



International type evaluation of dairy cattle

Summary

The World Holstein-Friesian Federation (WHFF) introduced a type harmonisation programme by almost all countries for the type evaluation of Holstein dairy cows. The quality and robustness of the programme have been demonstrated in the Multiply Across Country Evaluation (MACE) for type evaluations, producing inter-country correlations, which at one time were considered impossible to achieve. The International Committee of Animal Recording (ICAR) has adopted the principle of the WHFF type harmonisation programme and it is logical, considering the quality of the results, to fully integrate the recommendations of both organisations into an international standard for type evaluation, administration and presentation.

Mission

International harmonisation of type classification, to provide uniform and standardised information regarding the transmitting abilities of bulls.

History

In 1986 the European Holstein-Friesian federation (EHFF) established a working group to examine harmonisation of type classification systems. Objectives were to prepare recommendations for the harmonisation of type classification, including definition of traits, classification systems, publication of type proofs and evaluation of AI-bulls. In 1988 WHFF adopted the European Holstein-Friesian Confederation type harmonisation programme.

Since 1988 the EHFF has organised six workshops, where all aspects of type harmonisation were discussed. In 2000 the WHFF conferences in Sydney and in 2004 in Paris agreed with the proposals and recommendations of the working group on the most important points, especially the definition of individual linear traits, the publication of the bull proofs and the organisation of the workshops.

International Assessment Standards

The introduction of the 16 standard linear traits and one research trait, locomotion, has been universally accepted, with many countries changing programmes to comply with the recommendations. To assist in obtaining universal participation it is proposed that the use of the 16 traits must be a prerequisite to the data being included in international evaluations. The MACE programme should be the catalyst to establishing global uniformity. The programme has been approved by ICAR. All countries should follow the recommendations or be excluded from the programme.

MACE

MACE has been introduced by several countries. MACE evaluations for type provide information required by breeders. It is therefore essential that linear assessments are completed to the recommended international standards.

The results from Interbull confirm the success of the WHFF International Linear Assessment Programme and in particular the progress of the past decade in establishing a universal harmonised linear evaluation system.

Linear

Type Traits

Linear type traits are the basis of all modern type classification systems, and are the foundation of all systems of describing the dairy cow. Linear classification is based on measurements of individual type traits instead of opinions. It describes the degree of trait not the desirability.

Advantages of linear scoring are:

- traits are scored individually
- scores cover a biological range
- variation within traits is identifiable
- degree rather than desirability is recorded

International Standard Traits

The following traits are approved standard traits:

1. Stature
2. Chest Width
3. Body Depth
4. Angularity
5. Rump Angle
6. Rump Width
7. Rear Legs Rear View
8. Rear Legs Set
9. Foot Angle
10. Fore Udder Attachment
11. Front Teat Placement
12. Teat Length
13. Udder Depth
14. Rear Udder Height
15. Central Ligament
16. Rear Teat Position

Recommendation: All countries must use standard traits in the linear classification system, to the strict definition as recommended. Optional traits are additional traits that may be included in the classification reports of different countries.

Standard Trait Definition

The precise description of each trait is well defined and it is essential to use the full range of linear scores to identify the intermediate and extremes of each trait within its population. The assessment parameters for the calculations should be based on the expected biological extremes of two year-old heifers.

All countries at the WHFF conference in Sydney had approved and agreed to use the recommended standard linear traits, although some countries did not consider that all the traits were essential or have an economic value in their breeding programme. The position is that changes in the standard traits could occur based on scientific evidence or the requirement of the international dairy market for specific information. It is not always possible to have a single linear point of measurement, as with fore udder attachment and angularity. Angularity has been particularly questioned as to its relevance within the programme. Acknowledging that it is a descriptive trait required internationally, it's assessed with a high degree of confidence and accuracy producing a heritability figure equivalent to that for production traits – around 0.33. The correlation with stayability is very good, from 33% tot 76% (after adjustment for yield) for higher scored animals, confirmed by the NRS-data. In an attempt tot answer criticism of the trait angularity, a new definition has been developed which is explained in the trait definitions.

