

# Consequences of selection for milk quality and robustness traits

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# Context

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- **An increasing number of non-productive traits are included in dairy breeding objectives**
  - ❑ e.g., conformation, SCS, fertility, longevity
  - ❑ also new traits? e.g., animal welfare, products quality, environmental impacts of dairy production
- ➔ **Towards a better overall economic efficiency**
- **But consequences of selection for these new traits should be investigated ...**

# Objective

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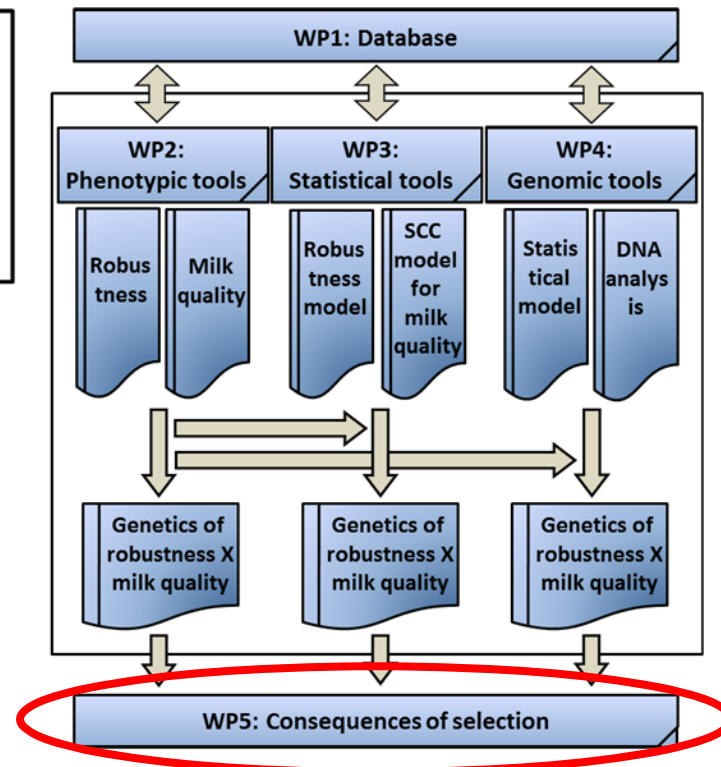
**Estimate consequences of selection for new robustness and milk quality traits on genetic gain in other economically important traits**

- **New traits**
  - ❑ For robustness: Body Condition Score
  - ❑ For milk quality: dUNSAT and dMONO → Indices that represent the relative part of milk fat that is unsaturated and mono-unsaturated
- **Two steps:**
  1. Estimate genetic correlations among traits
  2. Which breeding scenarios to be tested?

