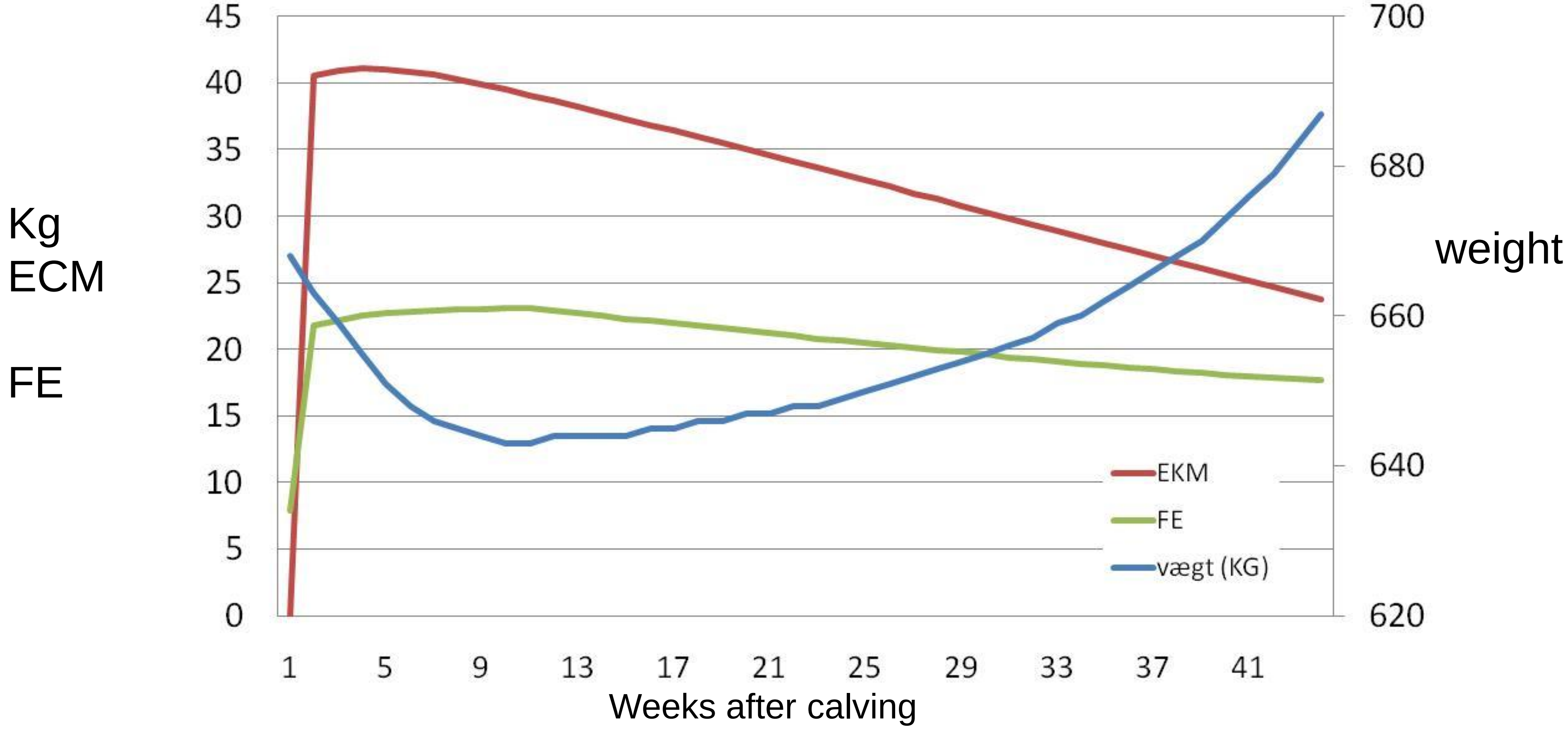
- SimHerd is a **dynamic**, **stochastic** and **mechanistic** simulation model of a dairy herd including young stock

- SimHerd can quantify the herd level technical and economic effects of
  - a change in management and/or
  - in cow level relationships

wk 1 wk2 wk3 wk4 wk5 wk .. wk *n*



The cow's life is simulated in **weekly steps** **(dynamic)**



Milk yield, feed intake and body weight are calculated every week using cow-specific lactation curves and energy requirement