Note

The linear scale used, must cover the expected biological extremes of the population in the country of assessment. The precise measurements in the scale given, may be used as a guide and should not be treated as an exact recommendation.

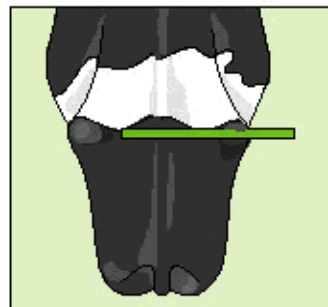
1. Stature

Ref. point:

Measured from top of the spine in between hips to ground.
Precise measurement in centimetres or inches, or linear scale.

1 Short	(1.30 cm)
5 Intermediate	(1.42 cm)
9 Tall	(1.54 cm)

Reference scale: 1.30 cm – 1.54 cm; 3 cm per point

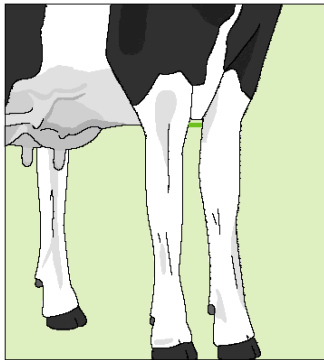


2. Chest Width

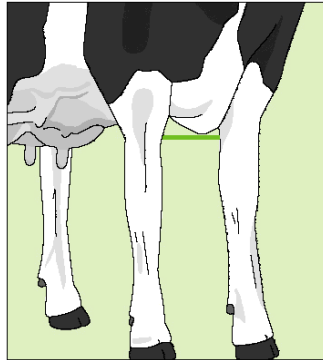
Ref. point: Measured from the inside surface between the top of the front legs.

- 1 – 3 Narrow
- 4 – 6 Intermediate
- 7 – 9 Wide

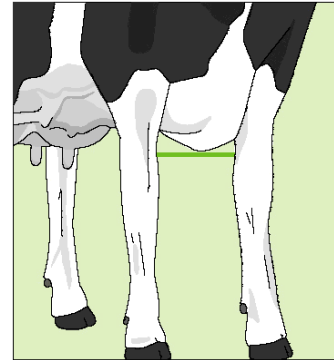
Reference scale: 13 cm – 29 cm; 2 cm per point



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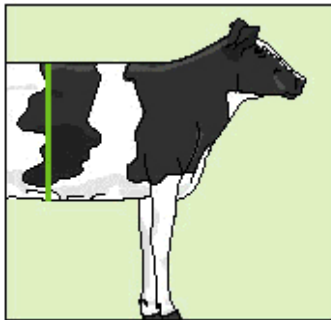
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3. Body Depth

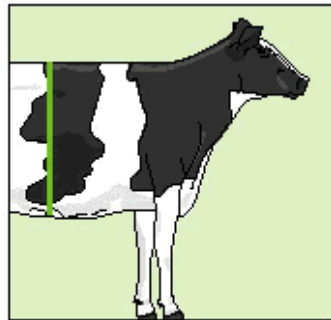
Ref. point: Distance between the top of spine and bottom of barrel at last rib – the deepest point. Independent of stature.

- 1 – 3 Shallow
- 4 – 6 Intermediate
- 7 – 9 Deep

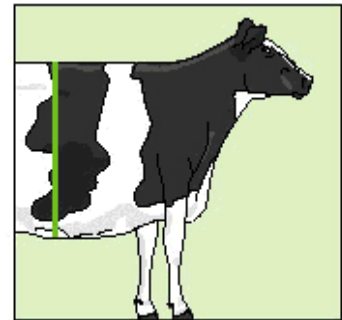
Reference scale: optical in relation with the balance of the animal



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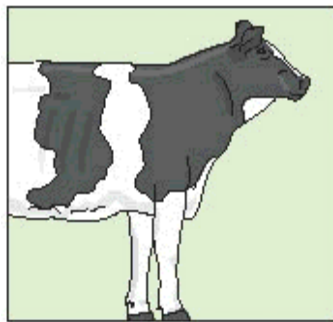
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4. Angularity

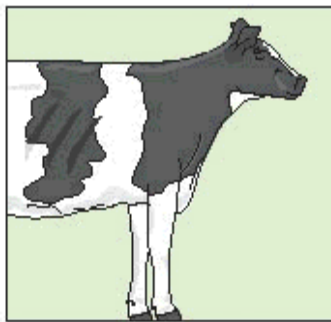
Ref. point: The angle and openness of the ribs, combined with flatness of bone avoiding coarseness. Not a true linear trait.

