



Progress of type harmonisation

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1. Introduction

One of the main activities of the WHFF is the harmonisation of procedures in Holstein breeding. The success of harmonized linear evaluation should be looked at as one of the greatest accomplishments of the Federation. Progress in harmonized type evaluation might seem slow to some, but in the 29 years since the first workshop for classifiers in Cremona, giant strides have been made.

2. History

The first workshop was attended by participants from 14 countries. The one in Shifnal, UK (2018) 25 countries and 47 participants attended the workshop. There were doubts on whether the countries could have high correlations measuring the same traits compared to other countries. We have seen linear correlations for type at the same level as production traits. This is very significant since classifiers only visually inspect the cow and the production traits are actually weighed and measured. I think we can all agree that from a beginning that was somewhat uncertain, we have universally developed a program that fits our breeder's needs.

3. What happened since the WHFF General Assembly in Buenos Aires 2016?

In 2018 the 13th Workshop was organised in The United Kingdom (Shifnal). Important recommendations from that workshop are:

1. Faster implementation of new traits i.e. locomotion and body condition, in classification programs.
2. Keep with the definition of Angularity adopted in Buenos Aires, “the spring and angle of the ribs” (60/40). Openness is not part of the definition. Do the measurement on the left side of the body. New drawings of the trait from behind will be made. The name angularity does not cover the new trait definition. Suggestion is to come up with a new name. The Working Group will discuss it properly at next meeting.
3. Share phenotypic correlation among, body traits, feet and legs traits and udder traits. Based on the last 12 months of data. Next deadline is 1st of January 2020 to provide input for the workshop in Switzerland.
4. Focus traits: Chest Width, Angularity, Rear Legs rear View, Foot Angle, Locomotion, Udder Support.
5. Body depth should be scored independent from stature. Countries should be made aware they should score linear traits as one dimension trait. Make no combinations with other traits. It is the only way to increase correlations in Interbull evaluations.
6. Share information on defects and analyse the results at the next workshop in Switzerland.
7. Continue the program of Head Classifiers Workshop.

Explanation on Recommendations

- Ad1) Locomotion is not scored in Australia, Belgium (Wallonia), Canada, New Zealand, Poland and South Africa– countries or country groups participating in Interbull genetic evaluation for conformation traits. USA is scoring locomotion but does not provide breeding values to Interbull. For body condition score Australia, New Zealand, Poland and South Africa do

not send breeding values to the Interbull genetic evaluation. USA is scoring BCS but does not provide breeding to Interbull.

- Ad2) Correlation of Angularity has risen since last workshop in Argentina from 0.72 to 0.75 but still needs to be improved. It was agreed during the meeting that from now on, every country should score the trait from the left side of the cow.

To improve the Interbull correlation among countries, the scores based on the former definition should be removed from the genetic evaluation or considered as a different trait in the genetic evaluation.

Further there was a discussion on the name. As the definition has been changed, the name does not cover the trait anymore.

Suggested names were:

Dairy Capacity: in several countries one is used to this name, the idea is that an animal with a lot of spring of ribs and a lot of angle has a larger chest content, which is translated to dairy capacity. The suggestion is that more dairy capacity results in more milk.

Body Capacity: this name indicates that we look at an animal with a lot of spring of ribs and a lot of angle has a larger chest content, but without the link in the name with the ability to produce milk.

Spring and angle of ribs: name is describing the trait as it is scored, similar to for example a trait rear legs set rear view. In the way it is clear what is scored. It is a name without judgement or link with milk producing capacity.

The discussion did not lead to an unanimous decision by the group. With counting votes on dairy capacity and spring and angle of ribs, dairy capacity got the most support.

- Ad3) For more understanding how the traits are scored by different countries, we request that countries send in the phenotypic correlations, before 1st of January 2020, to:

stefan.rensing@vit.de and gerben.de.jong@crv4all.com.

- Ad4) Interbull correlations below 0.80.

- Ad5) Based on discussion during the workshop, it appeared that some countries still score body depth relative to stature. Based on Interbull correlations and the phenotypic correlations, it could be indicated if countries are scoring the trait independent from or in relation with stature. It should be scored independent from stature as it is a linear trait.

- Ad6) Based on the willing of the group, countries should send in information about defects (list of defects recorded) and frequencies per defect on the last 12 months of data. The deadline is the 1st of January 2020 to provide input for the workshop in Switzerland so the WG can analyse it and present recommendations. Information on conformation defects can be found also in ICAR guidelines on recording, section 5 conformation recording.