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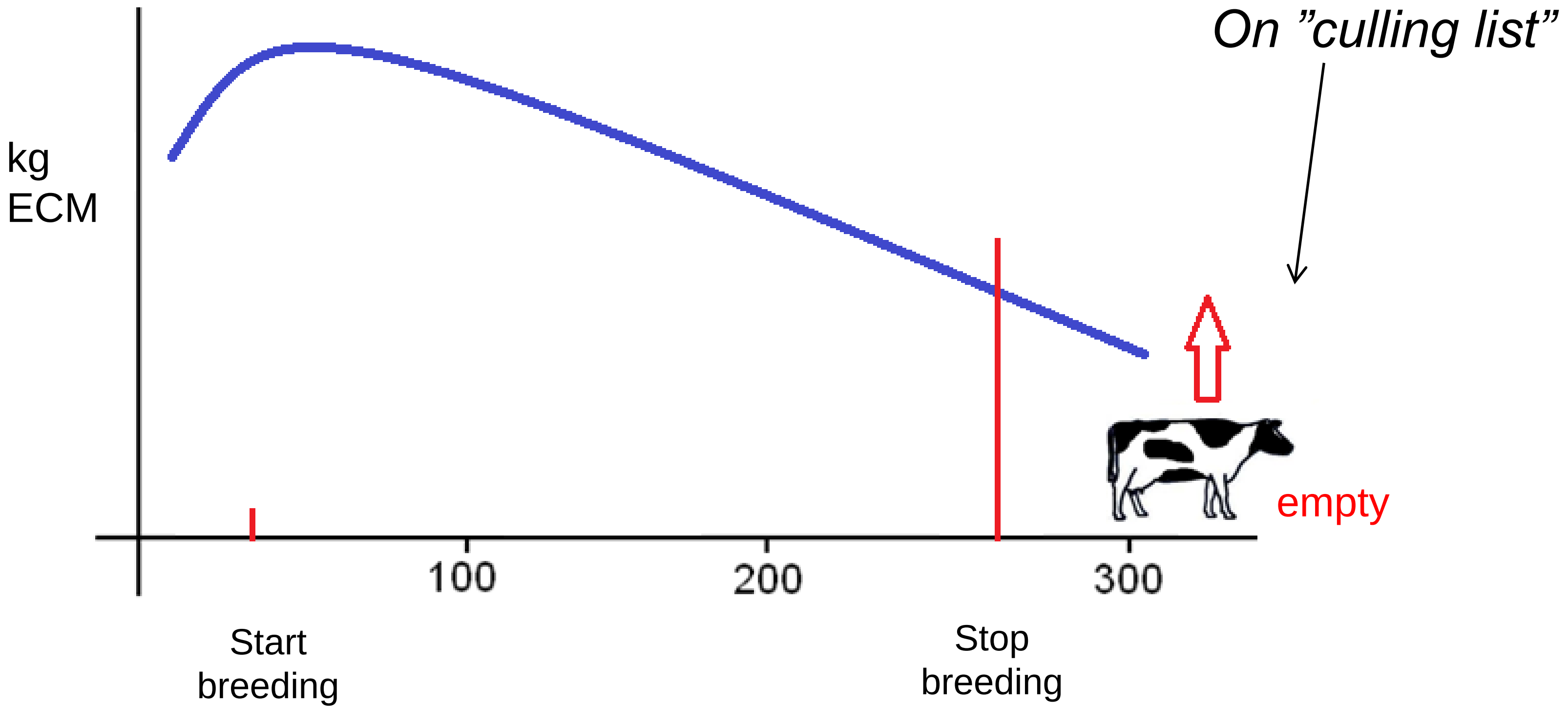
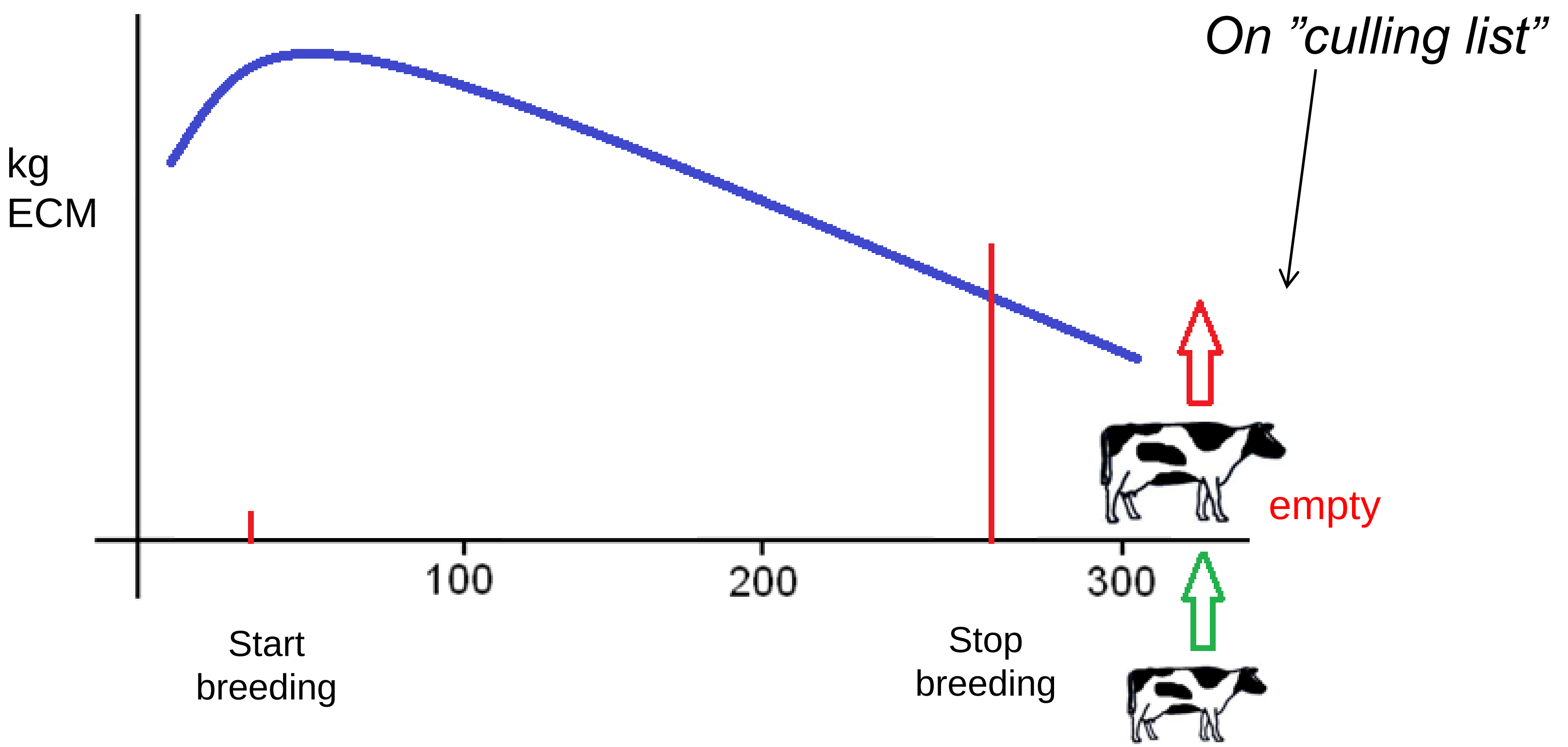
A mechanistic model illustrated: Voluntary culling