- 1 – 3 Lacks angularity close ribs coarse bone
- 4 – 6 Intermediate angle with open rib and intermedian bone quality
- 7 – 9 Very angular open ribbed flat bone

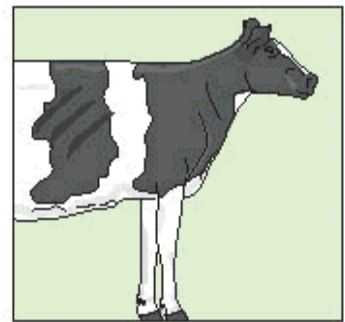
Reference scale: weighing of the three components; angle and open rib 80%, bone quality 20%



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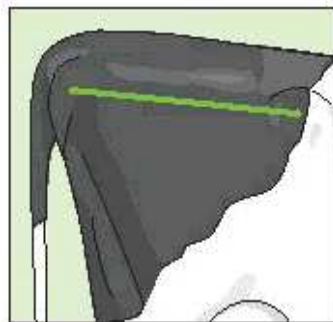


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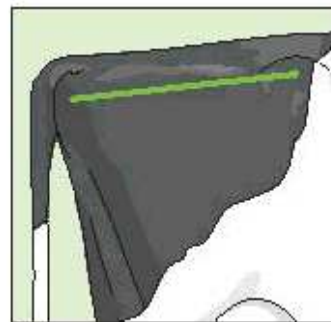
5. Rump Angle

Ref. point: Measured as the angle of the rump structure from hooks (hips) to pins.

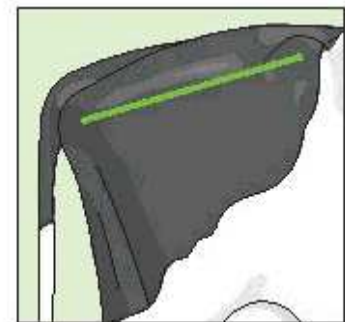
- | | |
|-----------------|----------|
| 1 High Pins | (+4 cm) |
| 2 | (+2 cm) |
| 3 Level | (+0 cm) |
| 4 Slight slope | (-2 cm) |
| 5 Intermediate | (-4 cm) |
| 6 | (-6 cm) |
| 7 | (-8 cm) |
| 8 | (-10 cm) |
| 9 Extreme slope | (-12 cm) |



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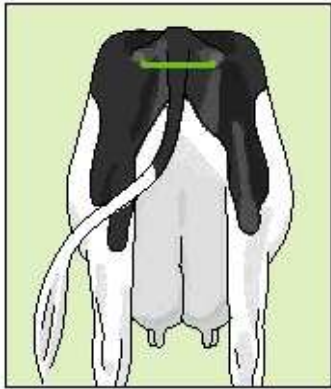
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6. Rump Width

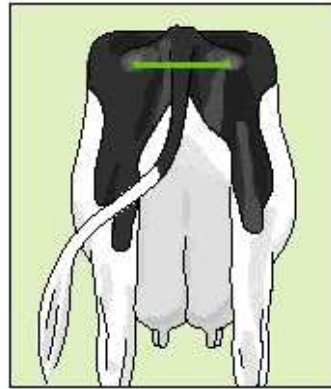
Ref. point: The distance between the most posterior point of pin bones.