- Ad7) Next workshop in Switzerland in March 2020

Summary of the 13 WHFF World Classifiers Workshop, Shifnal 9th-11th September 2018

1. In total 47 participants from 25 countries attended the workshop. List of participants, see appendix A.
2. The Conference was inaugurated by Meurig James, Head of Classification and Breed Development, who welcome all delegates and gave an introduction on the UK classification system. Darren Todd (NBDC R&D Manager) also spoke about UK genetics and Dairy and Beef breeds' classifications.

3. The chairman of the WG presented an overview of the harmonization program and type trait definitions.
4. Working Group meeting September 9th, present: Meurig James (UK), Cy Letter (USA), Bruno Jubinville (CN), Dennis Aitken (New Z.), Corrado Zilocchi (IT), Stefan Rensing (DEU), Gerben de Jong (NL), Thomas Ender (CH) and Gabriel Blanco (SP) as chairman. Also Raffaella Finocchiaro as interpreter.
5. In April 2018, 23 countries or country groups participated in the Interbull genetic evaluation for conformation traits. Gerben de Jong further explained the correlations: six linear traits already have a correlation of least 0.90 but 6 are also lower than 0.80. In some cases the low average correlation is due to the fact that a number of countries do not score the actual trait definition. Slovenia introduced breeding values for BCS, Estonia for locomotion and BCS, and Hungary for locomotion, BCS and rear teat placement. For body depth it appears that some countries score it independent from stature while others score it in relation with stature. By following two ways of scoring the correlation among countries too low. Further there is a large variation in correlations for angularity: some countries are in the process of changing to the new definition but the breeding values are still based on old and new definition.

Countries that do not score all WHFF standard traits are requested to introduce as quick as possible all traits and score them to WHFF definitions. The average increase of the correlation among countries is 0.01, with the largest increase for chest width (+0.03) and angularity (+0.03).

6. The analysis of phenotypic correlations was then carried out by Stefan Rensing. He showed that these phenotypic correlations based on scores of a 12 month period are a good help to analyse how certain traits are scored. Focus this time was on body traits, next time also analysis will be carried out on udder and foot & leg traits.

Angularity, chest width and body depth seem to have most variability. The correlations show that not all countries follow the WHFF definition but that several countries also make the change to the new angularity definition. For body depth it is clear that some countries score body depth in relation with stature, resulting in a low correlation between stature and body depth scores.

7. On the theoretical part of the program a total of 14 Presentations were made by several countries based on:
 - New type traits: Front feet orientation, udder balance
 - Classifiers monitoring and training programs
 - Final score from linear: Automated program
 - What is new since last workshop in your classification program?
 - Type traits versus economical traits: Fertility, foot health, etc.
 - Evaluation of traits from sensor devices
 - Inbreeding

Exchange this kind of information was an important part of the meeting and stimulated the discussion among participants.

For those countries that are scoring some of these new traits as secondary or research, information will be required from then and analysed again on the next workshop in Switzerland.

All presentations will be sent to countries by electronic support.

8. On farm workshop. Both practical workshops on Woodmarsh Farm and Styche Farm were very well prepare with loose cows and lots of space around so groups could score and discuss animals easily.

Both days, the discussions were centred on low correlation traits (chest width, body depth, angularity, locomotion, foot angle, rear legs rear view, fore udder attachment). Also the rest of traits were score and discuss.

All participants were divided into five groups with a WG member as the leader: three first calf heifers per group. Classifiers had the chance to score around and discuss with group leaders all 30 animals.

All participants agree on the very positive discussions and on the clear definitions of all traits, angularity also. Based on the intensive discussions in Argentina's workshop and specification of the description (60/40) of Angularity for the first time there was a real common understanding of the trait definition and how to score it on practice.

4. Linear Definitions

One of the proactive steps taken by the WHFF was the publishing of the Standard Linear Traits and their definitions on the website they can be downloaded and printed out by anyone who wants them. I would like to go over the traits and their definitions quickly to possibly spark some discussion during the presentation and later. As a group in Shifnal we all went over the definitions and had some discussions on fine-tuning anything that was giving the classifiers trouble. All participants agree on the very positive discussions and on the clear definitions of all traits. .

The following traits are approved standard traits:

- | | |
|------------------------|---------------------------|
| 1. Stature | 10. Locomotion |
| 2. Chest Width | 11. Fore Udder Attachment |
| 3. Body Depth | 12. Front Teat Position |
| 4. Angularity | 13. Teat Length |
| 5. Rump Angle | 14. Udder Depth |
| 6. Rump Width | 15. Rear Udder Height |
| 7. Rear Legs Rear View | 16. Central Ligament |
| 8. Rear Legs Set | 17. Rear Teat Position |
| 9. Foot Angle | 18. Body Condition |

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. The name Angularity has been particularly questioned .As the definition of Angularity has been change the name does not cover the trait anymore. The WG will discuss properly in his next meeting the possibility of coming up with a new name. 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. After the world classifiers workshop in the UK it was agreed that all countries should do the measurement of this trait on the left side of the body.

