

# New Total Merit Index RZG for Holsteins in Germany with more Emphasis on Herd Life

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## Introduction

Germany already introduced a total merit index for bulls in 1997, called RZG, including production and conformation traits as well as somatic cell score (SCS), longevity and reproduction traits (paternal and maternal fertility and calving traits). Within the non-production traits the SCS-index RZS was quite important (14%), as reliable proofs were available from the test day model at an early stage. Relative weight for functional herd life (RZN 6%) was less than economic importance would indicate, because reliable EBV were available only for older bulls.

The German Holstein Association (DHV) decided to change the weights of the composites for the RZG taking into account an improved EBV for longevity and a revised formula for the production index RZM. The new indices will be introduced with the August 2002 evaluation run. Longevity will become the second important trait complex in RZG. The weights for production (RZM), conformation (RZE) and somatic cell count (RZS) will be reduced and the weight for reproduction traits (RZZ) remains almost the same.

## The New Relative Weights

The relative weighting factors of the trait composites within the new and old German total merit index RZG are shown in Table 1.

Production remains the most important trait complex with 50%.

With 25% for RZN longevity will replace conformation as second important trait complex. Model calculations showed that longevity should get up to 60% of the weight for production in German situation, in which replacement costs take 1/3 of total variable costs of milk production.

The weight for conformation traits is slightly reduced. German Holstein breeders as well as for commercial milk producers made a clear demand not to reduce the emphasis on RZE, as conformation traits play traditionally an important role in selection. With 15% - instead of 20% previously - this is fulfilled since the current RZN includes also conformation traits as predictors.

SCS as trait for udder health is reduced in direct weight from 14 to 5%. This is justified, because the indirect economic effect of mastitis on enhanced culling rate is considered already in the new RZN. So direct weight for RZS has mainly to cover the costs for veterinary treatment and wasted milk.

Reproduction traits, combined in the RZZ, have high economic importance for milk producers. However, the genetic correlations between direct and maternal genetic effects in all reproduction traits render a correct consideration in selection programs. Therefore this trait complex has still a low weight in the total merit index.

**Table 1.** Relative weights of composites within the old and new German total merit index RZG.

	RZG old	RZG new
RZM (production)	56 %	50 %
RZN (longevity)	6 %	25 %
RZE (conformation)	20 %	15 %
RZS (udder health)	14 %	5 %
RZZ (reproduction)	4 %	5 %

## Revised Production Index

Together with the new weight of production in RZG the formula for the production index RZM will be changed. Since 1990 RZM formula considered only fat and protein yield (kg) with a relative ratio of 1 : 4. Starting in August 2002 proofs for fat and protein content (%) will be included with the same ratio in order to brake the negative trend observed in milk contents over the last decade. Due to the negative correlation between milk yield and milk contents progress in fat and protein yield was mainly achieved by increasing milk yield. Producing the same amount of fat and protein with more milk and lower contents is expensive, because milk contains about 4.85 % of lactose and its synthesis needs about the same feed energy as 3.4 % protein. The new formula for RZM is based on these facts.

The changed formula for RZM has more impact on the new RZG than the slight reduction

of relative weight. Almost half of all re-rankings by the new RZG are caused by the changed RZM. The new RZM is in accordance with the way breeders and A.I. industry look at bulls. EBV for fat and protein content play a major role for the acceptance of bulls in Germany.

## The Combined RZN

Since 2001 the EBV of direct functional herd life (fHL), evaluated with the Survival Kit, is combined with the EBV of the auxiliary traits SCS, body depth, feet&leg (F&L) score, fore udder attachment and maternal calving ease. The resulting index is published as relative breeding value for functional herd life, RZN. Especially young bulls profit from this procedure in terms of more reliable proofs in an earlier stage of life. More reliable proofs for functional herd life as well as the breeders' preference for this trait are causing the increased weight within RZG.

**Table 2.** Auxiliary traits and genetic correlations used in the German index for functional herd life, RZN (Holstein above, Red Holstein below diagonal).