# Part of ROBUSTMILK project



**Develop innovative and practical breeding tools for improved dairy products from more robust dairy cows**



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# Genetic correlations

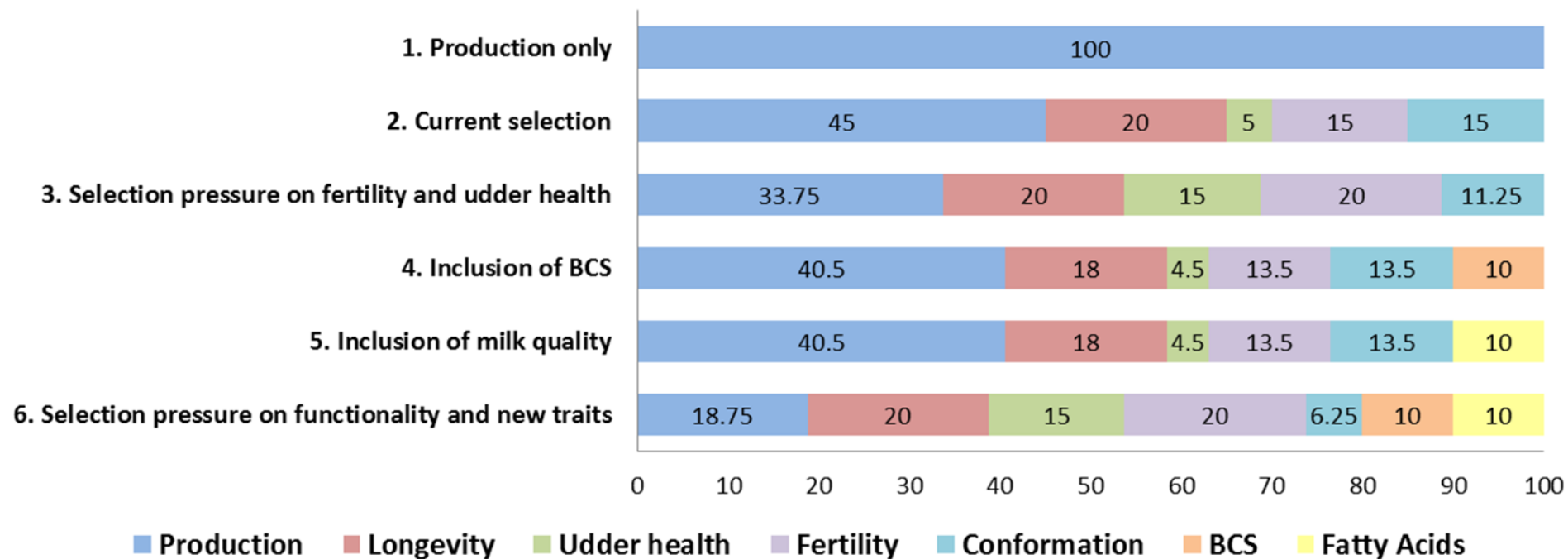
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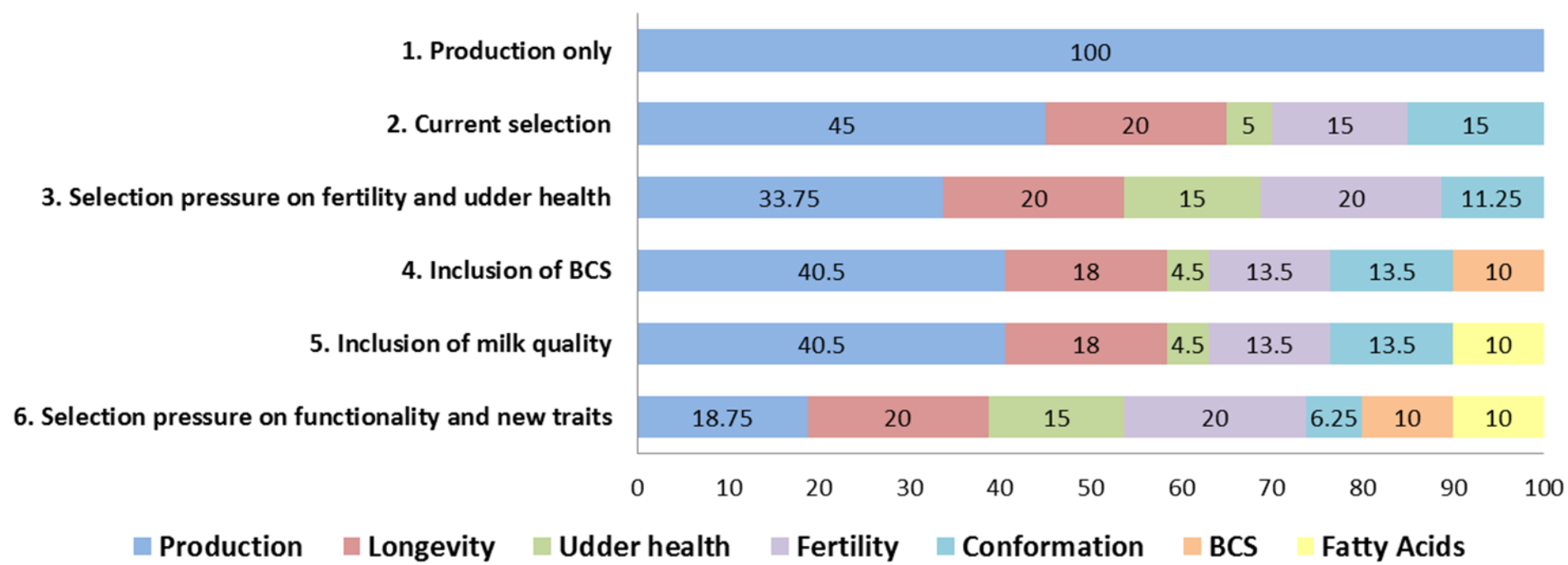
- **Approximated as correlations among EBVs of Holstein bulls with  $rel \geq 0.85$  from the August 2011 official routine run for the Walloon Region**
- **For traits available in Wallonia:**