- 1 – 3 Narrow
- 4 – 6 Intermediate
- 7 – 9 Wide

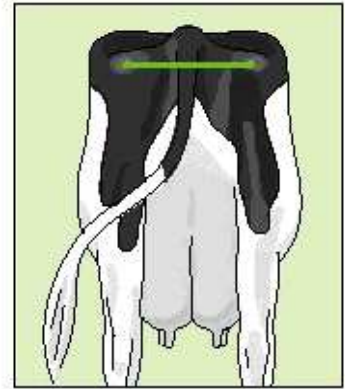
Reference scale: 10 cm – 26 cm; 2 cm per point



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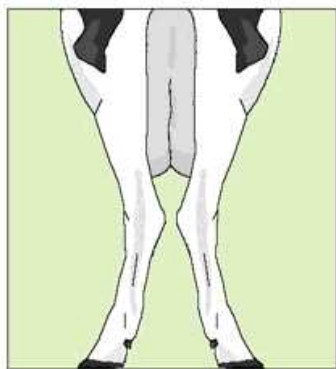


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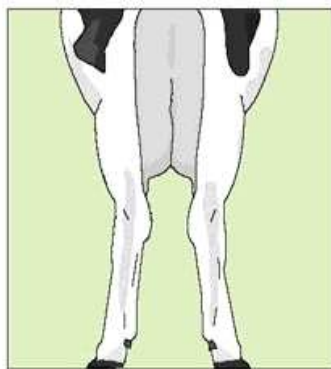
7. Rear Legs Rear View

Ref. point: Direction of feet when view from the rear.

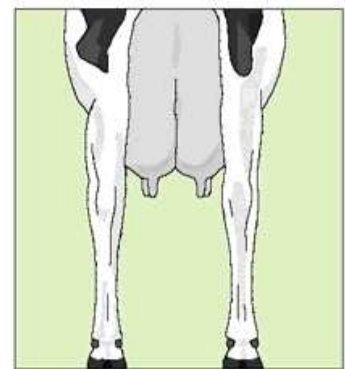
- 1 Extreme toe-out
- 5 Intermediate; slight toe-out
- 9 Parallel feet



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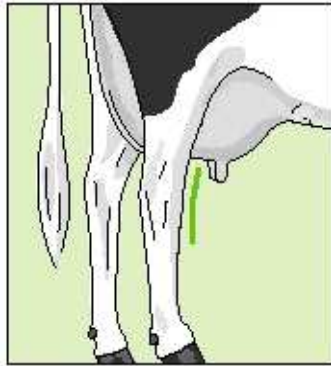


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8. Rear Legs Set

Ref. point: Angle measured at the front of the hock.

- 1 – 3 Straight (160 degrees)
- 4 – 6 Intermediate (147 degrees)
- 7 – 9 Sickie (134 degrees)



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9. Foot Angle

Ref. point: Angle at the front of the rear hoof measured from the floor to the hairline at the right hoof.

- 1 – 3 Very low angle
- 4 – 6 Intermediate angle
- 7 – 9 Very steep

Reference scale: 1=15 degrees; 5=45 degrees; 9=65 degrees



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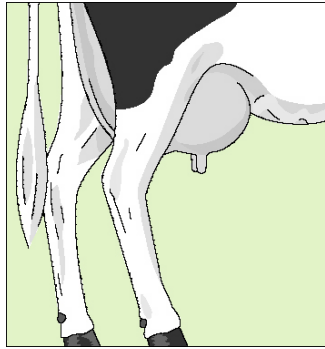


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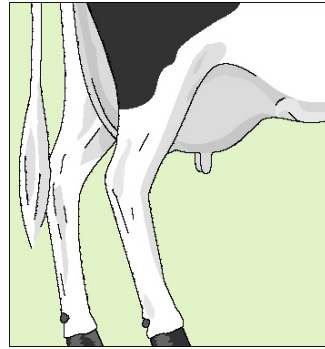
10. Fore Udder Attachment

Ref. point: The strength of attachment of the fore udder to the abdominal wall.
Not a true linear trait.