Cow has exceeded ”max number of days open” = > culling list

A mechanistic model illustrated: Voluntary culling



The **lowest** yielding cow on the list is culled **when** a new heifer is ready to come in

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Simherd Crossbred

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SimHerd Crossbred

- Each animal in the herd will be simulated
- Herd specific assumptions will be used
  (as done in normal SimHerd simulations)
- Each animal will be given genetic level dependent on breed composition
- Each animal will be given heterosis effects dependent on breed composition of parents
- Both Combi-Cross schemes and rotational crossbreeding schemes can de evaluated
- **Output: Annual net return per slot**

But can also be used for estimating the effect of a change of breed

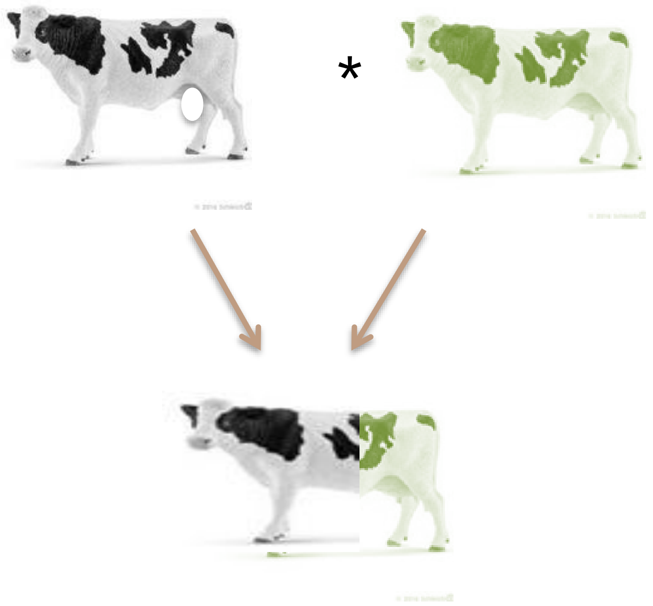
SimHerd – until now

- A cow is a cow independent of breed

SimHerd Crossbred

- A cow is characterised by its own as well as the parents breed composition

Parents



heterozygoti = degree of expressed heterosis

The cow

breed composition = degree of breed effect

How is it done?