<b>Production</b>	<b>Milk, fat and protein yields</b>
<b>Functionality</b>	<b>Longevity = survival over successive lactations</b>
	<b>Udder health = SCS, low values desirable</b>
	<b>Fertility = pregnancy rate</b>
<b>Conformation</b>	<b>Overall udder score and overall feet and legs score</b>
<b>New traits</b>	<b>Robustness → Body Condition Score</b>
	<b>Milk quality - fatty acids → dUNSAT and dMONO, two indices that represent the relative part of milk fat that is unsaturated and monounsaturated, high values are desirable</b>

# Breeding scenarios

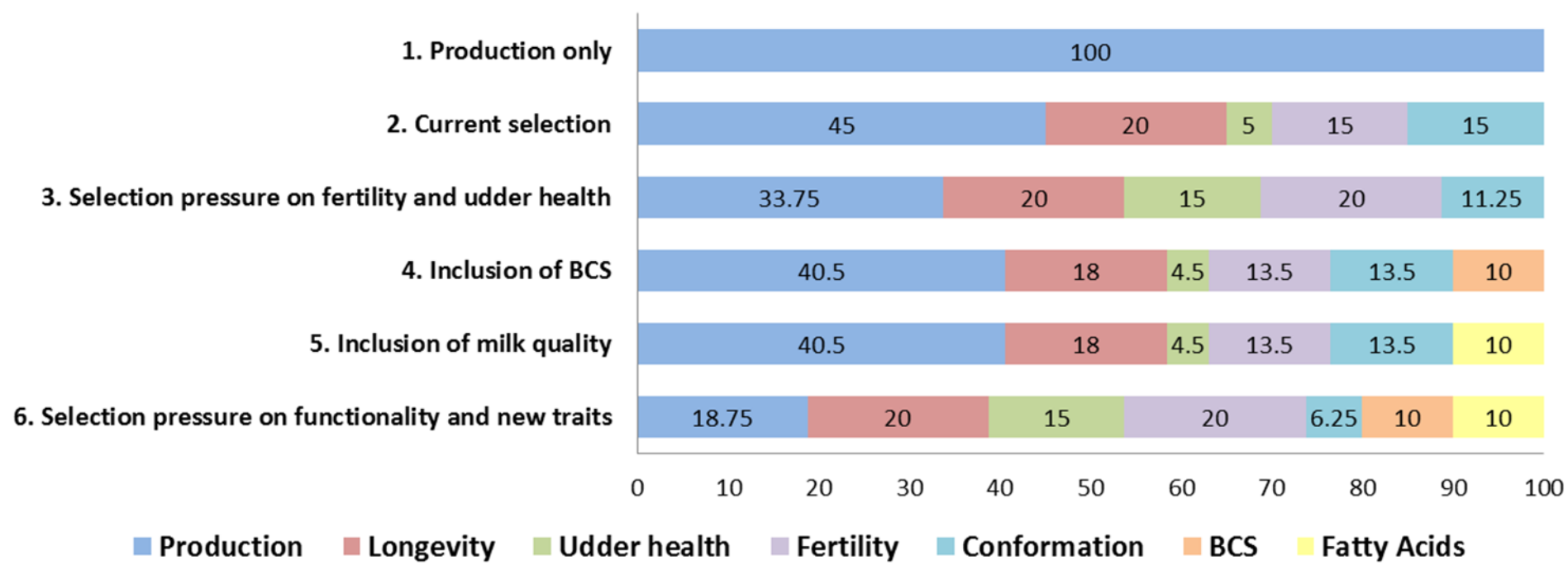
- 6 scenarios including traits available in Wallonia
- Reference point = “current selection scenario” (scenario 2)