	HL direct	F&L score	Body depth	Fore ud. attach.	SCS	Maternal CE
Functional herd life direct	-	0.32	-0.32	0.36	0.44	0.16
Feet & leg score	0.30	-	-0.02	0.29	-0.05	0.08
Body depth	-0.34	0.12	-	-0.03	-0.03	-0.09
Fore udder attachment	0.29	0.36	0.02	-	0.32	-0.01
Somatic cell score	0.53	0.12	-0.24	0.30	-	0,03
Maternal calving ease	0.17	0.20	-0.15	0.01	-0.06	-

Table 2 shows the genetic correlations used in the index calculations for Holstein and Red Holstein. The combination of auxiliary traits was derived from the correlations within bulls having at least 80% reliability for the direct RZN. Results for genetic correlations of conformation traits are in line with results in other countries for example Italy and The Netherlands. After including one linear trait from each conformation complex (Body, F&L, Udder) almost no increase in accuracy could be gained by including additional traits from the same complex. Except for F&L the single linear traits from each complex with the best correlation was a better predictor for direct RZN than the classifier's score or the EBV for the corresponding conformation composite (linear traits + score). Within udder traits udder depth had a little higher  $r_g$  than fore udder attachment, but because of less negative  $r_g$  to milk production the latter was chosen as auxiliary trait. In the group of

reproduction traits maternal calving was found to be the best prediction trait for RZN.

## Expected Genetic Progress

The new relative weights of the total merit index don't give a proper view of expected genetic trends by selection for RZG as remarkable genetic correlations of the included traits have to be considered, too. Table 3 shows that the new RZG, including the new RZM, leads to less negative average EBV for percentages in the top ranking bulls (Holstein top 300, Red Holstein top 75 bulls) which represent the majority of active A.I. sires. As expected, progress in milk yield is lower when selecting with the new RZG. Although weight for production was reduced by 6%, gain in protein yield is still 93-95% compared to the old RZG.

The demand of breeders to keep emphasis on conformation constant is fulfilled. Now 15% direct weight for RZE leads to comparable average EBV to the previous RZG. Within the overall conformation more progress is made for F&L and udder and less for dairy type and body,

because the correlations to longevity lead to an additional indirect selection response (Table 4). Even though relative weight for RZS was reduced to almost 1/3, progress in udder health is expected to be higher with selection on new RZG, due to the same effect (Table 3).

**Table 3.** Changes in average EBV of top bulls for new and old RZG (February 2002).

	All* Hol.	Holstein Top 300 RZG		All* Red Hol.	Red Holstein Top 75 RZG	
	N=8209	old	New	N=1190	old	New
Milk-kg	427	1774	1553	424	1615	1376
Fat-%	-0,07	-0,22	-0,13	-0,02	-0,13	0,00
Fat-kg	11,1	53,3	52,8	15,2	56,4	57,0
Protein-%	-0,04	-0,10	-0,05	-0,05	-0,11	-0,04
Protein-kg	10,3	50,6	47,1	10,6	45,6	43,1
RZN	98,7	104,1	107,4	97,8	99,3	102,0
RZE	95,5	114,6	114,6	99,0	115,6	113,1
RZS	98,4	99,4	101,8	100,2	102,7	104,1
RZZ	101,1	101,1	101,5	99,1	98,6	99,1

\*) all bulls published.

**Table 4.** Changes in average EBV of top bulls for conformation composites with the new RZG (February 2002).

	All* Hol.	Holstein Top 300 by RZG		All* Red H..	Red Holstein Top 75 by RZG	
	N=8209	old	new	N=1190	old	new
Dairy Type	97,6	113,9	111,5	99,5	117,6	113,1
Body	97,3	108,8	107,1	99,8	112,5	109,0
F&L	97,5	107,9	109,2	98,7	104,6	103,8
Udder	96,2	110,3	111,4	99,2	110,8	110,5
RZE	95,5	114,6	114,6	99,0	115,6	113,1

\*) all bulls published.

## Further Changes

The old RZG was calculated by using a fixed formula based on average reliabilities of bulls having complete information available from first crop daughters. Up to now RZN was only taken into account in RZG (and published) if reliability was higher than 50%.

Within the new RZG all EBV for RZN are included which base on daughter information (herd life direct and auxiliary traits). The new RZG will take into account the reliabilities of all EBV of a bull. This leads to an individual index formula for each bull. A fixed formula is not appropriate anymore as reliabilities of RZN have a wider range for active bulls (<50% up to 99%) and RZN gets a higher weight.

## Conclusions

Starting in August 2002 the German total merit index RZG for Holsteins - including the revised production index RZM and the combined EBV for longevity RZN - will put more emphasis on milk contents and longevity. More top ranking bulls are fulfilling the needs of German dairy farmers now. During the last two years total merit indexes in main Holstein countries followed the trend Germany set in 1997 with the former RZG, including already udder health, longevity and reproduction traits. The current changes in RZG are in line with the international trend to put more emphasis on health traits and longevity.