- Every single animal is given a genetic (breed effect and heterosis) level at birth
- Breed and and heterosis effects established for many traits
  - Yield
  - Fertility
  - Health
  - Mortality
  - Calving ease
  - and more

INTERNAL PROJECT REPORT
Fastlæggelse af den økonomiske værdi af krydsning – Kombi-Kryds

Julie Clasen, Morten Kargo, Jehan Ettema, Søren Østergaard

Results from Simherd Crossbred simulations

- the effect of changing from Holstein to RDM given the same management system

Morten Kargo, Julie Clasen, Jehan Ettema, Søren Østergaard

Breed effects used in SimHerd Crossbred

Yield 305 d, ECM	Danish Holstein	RDM	Ratio
1. Parity	7818	7773	0,97
2. Parity	8918	8721	0,95
3+. Parity	9301	9044	0,94

From the new NTM update

Yield 305 dage, F+P	Danish Holstein	RDM	Ratio
1. Parity	635	612	0,96
2. Parity	748	700	0,94
3+. Parity	776	729	0,94

OK

Breed effects used in SimHerd Crossbred

	Danish Holstein	RDM	Odds Ratio
Feed effciency	0,88	0,88	1,0

Diseases per. 100 cows	Danish Holstein	RDM	Odds Ratio
Milk fever	4	3,5	0,87
Retained placenta	9	8	0,88
Dystocia	8	7	0,87
Displaced abomasum	1	0,9	0,90
Ketosis	5	4,4	0,87
Digital Dermatitis	50	40	0,67
Horn related diseases	24	19	0,74
Mastitis	32	26	0,75
Cow mortality	5,3	3,7	0,69

Breed effects used in SimHerd Crossbred

Calves	Danish Holstein	RDM	Odds Ratio
Stillbirth	6	5	0,82
Calf survival 1-180	6,5	7,3	1,13

Reproduction	Danish Holstein	RDM	Difference
Insemination%, heifers	55	58	+3
Pregnancy%, heifers	58	61	+3
Insemination%, cows	37	38	+1
Pregnancy%, cows	40	46	+6

Price assumptions

Priser	Danish Holstein	RDM	Difference
Milk price, pr. kg ECM	2,11	2,14	+ 0,03
Bull calf, 3-weeks old	750	858	+ 108
Slaughter cow, pr. kg live weight	8,5	9,5	+1

Simulated results -Technical key figures

	Danish Holstein	RDM	Difference
# cows per year	200	200	0
Kg ECM per year cow	10025	9587	-438
Replacement rate	42	35	-7
# of health treatments	1,61	1,25	-0,36
# of sold heifers	3	3	0
# bull and crosbred calves for slaughter	102	116	+14
# of heifers per year	207	177	-30

Simulated results – Financaial key figures

Økonomi (x 1000 kr.)	Dansk Holstein	RDM	Forskel
Income			
Milk	4280	4136	**-144**
Slaughtered cows	359	343	**-16**
Heifers and calves	144	163	+19
Total	**4783**	**4642**	**-141**
Expenses			
Feed, cows	1968	1913	-55
Other, cows (vet, insem., mm.)	399	375	-24
Young stock	649	551	**-98**
Total	**3016**	**2839**	**-177**
Contribution margin (CM)	**1767**	**1803**	**+36**
CM per annual cow, kr.	**8835**	**9015**	**+180**

Less income

Less young stock

Increased revenue

Danish Comparison

- based on field data

Ruth Davis, Lisa Hein, Anders Fogh and Morten Kargo

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RDM and Holstein comparisons based on field data used for EBV calculation

- Holstein, RDC cows
- Herds with 70-200 cows
- Information from 3 lactations
- 2 years
  - 2010-2011
  - 2011-2012

Comparisons

- Pure bred herds
  - Max. 10 % of the cows may be of another breed
  - Comparison of herd averages within regional area
- Holstein og RDM in the same herd
  - 30-70 % of both breeds
- Contribution margin
  - Comparison of contribution margin within regional area

Pure bred herds – corrected for regional differences - Difference between Holstein and RDM

	Economic (DKR) difference per cow-year	
	2010-11	2011-12
Milk produktion	-179	-240
Calving	+30	+20
Female fertility	+216	+197
Mastitis	+41	+28
Claw health	+20	+17
Other diseases	+36	+49
Conformation	-93	-118
Total	+71	- 47

Both breeds in the same herd

	Economic (DKR) difference between RDM and Holstein per cow year	
	2010-11	2011-12
Milk produktion	-247	-225
Calving	+29	-16
Female fertility	+170	+167
Mastitis	+51	+52
Claw health	+6	+2
Other diseases	+35	+29
Conformation	-102	-135
Total	-58	-125

Herd figures
Contribution margin per annual cow
– Income from milk – expenses
same herds as in the previous analyses

	2015		2016		2017	
	Average	Difference to Holstein	Average	Difference to Holstein	Average	Difference to Holstein
HOL	7.023		6.371		12.249	
RDM	6.466	- 557	6.488	117	11.787	- 463

Herd figures
Contribution margin per annual cow
– Income from milk and slaughterd cows - expenses

	2015		2016		2017	
	Average	Difference to Holstein	Average	Difference to Holstein	Average	Difference to Holstein
HOL	9.813		9.157		15.338	
RDM	10.183	369	10.105	948	15.450	112

Conclusion

The breeds are economically equivalent!