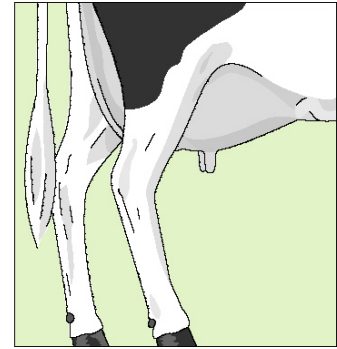
- 1 – 3 Weak and loose
- 4 – 6 Intermediate acceptable
- 7 – 9 Extremely strong and tight



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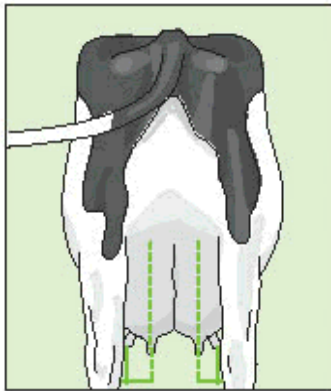


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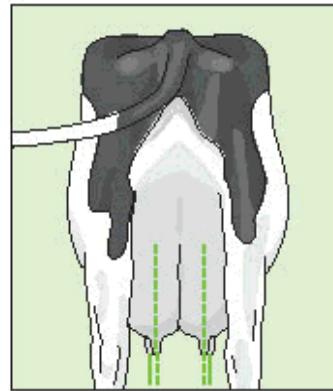
11. Front Teat Placement

Ref. point: The position of the front teat from centre of quarter.

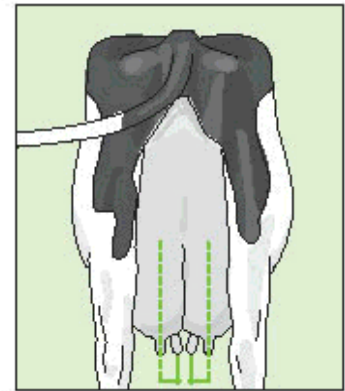
- 1 – 3 Outside of quarter
- 4 – 6 Middle of quarter
- 7 – 9 Inside of quarter



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12. Teat Length

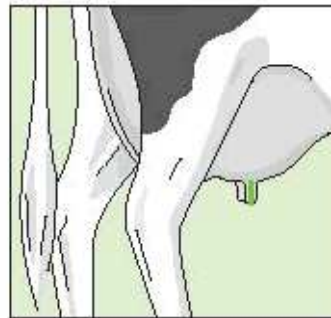
Ref. point: The length of the front teat.

- 1 – 3 Short
- 4 – 6 Intermediate
- 7 – 9 Long

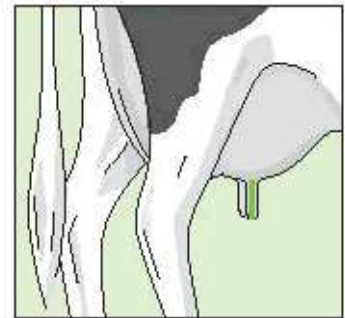
Reference scale: 1-9 cm; 1 cm per point



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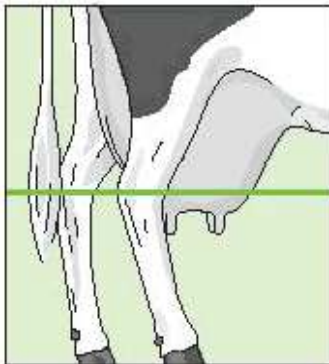
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13. Udder Depth

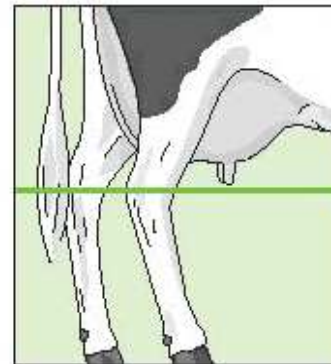
Ref. point: The distance from the lowest part of the udder floor to the hock.

