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**EUROPEAN AND WORLD-WIDE HARMONISATION OF LINEAR
TYPE CLASSIFICATION
DEFINITION OF TRAITS AND ESTIMATION OF BREEDING
VALUES**

Report of the world working group for the harmonisation of linear type classification:

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1. INTRODUCTION

Cattle breeding and artificial insemination have received a more and more international character during the last twenty years. Especially in the Holstein breed the top bulls from all countries are used more or less world-wide. This development makes it necessary to make the results of AI sires comparable for production traits as well as for other traits.

Besides production traits, type traits have a definitive importance for breeders in their selection of bulls. For this reason the "European Confederation of Black and White Breed Societies" started in 1986 to harmonize the type classification of the different countries, especially the traits based on the linear system. To this end a working group was formed which, since 1986, has furnished propositions for the harmonization at the occasion of five European conferences. All European countries have agreed to consider the same linear traits and also certain harmonisations have been achieved as to the execution of the classification and the estimation of breeding values.

In 1988, the results of the European working group were presented for the first time at the occasion of a conference of the "World Holstein Friesian Federation" and since then the group has been enlarged by two new members from Canada and the USA. Within the last world conference in Budapest in 1992, all countries fortunately accepted the same linear traits. The planning of world head-classifiers meetings which are to take place every two years in order to realise the harmonisation in practice and the recommendation to assign the harmonisation of the estimation of breeding values for type traits in future to INTERBULL were further results of this conference. In addition to this, the recommendation was made to give the group the new task to analyse the economic importance of type traits. Meanwhile, the realisation of this last task has already been commenced by collecting all studies dealing with this theme.

2. DEFINITIONS OF LINEAR TYPE TRAITS

Both the "European Confederation of Black and White Breed Societies" and the "World Holstein Friesian Federation" have meanwhile laid down twelve standard and two optional traits which are to be considered in all countries when estimating type traits according to the linear system. In the following, a brief description of them is given:

STANDARD TRAITS

All chosen standard traits fulfil the following conditions:

- * linear on a biological scale
- * single traits
- * heritable
- * of economic value
- * possible to be measured instead of scored
- * showing variation within the population

The following twelve standard traits have been assessed uniformly:

Trait	Remarks
1. Stature	Height at the rump between the hip bones
2. Body depth	Depth of the rear rib
3. Rump	Hips to pins; 3 is level on a 9-point-scale
4. Rump width	Distance between pins
5. Rear legs set	Angle; side view
6. Feet	Diagonal or foot angle or heel depth
7. Fore udder	Strength of attachment
8. Rear udder height	Distance between base of vulva (or pin bone) and top of milk secreting tissue
9. Central ligament	Udder cleft
10. Udder depth	2 is level with the hock on a 9-point-scale
11. Teat placement	Front teats
12. Teat length	Front teats

OPTIONAL TRAITS

There are a number of additional traits which do not meet all the requirements of the standard traits. They can be added to the classification report of a country if required. Two optional traits are of special importance and thus, as per conclusion of the world conference, are to be considered in every country:

Chest width	Width of chest floor. Highly correlated with body depth and rump width.
Angularity	Evidence of milking ability (not a single trait)

3. CLASSIFICATION SYSTEMS

For the estimation of breeding values it is most important that the classification systems meet certain requirements which are necessary for a good estimation of breeding values. The working group defined the following requirements which meanwhile have been realised in nearly every country:

1. A national organization should be in charge of classification systems. Classifiers should be independent of commercial interest in an AI bull.
2. There should be a national head classifier in charge of training and supervising the other classifiers. It is important to exchange information between head classifiers from different countries.
3. Besides herd classification (all first calvers of the contributing herds) additional classification should only be possible if completed by the national organisation and a certain number of herd mates are scored during the same visit.
4. All bulls in AI should be included in classification programs; no selection should be made among them after their production proofs.

4. SIRE EVALUATION

Sire evaluation for type traits should by all means be executed by using the BLUP method. Meanwhile, this is the case in almost every country. The use of the Animal Model seems to be especially positive since this model allows to bring in information from relatives and permits a correction for the merit of mates.