Note

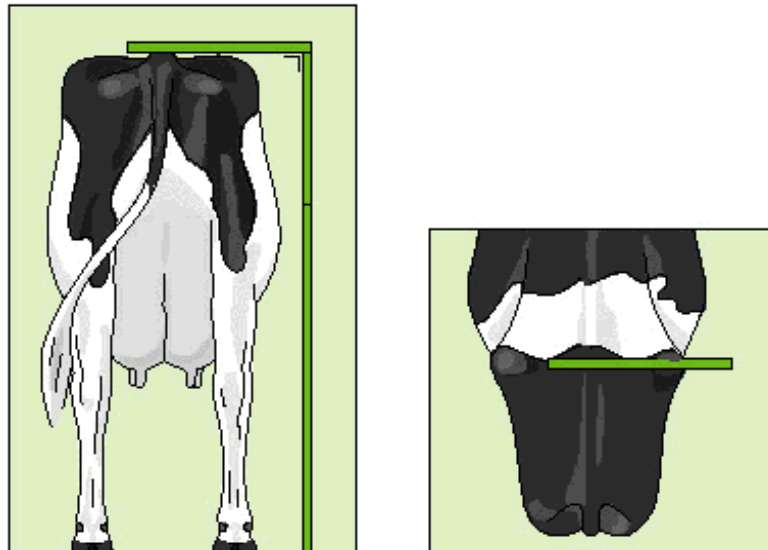
The linear scale used must cover the expected biological extremes of the population in the country of assessment. The precise measurements in the scale given, may be used as a guide and should not be treated as an exact recommendation.