- 1 Below hock
- 2 Level with hock
- 5 Intermediate
- 9 Shallow

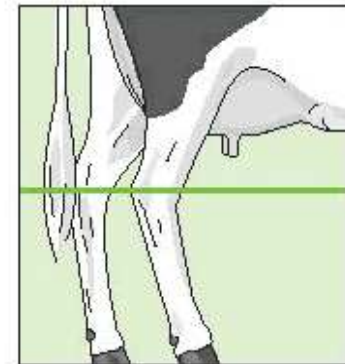
Reference scale: level=2 (0 cm); 3 per point



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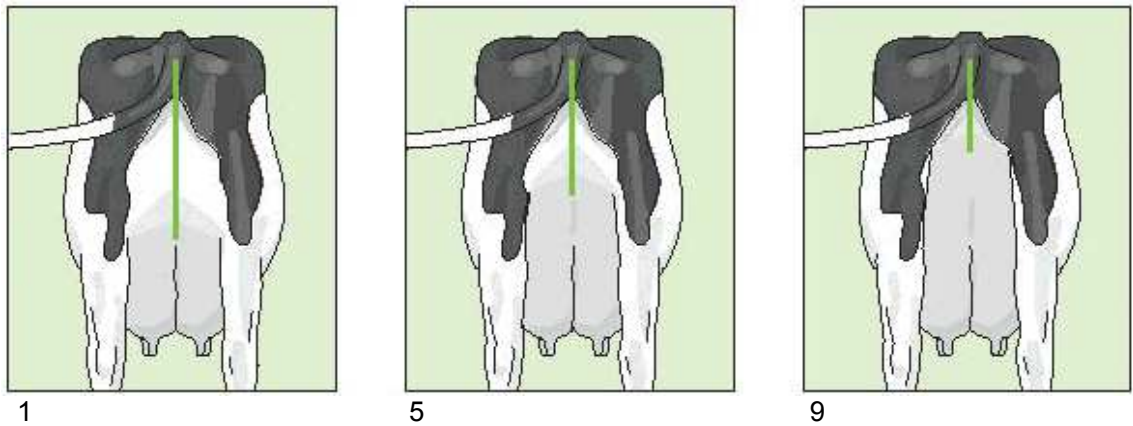
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14. Rear Udder Height

Ref. point: The distance between the bottom of the vulva and the milk secreting tissue: in relation to the height of the animal.

- 1 – 3 Very low
- 4 – 6 Intermediate
- 7 – 9 High

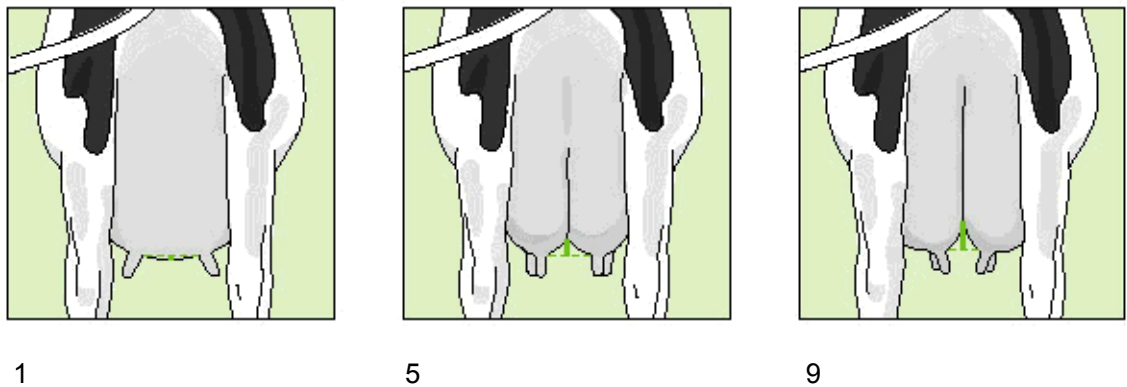
Reference scale: measured on a scale between the bottom of the vulva and the hock; the midpoint represents a score 4 (29 cm); 2 cm per point



15. Central Ligament

Ref. point: The depth of cleft, measured at the base of the rear udder.