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How to react in the Nordic Red organisations

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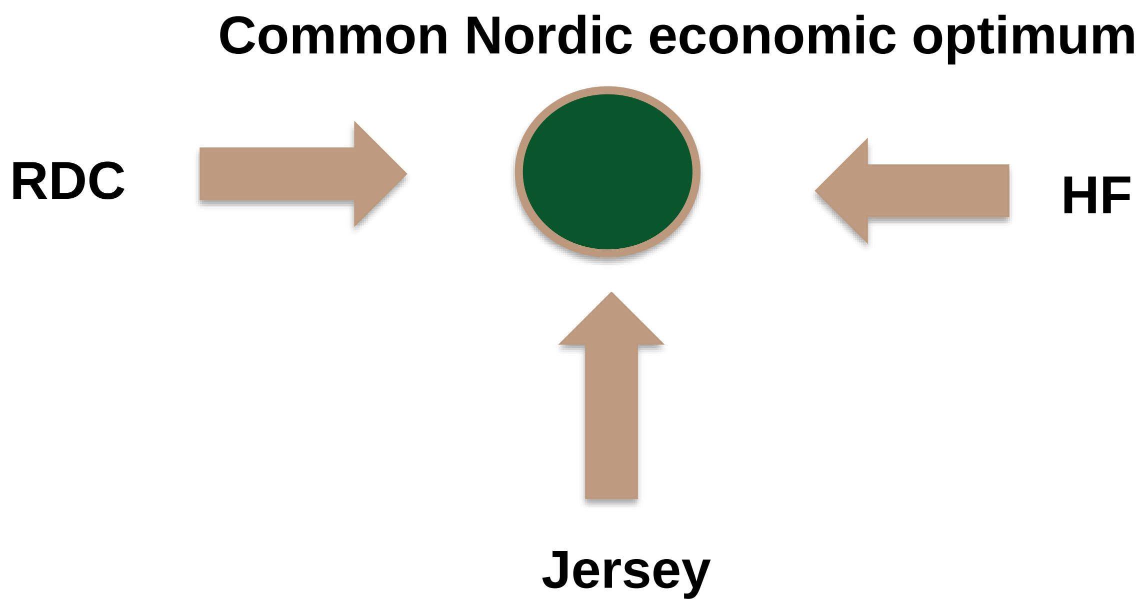
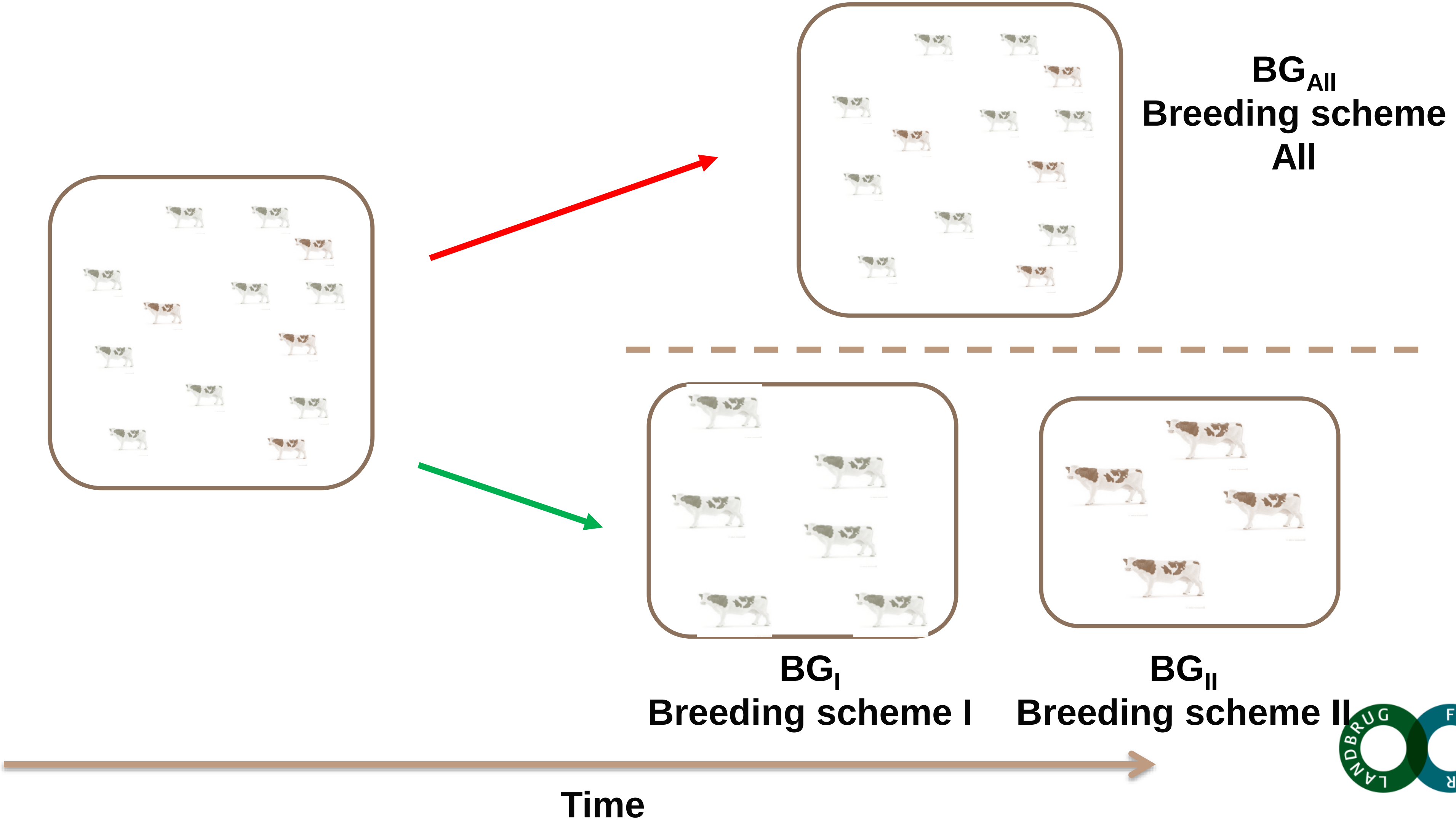
To be considered