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

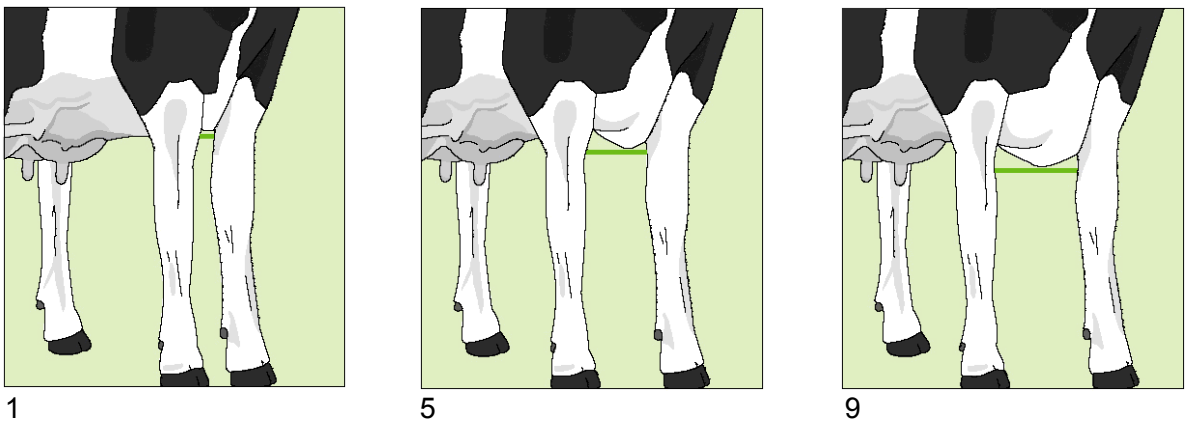


2. Chest Width

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

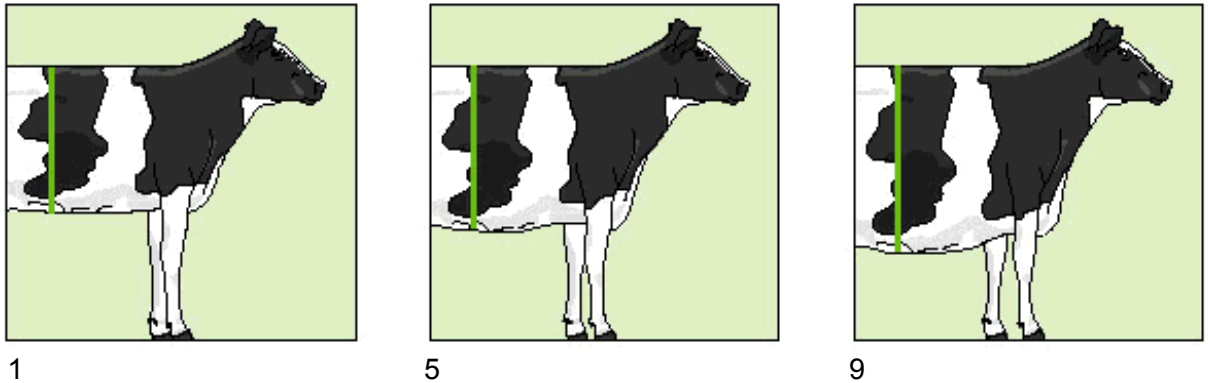


3. Body Depth

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

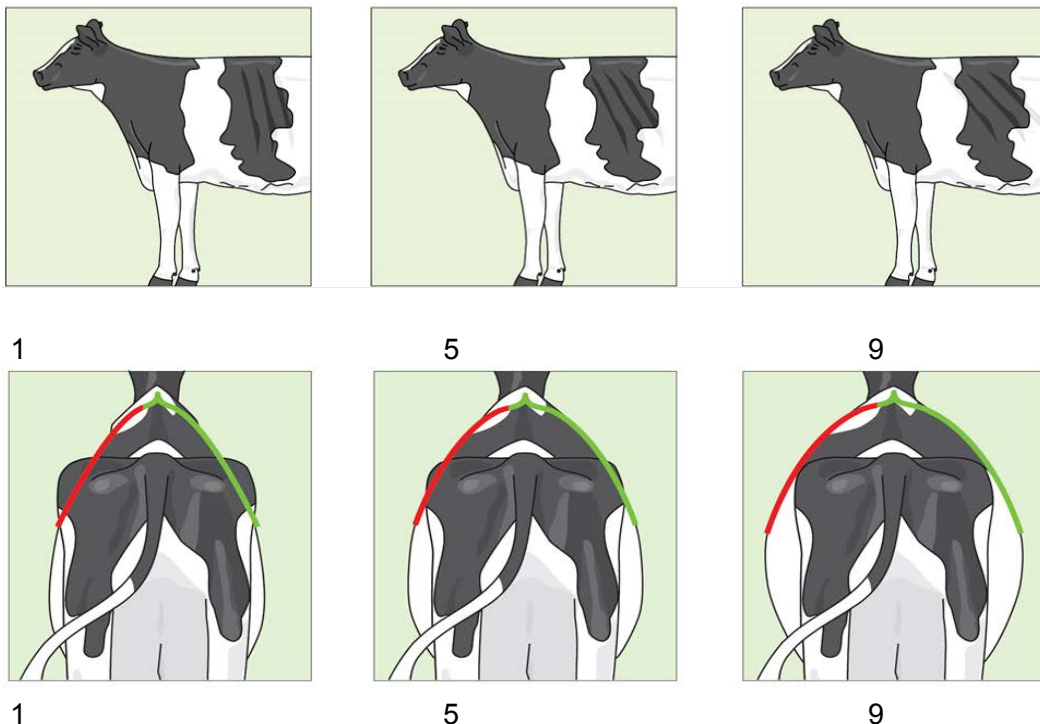
Reference scale: optical in relation with the balance of the animal



4. Angularity

Ref. point: The spring and angle of the ribs (60/40). Not a true linear trait. The best way to score spring, the arch of the ribs, is looking at the cow from behind. Angle is the direction of the ribs (side view). Openness is not part of the definition. Do the measurement on the left side of the body.

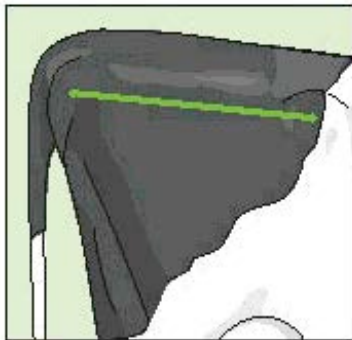
- 1 – 3 Lacks angularity (little spring of ribs and ribs are facing down)
- 4 – 6 Intermediate angularity
- 7 – 9 Very angular (much spring of ribs and ribs are pointing rearward)



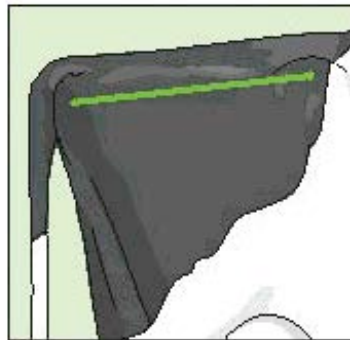
5. Rump Angle

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

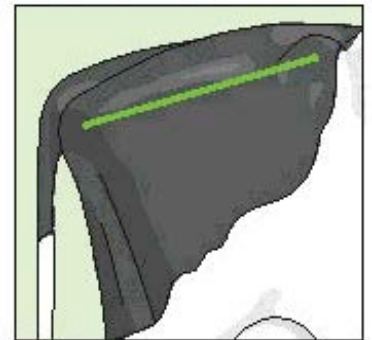
1 High Pins	(+4 cm)
2	(+2 cm)
3 Level	(+0 cm)
4 Slight slope	(-2 cm)
5 Intermediate	(-4 cm)
6	(-6 cm)
7	(-8 cm)
8	(-10 cm)
9 Extreme slope	(-12 cm)



