

# PARTICIPATORY DEVELOPMENT OF BREEDING GOALS IN AUSTRIAN DAIRY CATTLE

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## ABSTRACT

Due to the possibilities of genomic selection and changing circumstances of production an evaluation of all steps in the breeding process is important. Optimisation involves the aspects of breeding goals, performance recording, genetic evaluation and breeding programmes. To achieve desired genetic gains whilst taking genomic selection into account, the inclusion of all relevant traits and their appropriate weighing within the total merit index is essential. To enquire the needs of the farmers a survey is carried out. The survey is designed as a pure online survey. From about 8.000 farmers across breeds, of whom the email address was available, 16% participated in the survey so far. Two peaks were observed close to the dates, when the internet link for the survey was distributed per email. Preliminary results show that the individual breeding goals of Fleckvieh and Brown Swiss breeders have shifted from dairy towards fitness and conformation traits during the last decade. High interest in novel traits like claw health, metabolism or inter- and cross-sucking is observed as well. Selection response and monetary aspects from selection based on economic approaches will be compared with "desired gain" models based on the results of this survey. The survey is part of the Austrian project "OptiGene" with the main aim to optimise the different steps in the breeding process in order to achieve the long-term genetic gain desired by the farmers.

**Key words:** dairy cattle / breeding goals / genetic trends / survey / Austria

## 1 INTRODUCTION

During the last decades, milk yield increased tremendously in most dairy cattle populations worldwide. In Austria, on average a genetic trend of +99 kg milk per year could be observed in the largest cattle breed, Fleckvieh, (dual purpose Simmental; ZuchtData, 2011) during the last 10 years. However, at the same time an improvement of functional traits could hardly be noticed; in some traits even negative genetic trends were found (ZuchtData, 2011). Low heritabilities of functional traits, their mostly unfavourable genetic correlations to production traits, as well as insufficient or complete lack of recording complicate breeding (e.g. Fürst and Fürst-Waltl, 2006; Goddard, 2009; Kanitz *et al.*, 2003; Philipsson and Lindhe, 2003; Windig *et al.*, 2005). Nowadays genomic selec-

tion offers an approach for estimating breeding values for both, production and functional traits. However, a deterioration in functional traits may still be expected (e.g. Neuner and Götz, 2011; Karras *et al.* 2011; Egger-Danner *et al.*, 2012a). In model calculations Egger-Danner *et al.* (2012a) showed that the genetic gain of traits may be increased by genomic selection programmes as long as a clear natural genetic gain is observed. In case of negative genetic trends, genomically enhanced breeding programmes can however not turn those around. Genomic selection is thus likely to speed up the genetic progress, but its direction is determined by the composition of the total merit index (Egger-Danner *et al.*, 2012a). New traits regarding health or welfare and food safety aspects are gaining interest in many cattle populations worldwide. Apart from that, changing economic conditions, e.g. fur-

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ther liberalisation of agricultural markets after 2014 or increase of energy costs will affect dairy cattle breeding. New traits like energy efficiency or production efficiency are hence expected to gain importance.

Recently, a new project (OptiGene, “Optimization of long-term genetic progress of Austrian cattle breeds with emphasis on health and genomic selection”) started in Austria. Among the main aims of this project is the revision of breeding goals for the breeds Fleckvieh, Brown Swiss, Pinzgauer and Grauvieh (Tyrolean Grey). Currently, the economic weights in the total merit index for Fleckvieh are 38%, 16% and 46% for dairy, beef and fitness traits respectively. For Brown Swiss the corresponding weights are 48%, 5% and 47% (Fürst, 2012). When revising Austrian dairy cattle breeding goals, two main options exist. First, the current economic total merit index in the joint Austrian-German genetic evaluation of cattle (Fürst, 2012) may be extended by including new traits with their derived economic weights. Second, the desired genetic gain of different traits may be considered as suggested by Egger-Danner *et al.* (2012a). In Norway the economic weight on mastitis in the index was increased from 3 to 21% to ensure the desired positive trend (Heringstad, 2009; Geno, 2012). In order to be able to compare the desired gain index (Yamada *et al.*, 1975) with the selection by means of an economic total merit index (Hazel and Lush, 1943), the needs and desires of breeders and breeders’ organizations need to be known. In the year 2000, a first survey among Austrian Simmental and Brown Swiss breeders was carried out (Sölkner *et al.*, 2000). At that time the distribution of their personal breeding goal for Fleckvieh (Simmental) was 44% dairy traits, 22% for beef traits, 19% for fitness and 15% for conformation traits. For Brown Swiss it was 48% for dairy traits, 18% Fitness, 17% conformation and 16% beef traits.

