DESCRIPTION OF NATIONAL GENETIC EVALUATION SYSTEM AND TREND VALIDATION FOR PRODUCTION TRAITS

Country (or countries):	Germany, Austria and Luxembourg
Main trait group:	Production
Breed(s):	**HOL**stein (Black & White, Red & White), Red cattle (**AYS**), **JER**sey
Trait definition(s) and unit(s) of measurement Attach an appendix if needed	Milk (kg), fat (kg), protein (kg), fat (%), protein (%) on 24-hour daily basis
Method of measuring and collecting data	All production data collected by official milk recording agencies using ICAR certified milk recording methods
Criteria for extension of records	No extension of records required
Time period for data inclusion	All test day records from 1990 onwards are used.
Age groups (e.g. parities) included	First three lactations
Other criteria (data edits) for inclusion of records	Allowed ranges of age of calving for first three lactations are 20-40, 30-56 and 44-75 months, respectively. Range of days in milk is 5 to 330.
Sire categories	All categories of bulls are evaluated jointly.
Environmental effects[a], pre-adjustments	No pre-adjustments for environmental effects
Method (model) of genetic evaluation[a]	ST – ML – RR – TD – BLUP – AM
Environmental effects[a] in the genetic evaluation model	Fixed effects: herd-test-date-parity-milking-frequency effects for 1st lactation and combined 2nd and 3rd lactation, fixed lactation curves defined by lactation number * region/breed * calving age class * calving year class * calving season * calving interval class with a total of 8547 different curves Random effects: permanent environmental effects by lactation
Adjustment for heterogeneous variance in evaluation model	Standardization of heterogeneous variances within herd-test-date-parity-milking-frequency effect is performed prior to solving mixed model equations
Use of genetic groups and relationships	Genetic groups are defined for unknown parents of animals based on breed, sex, year of birth and country of origin of the animal. At least six generations of pedigree are traced back from the cows in test day data set.
Blending of foreign/Interbull information in evaluation	No
Genetic parameters in the evaluation	see PART 3 for heritability/genetic variance estimates; for multiple-trait genetic evaluations, provide genetic correlation estimates between traits separately
System validation	- checks on data quality (raw data, pedigree information, etc.) - checks on results: changes in EBV between evaluations, genetic trends, stability of EBV over time, lactation curve analysis, residual analysis, analysis of Mendelian sampling effects, etc. - Interbull validation methods II and III to be done
Expression of genetic evaluations If standardised (e.g. RBV), give standardisation formula in PART 3	EBV (milk kg, fat kg, protein kg, fat %, protein %) RZM (relative breeding value milk) with mean of 100 and standard deviation of 12
Definition of genetic (reference) base	EBV: stepwise 5 year cow base including all cows born in 1995 separately for each breed