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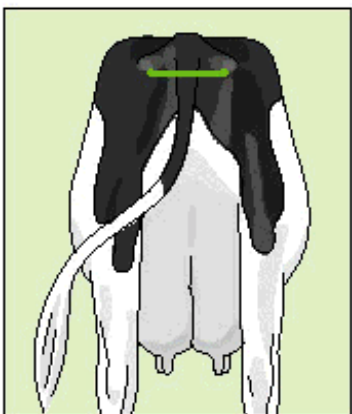
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6. Rump Width

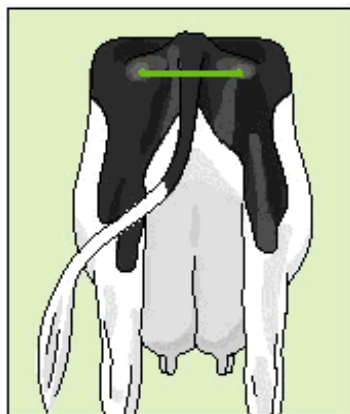
Ref. point: The distance between the most posterior point of pin bones.

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

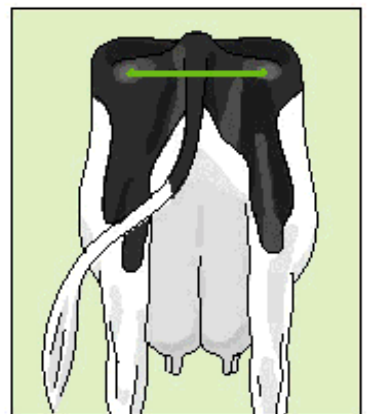
Reference scale: 10 cm – 26 cm; 2 cm per point



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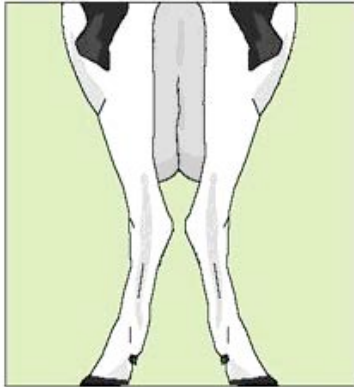


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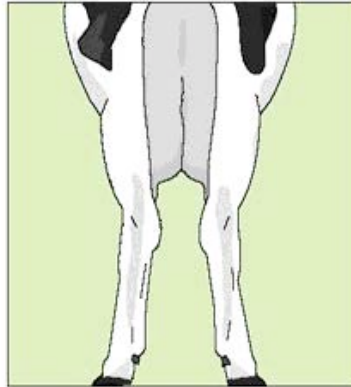
7. Rear Legs Rear View

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

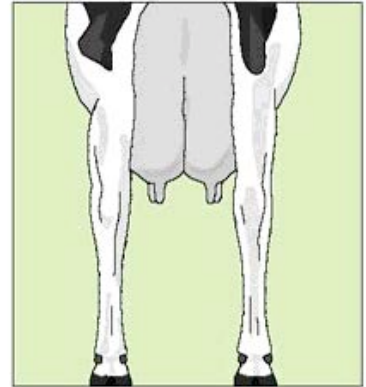
- 1 Extreme toe-out
- 5 Intermediate; slight toe-out
- 9 Parallel feet



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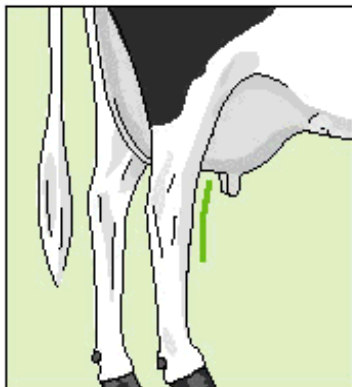


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8. Rear Legs Set

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

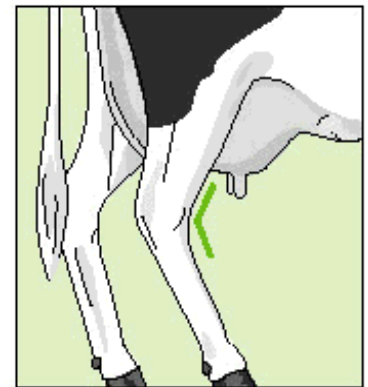
- 1 – 3 Straight (160 degrees)
- 4 – 6 Intermediate (147 degrees)
- 7 – 9 Sickie (134 degrees)



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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

If the Foot Angle is difficult to score because of hooftrimming, bedding, manure etc. it is also possible to look at the Angle of Hairline.