- With the present model the breeds go towards a common goal
  - The breeds need to consider whether this is good or bad



Specific breeding lines?



Correlations between breeding goals depends on:

- Economic values (EV) (discussed by Slagboom et., 2016 and Slagboom et al., 2018)
  - Given by production circumstances
  - Given by non-market values
    - Farmer preferences
    - Principles of production
- G*E interactions (see eg. Liu et, 2018)
  - Biologically defined
    - cannot be changed
- Registration methods
  - Can be harmonized

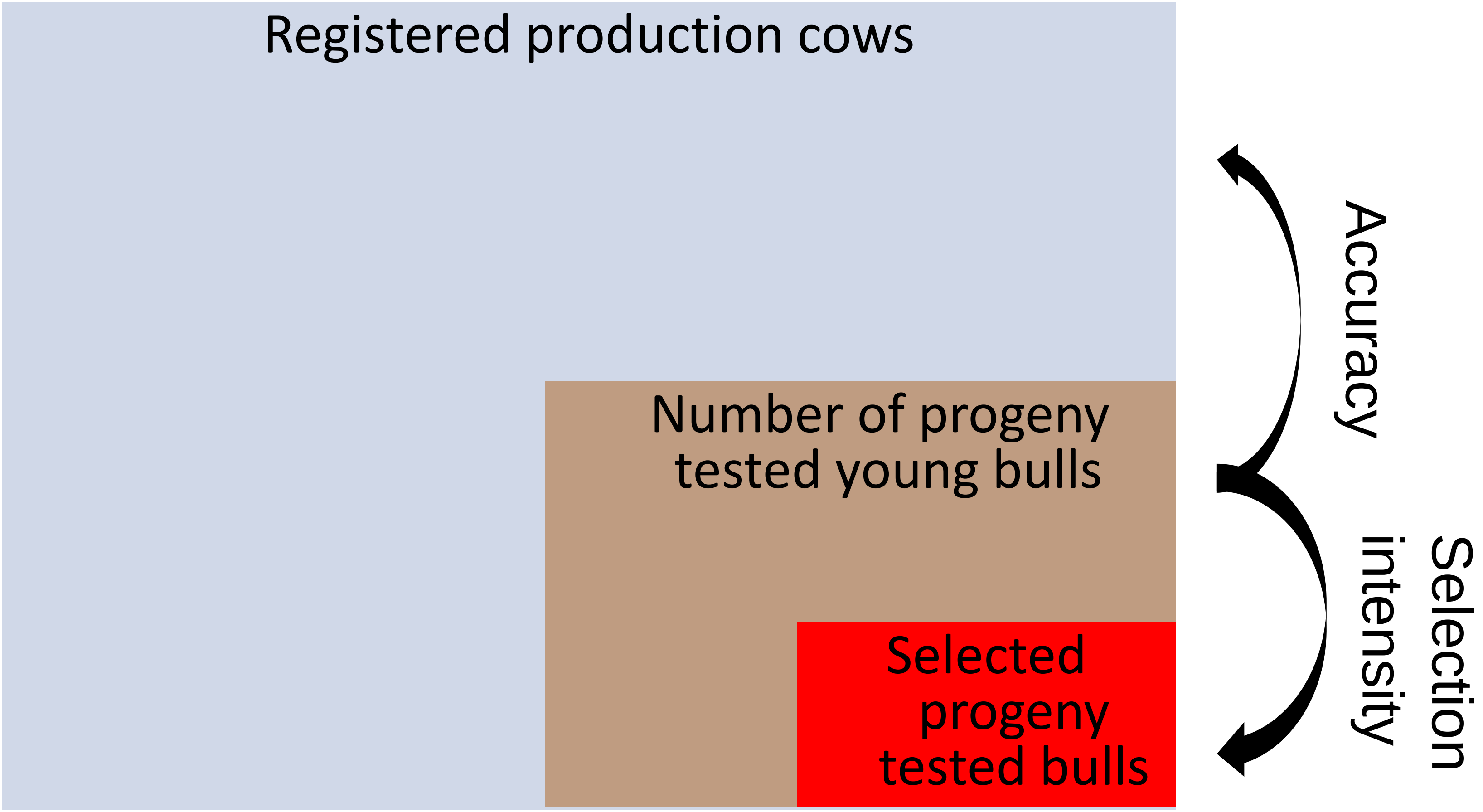
Possible reasons for different economic values between conventional and organic dairy production