## Expected relative genetic gain (%) under each breeding scenario

	Milk	Fat	Protein	Longevity	SCS	Fertility	Udder	Legs	BCS	dUNSAT	dMONO
1	41	47	53	14	6	-25	-10	-1	5	-4	6
2	18	17	21	30	-14	0	13	16	6	-6	3
3	11	10	12	30	-25	9	13	14	7	-4	2
4	16	15	20	26	-13	3	10	15	15	-4	3
5	15	13	20	25	-12	1	11	15	5	4	12
6	4	1	6	24	-25	17	9	12	17	6	10

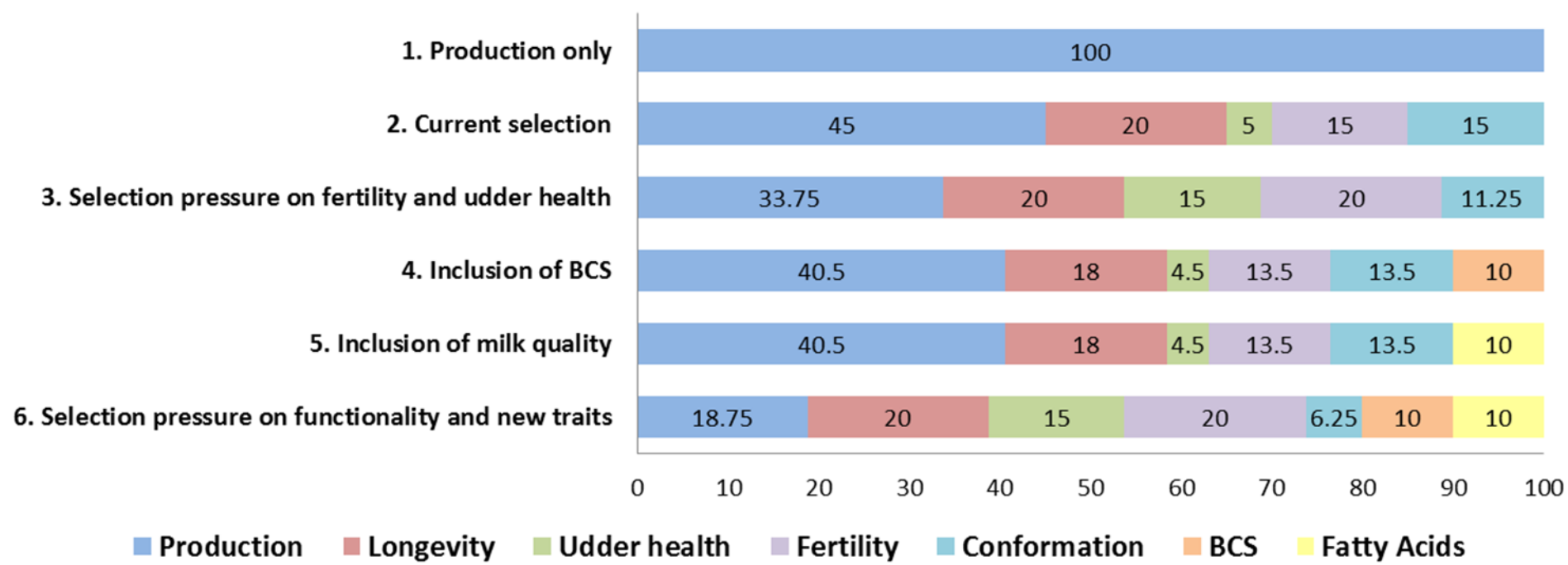


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**Scenario 1: High improvements in milk, fat and protein yields but negative impacts on fertility, udder health, and overall udder score**