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10. Locomotion

“The use of legs and feet, length and direction of the step”. Not a true linear trait.

Ref. Point:

- 1 – 3 Severe abduction and short stride
- 4 – 6 Slight abduction and medium stride
- 7 – 9 No abduction and long stride

Abduction is the lateral deviation in respect to the straight line.

Can and should only be scored in herds where cow regularly do walk and has no lameness. If so, score all cows, be classified that day. The score of 9 means that the rear leg is put straight forward with force upon the step of the foreleg, and (extreme) lame cows getting score 1 because they have short strides.



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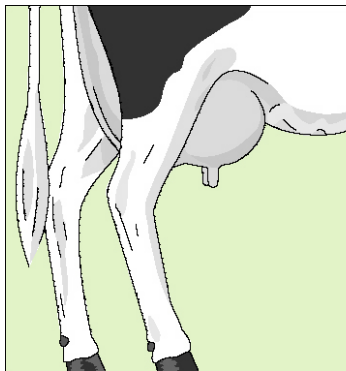
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11. Fore Udder Attachment

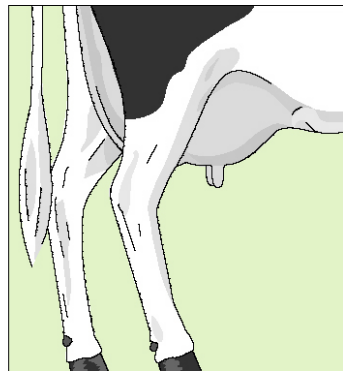
Ref. point: The strength of attachment of the fore udder to the abdominal wall.
Not a true linear trait.

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

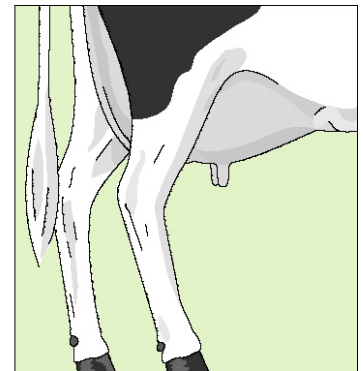
In case of a significant difference in the quality of udder attachment of both sides by scoring fore udder attachment, than the worse side must be scored. This only if the udder is healthy.



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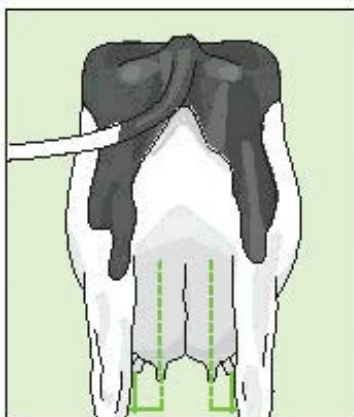


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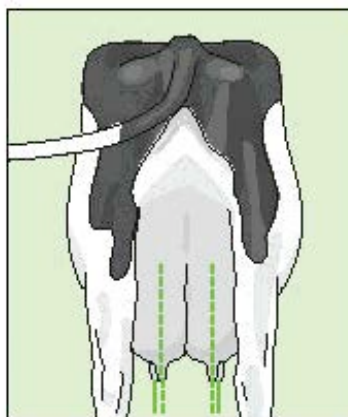
12. Front Teat Position

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

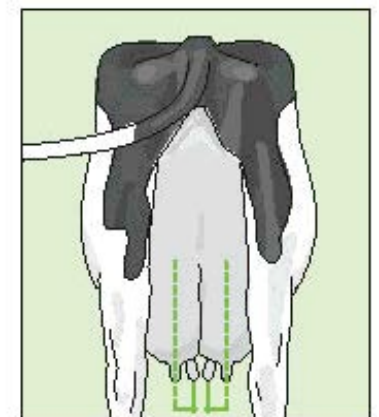
- 1 – 3 Outside of quarter
- 4 – 6 Middle of quarter
- 7 – 9 Inside of quarter



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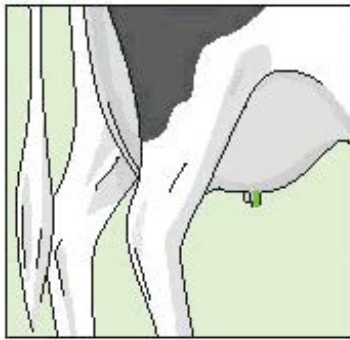
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13. Teat Length

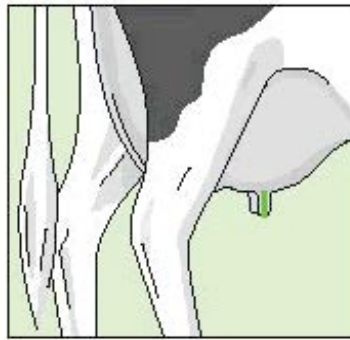
Ref. point: The length of the front teat.