Influencing factors for which it is usually adjusted are herd (or herd group), year, season, classifier, age and stage of lactation. It is an important question if a different variation between classifiers should be corrected. At present, this is practiced e.g. in Denmark, Germany, Israel, Netherlands and Great-Britain.

As to the base of type proofs used in the countries concerned, considerable differences can be observed. Both the fixed base and the rolling base as well as a combination of both are used. A considerable time ago, INTERBULL recommended to use a step-wise fixed base. The base will change every five years and between 1990 and 1995 it would be formed by the cows born in 1985. Actually, this system is only used in few countries (e.g. in Italy, Spain, USA).

5. STANDARDISATION AND PUBLICATION OF PROOFS

In order to enable the user (breeder) to compare the results of the sire evaluation ascertained in different countries, the type proofs have to be standardised in the same way. Also to this effect INTERBULL made a recommendation some years ago according to which results should be transmitted to a system with a mean of 100 and a standard deviation of 6 should be realised. Already in 1986, this proposition was taken up by the working group but, in reality, many different systems are used.

About half of all the countries use 0 or 100 as mean. In the case of systems with a mean of 0 the standard deviation usually is 1, the systems with a mean of 100 usually have standard deviations of 4, 5, 6, 10 and 12.

The use of a system with a mean of 100 is more advantageous because linear description mainly intends to describe the marks of certain body traits without evaluating them. Thus negative values, as in the case of a system with a mean of 0, should be avoided. In the end, the most important thing is the realisation in practice and therefore it would be desirable if INTERBULL elaborated a new recommendation for the standardisation of breeding values as well as for the estimation of proofs.

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Table 1.

CLASSIFICATION SYSTEMS IN DIFFERENT COUNTRIES

Country	Sires	Number Records	Daughters
BEL	all	1	all
DNK	test	1	max. 80 random
FRA	all AI	1	all
DEU	test	1	30 - 35 random
HUN	all	1	all
ITA	all	1	all
ISR	test	1	all
NLD	all	1	all
GBR	all	1	all
ESP	all	1	all
SWE	milk +	1	30 - 50 random
USA	all	all	all
CAN	all	all	all

Table 2.

MODEL OF SIRE EVALUATION OF TYPE TRAITS IN DIFFERENT COUNTRIES

Country	Method	Variation Classifiers	Adjustment for *
BEL	AM	-	1 2 3 4 5 6
DNK	AM	+	1 2 3 4 5 6
FRA	AM	-	1 2 3 4 5 6
DEU	AM	+	1 2 4 5 6
HUN	BLUP	-	1 2 3 4 5 6
ITA	AM	-	1 2 3 4 5 6
ISR	BLUP	+	1 2 3 4 5 6
NLD	AM	+	1 2 3 4 5 6
GBR	AM	+	1 2 3 4 5 6
ESP	AM	-	1 2 3 4 5 6
SWE	BLUP	-	1 2 3 4 6
USA	AM	-	1 2 3 4 5 6
CAN	AM	-	1 2 3 4 5 6
*	1 = herd 4 = classifier	2 = year 5 = age	3 = season 6 = stage of lactation

Table 3.

DEFINITION OF BASE FOR TYPE PROOFS

Country	Method *	Definition
BEL	R	last year of test bulls
DNK	R	last year of test bulls
FRA	R	three years of test bulls
DEU	R	three years of test bulls
HUN	F	bulls born in 1976
ITA	F/I	cows born in 1985
ISR	R	last year of test bulls
NLD	F	daughters of test bulls classified in 1988
GBR	F	cows classified in 1988
ESP	F/I	cows born in 1985
SWE	R	last four years of last bulls
USA	F/R	all bulls
CAN	F/I	cows born in 1985
* R = rolling base F/R = combination		F = fixed base F/I = INTERBULL definition

Table 4.

STANDARDISATION OF TYPE PROOFS

Country	Mean	S.D.
BEL	0	1
DNK	0	1
FRA	0	1
DEU	100	12
HUN	0	1
ITA	0	1
ISR	100	6
NLD	100	4
GBR	0	1
ESP	0	5
SWE	100	5
USA	0	1
CAN	0	5