➡ **“balanced” indices required**



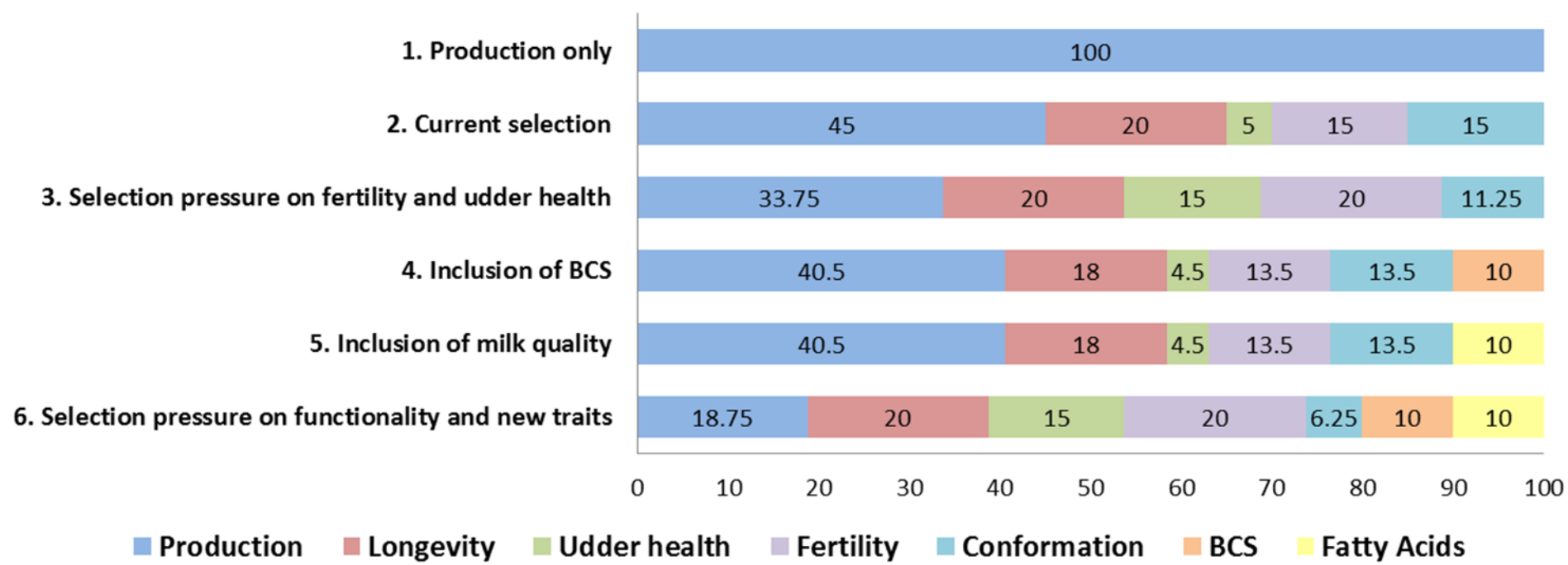


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“Balanced”  
indices



- lower improvements in yields but favourable genetic gain in most of the other traits
- 20% emphasis on fertility → genetic gain of +9%