Next base change	RZM: yearly rolling bull base with all AI-bulls born in 1992-1994 by breed EBV: August 2005 with the base population including all cows born in 2000 by breed RZM: August 2003 with the base population including all AI bulls born in 1993-1995 by breed
Calculation of reliability	Using multiple trait effective daughter contribution method
Criteria for official publication of evaluations	Daughters' test day records passed 90 days in milk on average for first lactation and daughters distributed in at least 10 herds, at least 70% reliability for protein yield Additional criterion to be included in sire ranking list: at least 50 daughters/30 herds
Number of evaluations / publications per year	3 / February, May, and August
Use in total merit index[b]	RZM (relative breeding value milk) separately for breeds: B&W: $91.5 + .137*EBV_{Fkg} + .548*EBV_{Pkg} + 4.907*EBV_{F\%} + 19.628*EBV_{P\%}$ R&W: $92.0 + .130*EBV_{Fkg} + .520*EBV_{Pkg} + 4.667*EBV_{F\%} + 18.668*EBV_{P\%}$ Red cattle: $90.5 - .006*EBV_{Mkg} + .120*EBV_{Fkg} + .720*EBV_{Pkg}$ Jersey: $95.0 + .100*EBV_{Fkg} + .600*EBV_{Pkg}$ RZG (Total merit index): 50% production traits, 25% functional herd life, 15% type traits, 5% somatic cell score, 5% reproduction traits
Anticipated changes in the near future	Implementation of the random regression test day model expected in May 2003
Key reference on methodology applied	Liu, Z., Reinhardt, F., and Reents, R. 2000. Estimating parameters of a random regression test day model for first three lactation milk production traits using the covariance function approach. *Interbull Bulletin* 25:74-80. Liu, Z., Reents, R., Reinhardt, F., and Kuwan, K. 2000. Approaches to estimating daily yield from single milking testing schemes and use of a.m.-p.m. records in test-day model genetic evaluation in dairy cattle. *J. Dairy Sci*. 83:2672-2682. Liu, Z., Reinhardt, F., Bünger, A., Dopp, L., and Reents, R. 2001. Application of a random regression model to genetic evaluations of test day yields and somatic cell scores in dairy cattle. *Interbull Bulletin*: 27:159-166. Liu, Z., Reinhardt, F., and Reents, R. 2001. The effective daughter contribution concept applied to multiple trait models for approximating reliability of estimated breeding values. *Interbull Bulletin*: 27:41-47. Reents, R., Dopp, L., Schmutz, M., and Reinhardt, F. 1998. Impact of application of a test day model to dairy production traits on genetic evaluations of cows. *Interbull Bulletin*: 17:49-54. Reinhardt, F., Liu, Z., Bünger, A., Dopp, L., and Reents, R. 2002 Impact of application of a random regression test day model to production trait genetic evaluations in dairy cattle. *Interbull Bulletin*: 29:103-107.
Key organization: name, address, phone, fax, e-mail, web site	Vereinigte Informationssysteme Tierhaltung w. V. (VIT), Genetic Evaluation Unit, Heideweg 1, D-27283 Verden/Aller, GERMANY Phone: 0049 - 4231 - 955 10 Fax: 0049 - 4231 - 955 166 e-mail: vitzws@vit.de or info@vit.de, web site: http://www.vit.de

[a] Use abbreviations for most common effects (see document with list of abbreviations at http://www-interbull.slu.se/service_documentation/General/framesida-general.htm) and indicate random (R) or fixed (F)

[b] Please give economic weights and indicate how they are expressed (preferably in genetic standard deviation units).

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Trait	h^{2a}	genetic variance[a]	official proof standardisation formula[b]
Milk yield:	.49 on combined lactation basis	314,989	
Fat yield:	.48 on combined lactation basis	534	
Protein yield:	.48 on combined lactation basis	280	

[a] If lactations, or part of lactations, are treated as separate traits, provide heritability estimates and genetic variances separately for each lactation, as well as for all lactations pooled, i.e. for the trait submitted to Interbull.

[b] Expressed as follows:
StandEval=((eval-a)/b)*c+d where a=mean of the base adjustment, b=standard deviation of the base, c=standard deviation of expression (include sign if scale is reversed), and d=base of expression.

Table 1: Genetic parameters[§] for milk, fat and protein yield on 305-day basis with heritabilities on diagonal, genetic correlations above diagonal and phenotypic correlations below diagonal

Trait	Lactation	Genetic variance (kg^2)	Lactation 1	2	3	Combined
Milk yield	1	350,378	**.53**	.84	.84	
	2	321,393	.55	**.35**	.97	
	3	352,834	.52	.54	**.34**	
	Combined	314,989				**.49**
Fat yield	1	525	**.52**	.88	.87	
	2	541	.54	**.36**	.97	
	3	651	.50	.53	**.36**	
	Combined	534				**.48**
Protein yield	1	295	**.51**	.86	.84	
	2	293	.62	**.38**	.96	
	3	335	.57	.64	**.38**	
	Combined	280				**.48**

[§]Note that the parameters were estimated based on data from supervised tests of Holstein cows.