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

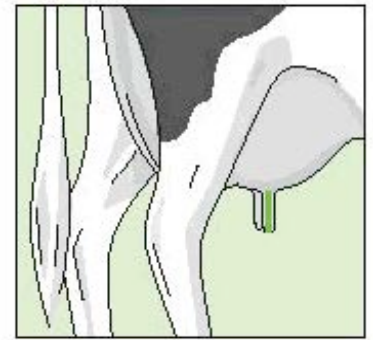
Reference scale: 1-9 cm; 1 cm per point



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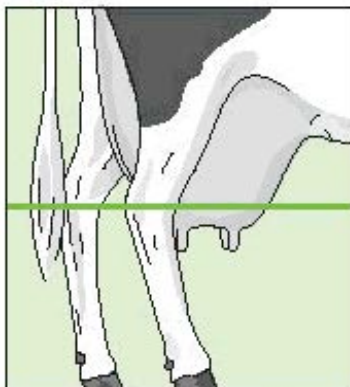
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14. Udder Depth

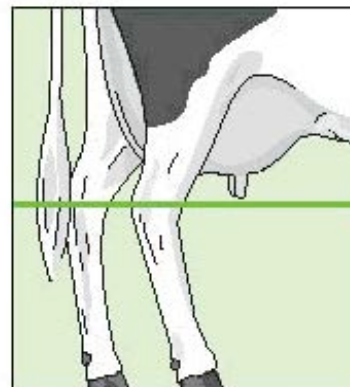
Ref. point: The distance from the lowest part of the udder floor to the hock.

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

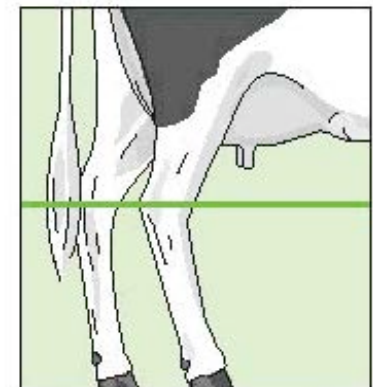
Reference scale: level=2 (0 cm); 3 per point



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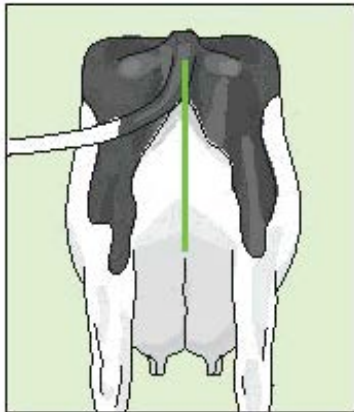
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15. Rear Udder Height

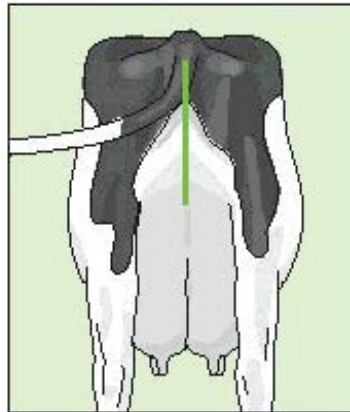
Ref. point: The distance between the bottom of the vulva and the milk secreting tissue: in relation to the height of the animal.

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

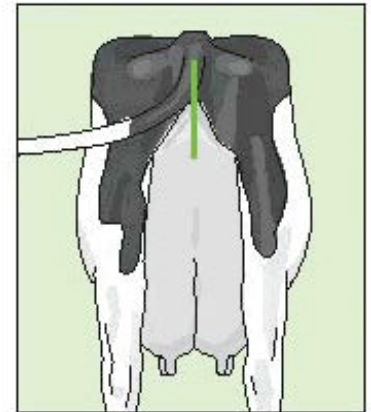
Reference scale: measured on a scale between the bottom of the vulva and the hock; the midpoint represents a score 4 (29 cm); 2 cm per point



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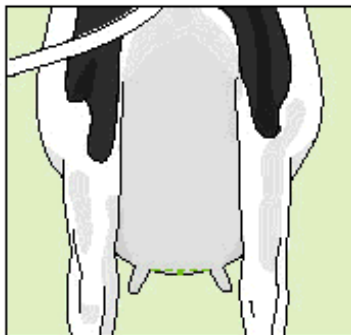