- 1 Convex to flat floor (+1 cm)
- 2 (+0.5 cm)
- 3 (+0 cm)
- 4 Slight definition (-1 cm)
- 5 (-2 cm)
- 6 (-3 cm)
- 7 Deep definition (-4 cm)
- 8 (-5 cm)
- 9 (-6 cm)

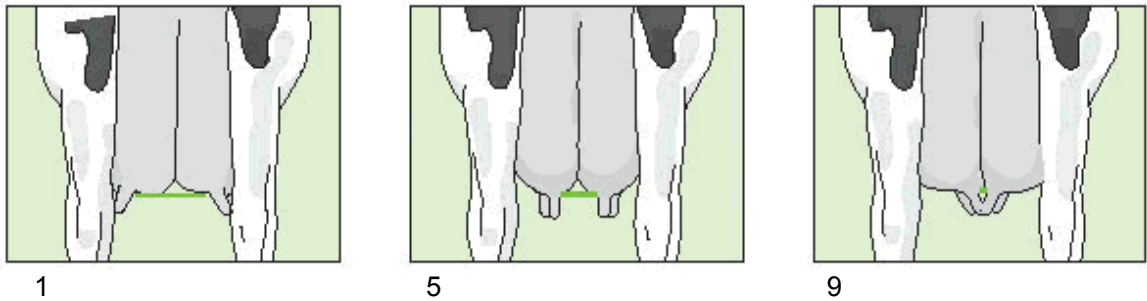


16. Rear Teat Placement

Ref. Point: The position of the rear teat from centre of quarter.

- 1 – 2 Outside
- 4 Mid point
- 7 – 9 Inside of quarter

Reference scale: to obtain population distribution it is recommended that 4 represents mid point of the quarter



Linear Scoring Scale

It is recognised that differences exist in the scale used to record linear traits between different countries, which are not easily resolved. Most countries use a scale from 1 to 9 or from 0 to 50. Both scales have advantages and disadvantages. Linear traits give a description of the cow, measured by the eye of a classifier. Most traits can be measured by centimetres instead of a score by classifiers.

The scores used can be converted to real measurements. In the report it is not necessary to have the same scale to describe the animal. Knowledge of the scale used is sufficient to understand the scoring system. There are no practical problems in using either a 1-9 scale or a 0-50 scale. Dairy breeders require information on the breeding value of bulls, not the linear scale by which the information is collected. Therefore it is significantly important to harmonise the scale of publications of bull proofs.

General Characteristics

General characteristics, or breakdowns, are combined traits, which are not linear in a biological sense. A subjective score of description is given for the desirability of the cow according to the breeding objective of the country. Because of the differences in the definition of breeding goals between countries it is difficult to recommend a harmonised definition for general characteristics. However as the international use of sires increases, the opportunity will present itself for accepting the challenge of defining fully harmonised classification systems.

Composites

Linear traits are the international language of type classification. General characteristics as total scores for udder and final class vary within different countries' breeding programmes. The development of programs to calculate composites from the linear traits has been introduced. The combination of standard traits by economic weighing factors into composites, representing a defined functional area is practised in several countries.

Each country that produces composites, defines them by different weighing factors. The weighing factors are calculated within the specific economic environment.

An example: in European countries attention is paid to muscularity and size because of the importance of selling calves and culled animals for veal or beef production. In other countries this is not common. Additionally no common agreement exists on the importance of the standard traits in the prediction of lifetime production. Therefore composites must be evaluated in context with the country of origin and its breeding objectives. The further harmonisation of the standard traits will result in the faster development of common weighing factors for composites.

The calculation of the subjective general characteristics from the standard traits presents difficulties. To obtain meaningful calculations for desirability composites, it was established that additional subjective information had to be weighted into producing a final class. The development of these systems would present many opportunities in the future, but it was considered that there is a requirement for more research and development. Currently, beside the 16 standard linear additional information is required to provide desirability scores.

Conversion

Type Traits

Historically, because of differences between countries in genetic level and genetic variation of the bull proofs it is important that type traits can be converted between countries.

For efficient conversions a precise definition of each linear trait is required. Currently only standard traits are suitable for conversion. It is impossible to achieve efficient conversions of composites or general characteristics that provide satisfactory information regarding the transmitting ability of a bull. It is advised not to convert composites or general characteristics but to convert the underlying standard linear traits and weigh these again by use of the weighing factors from the importing country.