- Different production circumstances, e.g.:
  - Higher roughage consumption
  - Reduced use of antibiotics
- Different prices
  - Higher prices for output
  - Higher prices for input
- Legislation
  - Based on national and international principles for organic production
- A consumer wish for differentiation on genetic material to be used in organic production compared to conventional production

Break-even correlations are dependent on breeding schemes and have changed over time

- Before the genomic era
  - Many progeny tested bulls needed for substantial ΔG
  - Large populations needed
  - Break-even correlation approximately 0.85

The driving force behind genetic gain
- before GS

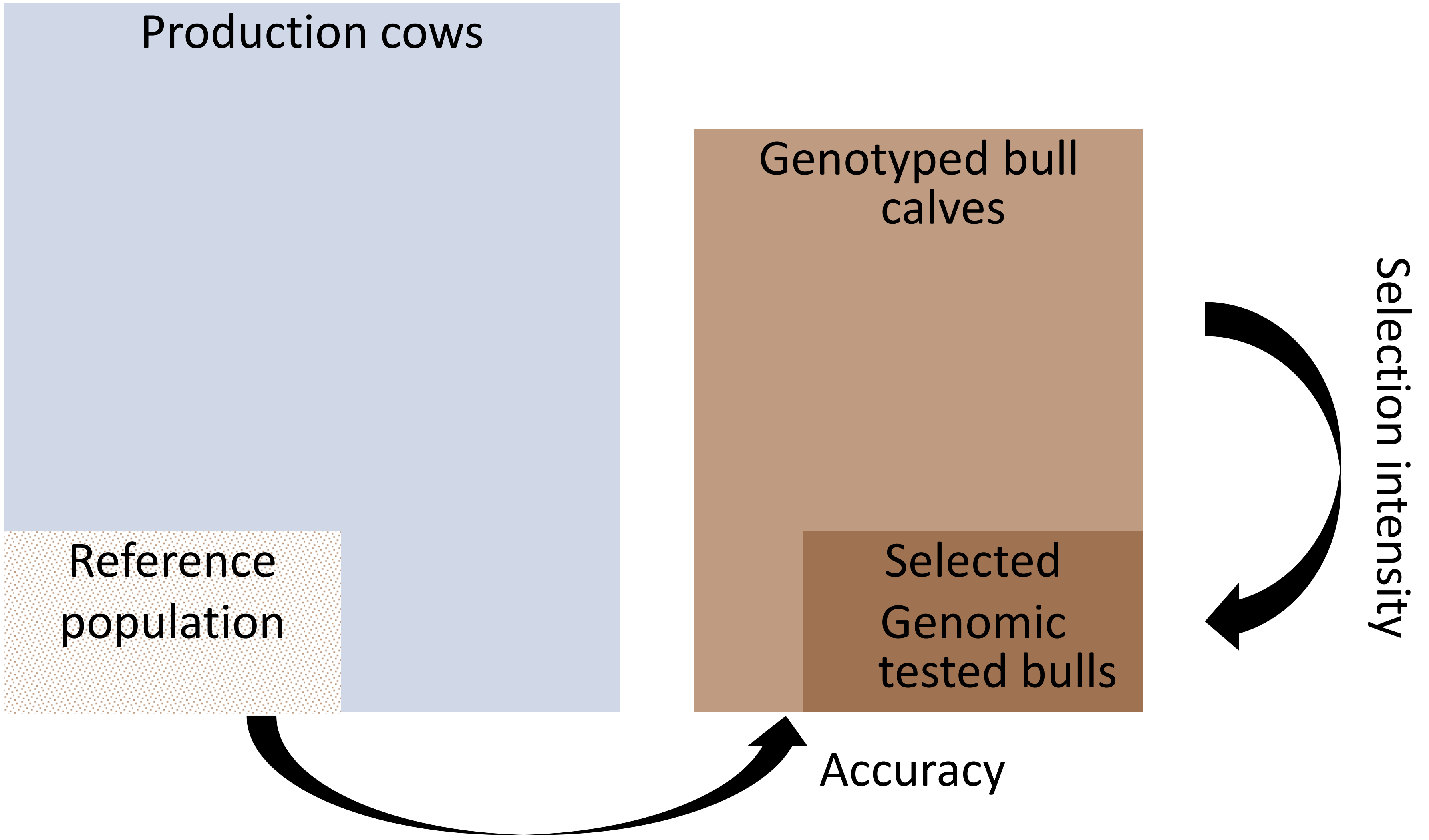


Break-even correlations dependent on breeding schemes and have changed over time

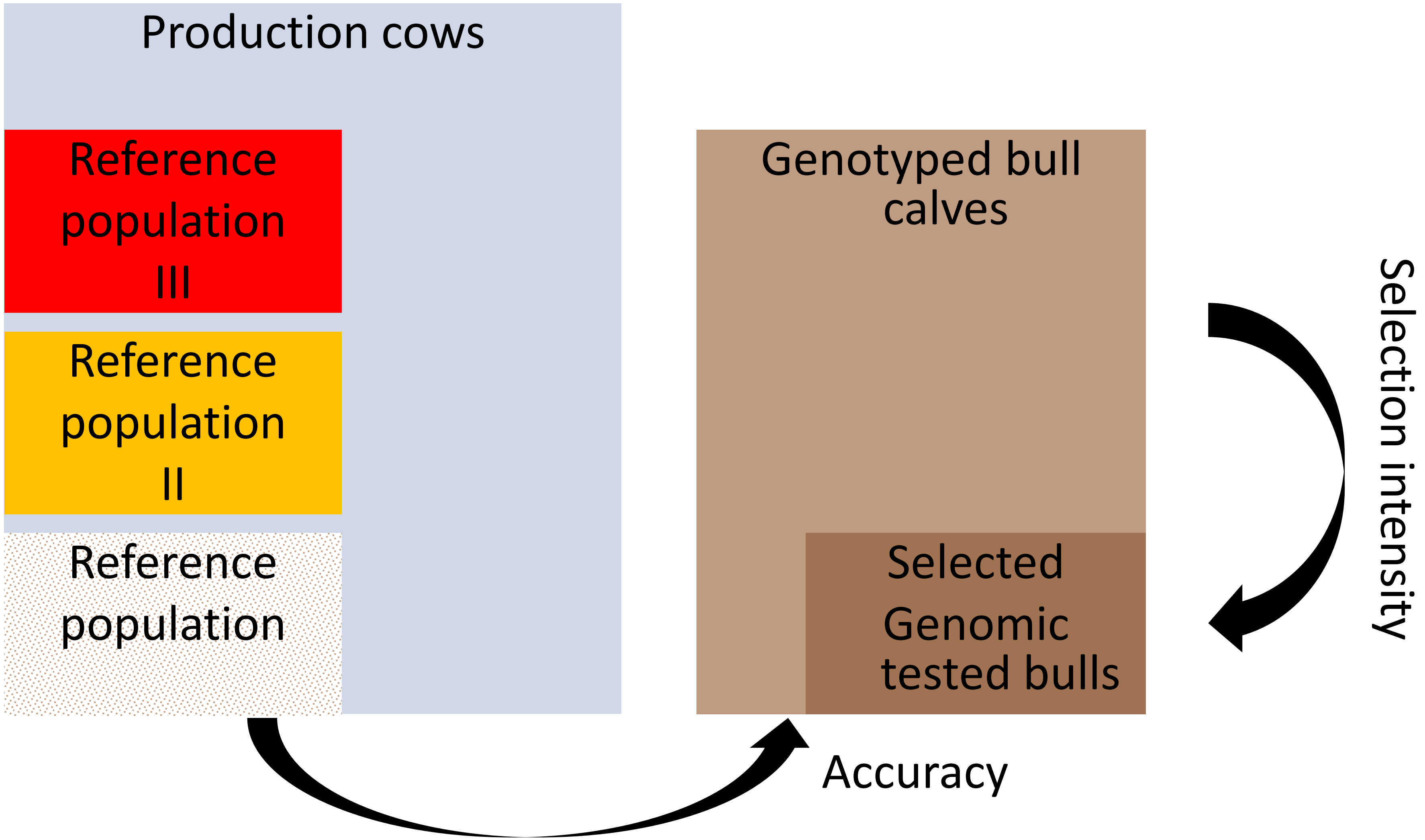
- Before the genomic era
  - Many progeny tested bulls needed for substantial ΔG
  - Large populations needed
  - Break-even correlation approximately 0.85

- Today
  - Cow reference populations needed
    - Much smaller than the number of test daughters needed before
  - Break-even correlation >> 0.85
    - As higher gain can be achieved in smaller population (or lines)

The driving force behind genetic gain - using GS



The driving force behind genetic gain - using GS



(Improved) Possibilities for specific breeding lines within breeds

- An assumed diversification of EV's for organic and conventional production systems
- Probability for significant G*E interactions
- In general increased break-even correlation due to genomic selection
  - Genetic progress in smaller population (lines of populations)
  - Genetic progress at a lower cost