



D5.3_45: Report written on the consequences of selection for alternative traits on the other traits of economic importance

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Dissemination Level		
PU	Public	X
RE	Restricted to a group specified by the consortium	

WP no: WP5

Lead Participant: GxABT – ULg (previously FUSAGx; Belgium)

1. Introduction

The Robustmilk project aims at developing innovative and practical breeding tools for improved dairy products from more robust cows. Among others, new breeding tools for milk quality traits (i.e. fatty acids profile in milk) and robustness traits (i.e. indicators of energy balance status of dairy cows) have been developed. Even if these new traits currently have no (or undefined) monetary value, it is suggested that better overall economic efficiency could be achieved if they are included in the breeding goals. However, before doing this, the consequences of shifting emphasis from the current traits in the breeding objective to these new traits should be investigated particularly given that genomics is likely to lead to accelerated rates of gain. Together with existing information from the different countries, and using selection index theory, consequences of selection can be anticipated and disseminated.

2. Objective and deliverable

The objective was to assess the consequences of selection for new robustness and milk quality traits using selection index theory. The deliverable is a public report describing consequences from the integration and the selection for product quality and animal robustness.

3. Description of work

The work was conducted in 3 steps.

Innovative and practical breeding tools for improved dairy products from more robust dairy cattle

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1. The total merit indexes of the European countries/regions participating in the project Robustmilk were collected and compared. A total of 6 scenarios of selection (e.g. inclusion of new robustness and milk quality traits) were then defined (Figure 1). New traits considered were body condition score (BCS) for robustness and dUNSAT and dMONO for milk quality. These 2 indices represent the relative part of milk fat that is unsaturated or monounsaturated.
2. Genetic correlations among traits were estimated based on the estimated breeding values of Walloon Holstein bulls. The following traits were included in the analysis: production (milk, fat, and protein yields), udder health (somatic cell score, SCS; lower value desirable), longevity (survival over successive lactations), fertility (pregnancy rate), conformation (overall udder score and overall feet and legs score), robustness (BCS; higher value desirable), and milk quality (dUNSAT and dMONO; higher values desirable).
3. Consequences of selection under the different scenarios were studied using selection index theory.

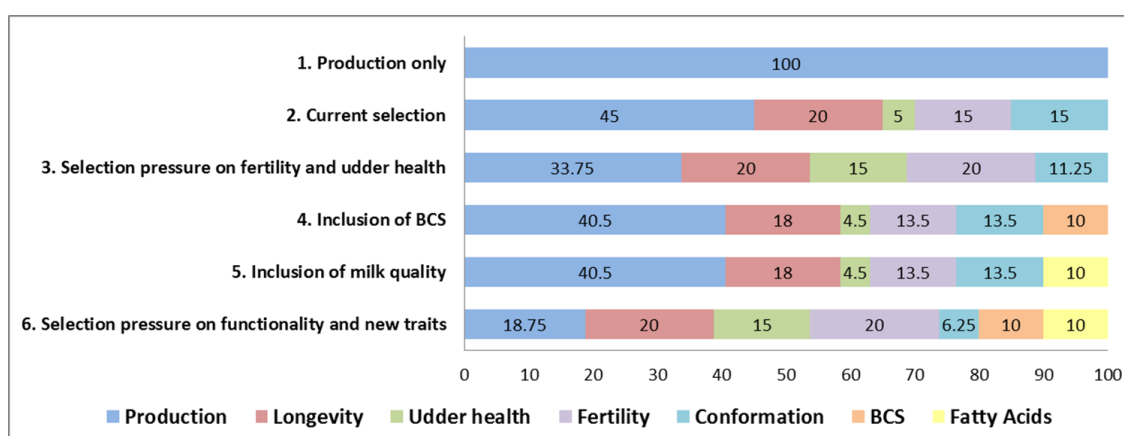


Figure 1: Selection scenarios

4. Results

Relative genetic gains expected on all traits under the different scenarios are presented in Table 1. Selection under scenario 1 was found to lead to high improvements in milk, fat and protein yields but had a negative impact on fertility, udder health, and overall udder score. Selection indexes with balanced emphasis on both production and non-production traits (scenarios 2 to 5) led to lower improvements in yields but favorable genetic gain was expected in most of the other traits. Emphasis of 20% on fertility combined with greater emphasis on udder health led to improved fertility and reduced SCS. Selection under scenario 6 (i.e. lower emphasis on production, 20% emphasis on fertility, and 10% emphasis on BCS) led to 17% of genetic gain in fertility. Changes in the balance between production and other traits did not affect dUNSAT and dMONO. But 10% emphasis on milk fatty acid traits provided favorable genetic gain on these traits.

Table 1: Expected relative genetic gain (%) under each breeding scenarios

	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

Current breeding goals put more balanced emphasis on both production and non-production traits which lead to total merit indexes including an increasing number of functional traits. Such indices lead to favorable genetic gains on production but also on most of the other traits. Also current selection indices do not affect greatly new traits.

5. Comments

Results from this research were presented at the 2011 Interbull Meeting which took place in Stavanger, Norway, from August 26 to 28, in connection with the 2011 EAAP meeting. During the meeting, two sessions were dedicated to animal robustness and milk quality and were organized in cooperation with the Robustmilk project. The paper and the presentation related to this research are available on the Interbull website or on the Robustmilk website.

Link to the Interbull website:

http://www.interbull.org/index.php?option=com_seminar&task=3&cid=7&Itemid=39

Link to the Robustmilk website:

<http://www.robustmilk.eu/Publication/Publication.html#2011-interbull>