The requirement for direct conversions is declining due to the introduction of MACE. MACE linear proofs are used in the calculation of individual country composite traits. MACE composite traits have been calculated at the request of participating organisations.

International Evaluation System

Type Classification System

To obtain unbiased reliable information the following recommendations are proposed concerning the administration of the classification system:

- a. One organisation should be in charge of classifications within each evaluating system.
- b. There should be a head-classifier in charge of training and supervising other classifiers within the evaluating system to achieve and maintain a uniform level of classification. Additionally the exchange of information between head-classifiers from different systems/countries is advised.
- c. Classification should be completed by individual full time professionals. Classifiers should be independent of commercial interest in AI-bulls/studs.
- d. Bull proofs has to be based on the classification of first calvers. If the evaluating system is modified, repeat classifications can be added. If there is a herd classification system additional classification may only be possible if completed by the same organisation of evaluation and sufficient herd mates (contemporaries) are scored during the same visit. All bulls in AI should be included in the classification programmes.
- e. A minimum of 5 heifers must be inspected at the same visit.

Evaluation Model

It is recommended for the calculation of type proofs that:

- a. Modern evaluation techniques should be used to obtain accurate unbiased evaluations.
- b. Data should be corrected for influencing factors such as age, stage of lactation and season by the model. Classifiers should not make corrections during scoring.
- c. Corrections for variation between classifiers are required to avoid heterogeneity of variance.
- d. Herd mates are defined as the contemporaries of the evaluated cows in the same lactation, scored during the same visit by the same classifier.

Publication

It is extremely important to publish the results of the evaluation of sires in all countries in the same way. Bull proofs for linear traits should be standardised to make the different traits comparable. Currently different means and standard deviations are used in different countries when standardising these proofs. In 1986 the original Interbull recommendation (unofficial) was accepted to publish type proofs with a mean of 100 and a standard deviation of 6. Currently half the countries use 0 and half use 100 as mean. In the case of systems with a mean of 0 the standard deviation usually is 1.00. The systems with a mean of 100 have different standard deviations of 4, 5, 6, 10 and 12.

The use of a system with a mean of 100 negates the use of negative values as linear describes the variation of certain body traits without evaluating them, thus negative values as in the case of a system with a mean of 0, are avoided.

However in the end the most important aspect is the practical application and appreciation of the information. It is our stated aim to harmonise on this point and is far more important than having either 0 or 100 as mean. Therefore to be pragmatic the recommendation is 0 as mean and 1.0 as standard deviation.

The recommendations for the publication of type proofs are:

- a. Publish bull-proofs around an average of 0 and a standard deviation of 1.0.
- b. Proofs of widespread used bulls should be published as bar graphs covering the range between +3 and -3 standard deviations.
- c. The base of sire evaluation should follow the definition of the production proofs, given by Interbull. This includes a stepwise fixed base that should be renewed every five years. For example: currently the base is cows born in 2000.

Classifiers' Selection and Monitoring

To individual countries' requirements, it is essential to appoint people with very good communication skills combined with enthusiasm and knowledge for the dairy breed with the ability to evaluate within defined parameters.

In some countries it is necessary to appoint part-time classifiers. It is strongly recommended that in these circumstances the person should not have additional employment in semen sales.

The monitoring and performance evaluation of classifiers is an important part of the standardisation of the WHFF international type programme. The level of sophistication varies from country to country. However a base monitoring system is needed to assist developing countries in monitoring the standards.

Actuality

The WHFF General Assembly, in Paris in 2004, agreed upon the following:

- The two new traits introduced in 2000 have been adopted, namely Rear Legs Rear View and Rear Teat Rear View
- Four recommendations have been adopted, namely:
 - a. members should use type definitions as published on the WHFF-website
 - b. working group to look after locomotion to include in harmonised classification
 - c. members should use 4 general characteristics, Udder, Feet and Legs, Frame and Capacity, Dairy Character
 - d. working group to look after Rear Udder Width for further harmonisation
- Next head classifiers workshop will be in September 2005 in the Netherlands