In order to consider the breeders’ desires within the new frameworks affecting dairy cattle breeding, another survey is necessary. Hence, the design of such a new survey as well as first results are presented in the following.

## 2 MATERIAL AND METHODS

To observe the needs and desires of Austrian cattle breeders, a questionnaire with about 30 questions was designed. In a first step, a list with questions of interest was compiled in February 2012. After consulting the Austrian breeding organizations final questionnaires for each of the four analysed breeds (Fleckvieh, Brown Swiss, Pinzgauer and Grauvieh) were prepared. The Austrian breeding organizations decided for a pure online survey. Printed questionnaires should only get used if necessary

– for example to interview breeders in underrepresented regions. For building the online survey the service of SurveyMonkey (2012) was used. The final versions of the survey were released on March 15, 2012.

The questionnaire for this survey covered eight main topics. Most of the questions had a couple of sub items. The main topics were:

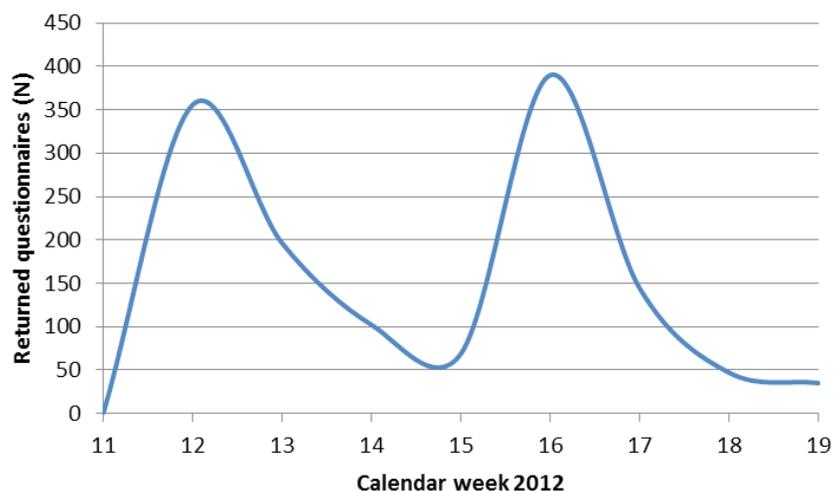
1. statistics of the farm (7 questions)
2. statistics of the respondent (3 questions)
3. individual breeding goal of the respondent (4 questions). About 20 traits, for which a genetic evaluation already exists as well as 8 novel traits were listed. The respondents also could suggest further traits of interest
4. advantages and disadvantages of the current main breed of the farm (4 questions)
5. trust in the estimated breeding values (1 question)
6. usage of young bulls, which only have a genomically enhanced breeding value (2 questions)
7. usage of services offered by breeding organizations (2 questions)
8. agriculture and socio-political topics (2 questions).

To keep the survey as anonymous as possible, the question for postal code (for the ability to refer to regions) was optional. All other questions were obligatory. Most of the questions were asked in form of closed questions, but within 6 questions farmers were enabled to comment freely. Fairly similar questionnaires are going to be used for a survey in German cattle breeders as well, as the current total merit index is the same in the joint Austrian-German genetic evaluation.

In Austria, all Fleckvieh, Brown Swiss, Pinzgauer and Grauvieh breeders may participate in our survey. All farmers who regularly receive the results of the milk performance testing by email (about 7,700 of 21,135 farmers) got an email with explanations, link and password for participation. All other farmers were informed by various media of the responsible breeding organization.

## 3 RESULTS AND DISCUSSION

So far, 1340 questionnaires were completed in the period March 16, 2012 to May 10, 2012 (Fig. 1). The second peek in calendar weeks 16 and 17 was due to a follow-up letter per email. Apart from email invitations, attention to the questionnaire was called by articles in different subject-specific magazines, newsletters, presentations at meetings and on the homepage of the Federation of Austrian Cattle Breeders, ZAR. A third and last follow-up email is planned for end of May 2012. In total,



**Figure 1:** Returned questionnaires in calendar weeks 11–19 (March 16 – May 10) 2012 – all breeds (N = 1340)

approximately two thirds of all breeders completing the questionnaire were Fleckvieh breeders (Table 1). Fleckvieh is Austria's largest breed with a share of approximately 70% of all dairy herd book cattle (ZAR, 2012). The highest proportion of questionnaires completed by breeders who were invited per email was observed in Grauvieh (38.2%), the lowest (16.1%) in Brown Swiss. More than 50% of all breeders completing the questionnaire were in the production classes 6000–6999 and 7000–7999 kg average annual milk yield; more than 75% of all breeders owned 29 or less cows reflecting the average herd size of 16.9 herd book cows in Austria (ZAR, 2012). Despite the optionality for postal code, about 98 percent answered this question.