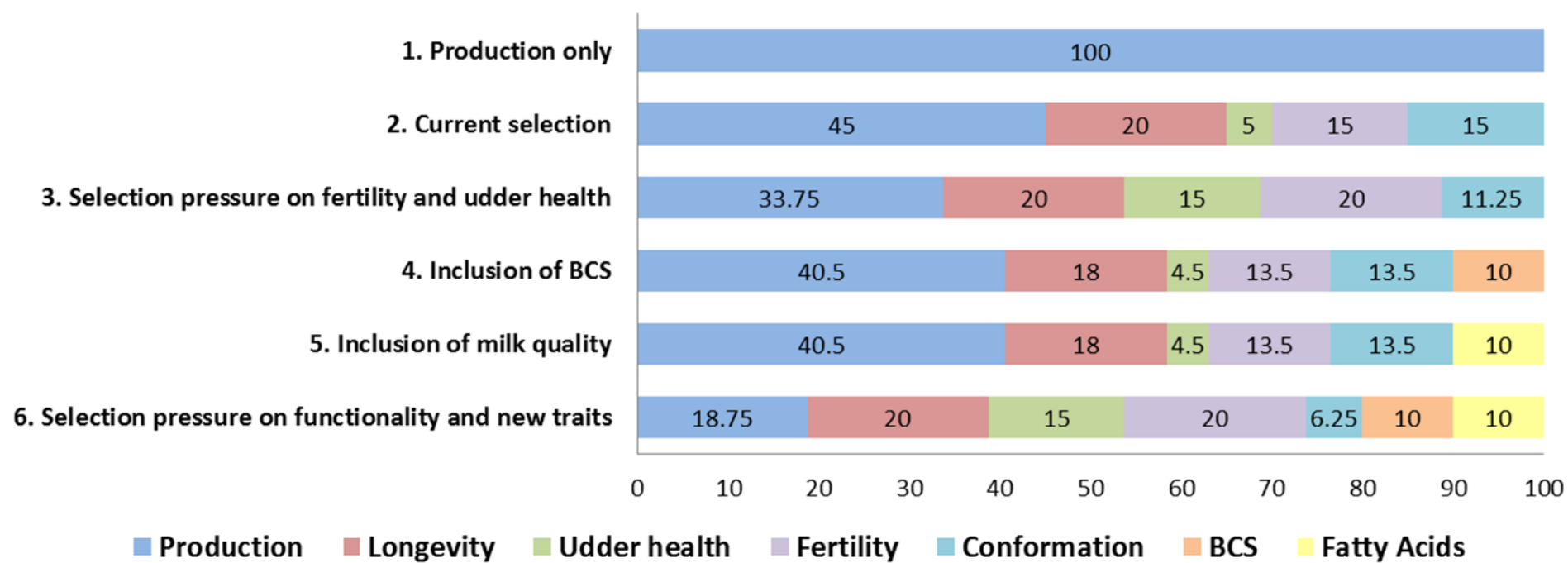


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Scenario 4: inclusion of BCS only → other traits not significantly affected

Scenario 6: inclusion of BCS and milk quality + more emphasis on functionality

→ improvement of fertility (+17%)




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- Changes in the balance between production and other traits did not affect dUNSAT and dMONO
- 5% of emphasis on dUNSAT and dMONO provides genetic gain

# Conclusion

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- **Current breeding goals with balanced emphasis on both production and non-production traits**
    - ❑ favorable genetic gain in yields but also in most of the other traits
    - ❑ new traits are not strongly affected
  - **Inclusion of new traits?**
    - ❑ BCS and milk quality traits (dUNSAT and dMONO)
    - ❑ other traits slightly affected
    - ❑ economic weights require further research
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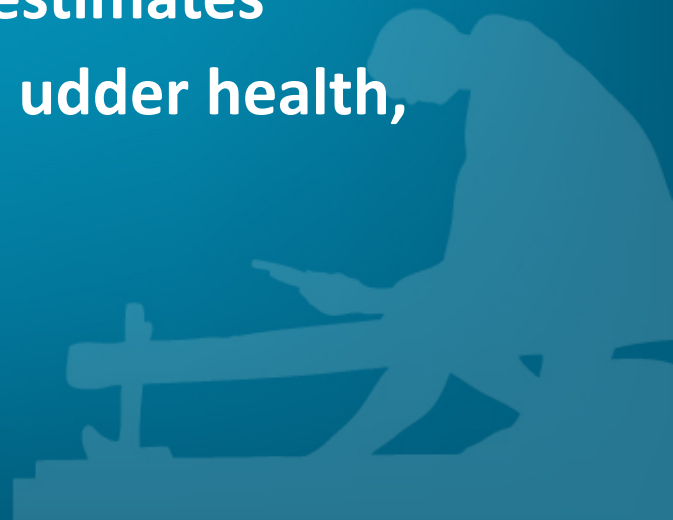
# Conclusion

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## ➤ Limitations of the study:

- ❑ approximation of genetic correlations
- ❑ results assumed equal reliabilities but accuracy will differ due to heritability and different recording

## ➤ Further studies:

- ❑ more reliable genetic correlation estimates
  - ❑ inclusion of other new traits (e.g., udder health, energy balance indicators)
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