Preliminary results (Table 2) showed that the individual breeding goal of Fleckvieh and Brown Swiss breeders shifted from dairy and beef towards fitness and conformation traits (Sölkner *et al.*, 2000) during the last decade. However, apart from differences between breeds, rather large differences may also be observed for breed-

ers with different herd sizes and milk yields. With a share of 42 and 34%, respectively, breeders owning larger herds (>50 cows) have a stronger focus on dairy traits compared to those having smaller herd sizes (<15 cows). In contrast, the individual relative weight on the fitness complex is 25% in breeders of large herds but 30% in those of small herds. A similar tendency may be observed with regard to production level – the higher the least weight is put on fitness traits. The importance of dairy traits increases with average annual milk production (31%–38%). However, breeders in the highest production class (more than 9000 kg average milk yield per cow and year) have a lower individual weight on dairy traits than those in the class 8000–8999 kg milk (35 vs. 38%).

Being asked for the relevance of new traits in a future breeding goal on a scale from 1 (not important) to 6 (very important; Table 3), the breeders attached rather high importance to most suggested traits. Across all breeds, claw health, metabolism and inter-sucking ranked first with an average score of 4.5. The least important trait for

**Table 1:** Return rates per breed and in relation to number of breeders being invited to complete the questionnaire (cut-off date May 10, 2012)

Breed <sup>1</sup>	Total number of breeders	Breeders invited to complete questionnaire per email	Breeders completing questionnaire		
			N	in % of all breeders	in % of breeders invited per email
BS	4,180	1607	258	6.17	16.05
FV	14,576	5668	931	6.39	16.43
GR	801	233	89	11.11	38.20
PI	578	198	62	10.73	31.31
Total	20,135	7706	1340	6.66	17.39

<sup>1</sup> BS = Brown Swiss, FV = Fleckvieh, GR = Grauvieh, PI = Pinzgauer

**Table 2:** Breeders' individual breeding goals by trait complexes and breeds

Breed <sup>1</sup>	Dairy	Beef	Fitness	Conformation
BS	37.40	10.40	30.71	21.50
FV	36.20	15.34	29.17	19.29
GR	28.11	21.61	30.36	19.92
PI	38.47	12.58	32.40	16.55
Total	36.00	14.68	29.69	19.63

<sup>1</sup> BS = Brown Swiss, FV = Fleckvieh, GR = Grauvieh, PI = Pinzgauer

breeders was suitability for automatic milking systems with an across breed average of 1.9. Differences between breeds were rather small and partly unexpected, e.g. inter- and cross sucking or the insufficient sucking reflex. Generally, the results indicate that new ways of performance testing but also genetic evaluation for novel traits have to be considered. It should be noted that health traits are routinely recorded in Austria (Egger-Danner *et al.*, 2012b), thus they are not included in the novel traits' list.

#### 4 CONCLUSION

The results indicate that a survey is a valuable tool to assess the needs and expectations of cattle breeders. The comparison of the preliminary results to a similar survey conducted one decade ago shows major changes in the weighing of the trait complexes with a clear shift towards fitness and conformation. Additionally, the interest in inclusion of novel traits is high. This is comprehensible as genetic gain was mainly achieved for dairy traits, while fitness traits remained stable or deteriorated within the last decade. Genomic selection is a tool which can en-

force genetic trends, but the direction to go is essential. Therefore the composition of the breeding goal is crucial. In order to meet the demand and desire of breeders, a participatory elaboration of the breeding goal is very valuable. Additionally, the economic circumstances need to be included in the deviation of the economic weights within the total merit index. The re-elaboration of the breeding goal is part of the Austrian project "OptiGene". Besides, the genetic evaluation as well as the breeding programmes will be further developed and updated to achieve the desired long-term genetic gain.

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**Table 3:** Average importance of novel traits for breeders on a scale of 1 (not important) to 6 (very important)

Trait	Breed average			
	BS	FV	GR	PI
Feed and energy efficiency	4.34	4.23	4.26	4.27
Claw health	4.45	4.60	4.21	4.44
Metabolism	4.60	4.54	4.24	4.27
Temperament	3.80	4.25	4.10	4.10
Inter- and cross-sucking	4.16	4.56	4.28	4.48
Insufficient sucking reflex	4.00	3.46	3.61	3.08
Umbilical hernia	3.29	3.10	3.52	3.58
Suitability for automatic milking systems	1.74	1.94	1.54	1.81

BS = Brown Swiss, FV = Fleckvieh, GR = Grauvieh, PI = Pinzgauer

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