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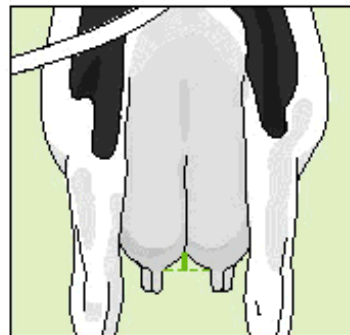
16. Central Ligament

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

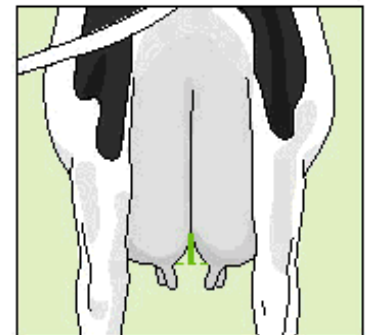
- 1 Convex to flat floor (+1 cm)
- 2 (+0.5 cm)
- 3 (+0 cm)
- 4 Slight definition (-1 cm)
- 5 (-2 cm)
- 6 (-3 cm)
- 7 Deep definition (-4 cm)
- 8 (-5 cm)
- 9 (-6 cm)



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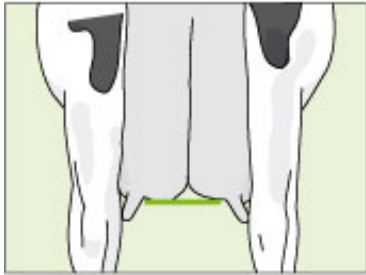
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17. Rear Teat Position

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

- 1 – 2 Outside
- 4 Mid point
- 7 – 9 Inside of quarter (8= touching, 9=crossing)

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



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4



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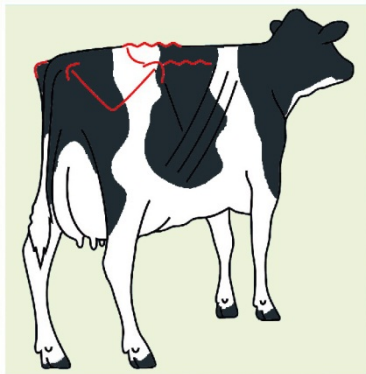
18. Body Condition Score

The covering of fat over the tail head and rump, not a true linear trait.

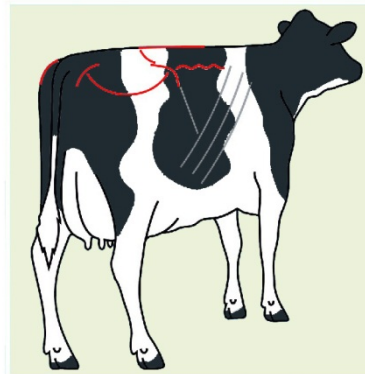
Ref. Point:

- 1 – 3 Poor
- 4 – 6 Intermediate
- 7 – 9 Grossly fat

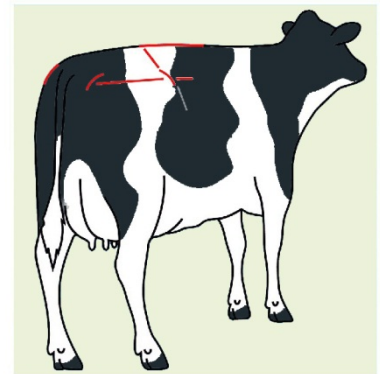
The loin is the main area to observe for scores 1-6, while the tail implant is important with the higher score (7 – 9)



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5. Genetic correlation

The average genetic correlation between countries for 21 traits, as analysed by Interbull. An average correlation is based on the average correlation one country has with all other countries.

Trait	Average correlation									
	May	May	Nov	Sept	Sept	Jan	Aug	April	Dec	Apr
	2001	2002	2003	2005	2007	2010	2012	2014	2015	2018
Stature	0.89	0.92	0.91	0.92	0.92	0.91	0.91	0.90	0.90	0.91
Chest width	0.76	0.79	0.79	0.80	0.79	0.80	0.78	0.76	0.76	0.79
Body depth	0.75	0.79	0.80	0.82	0.81	0.81	0.81	0.81	0.80	0.82
Angularity	0.76	0.78	0.76	0.78	0.77	0.75	0.74	0.73	0.72	0.75
Rump angle	0.93	0.94	0.94	0.95	0.95	0.94	0.94	0.93	0.93	0.93
Rump width	0.75	0.83	0.84	0.84	0.84	0.87	0.87	0.86	0.86	0.87
Rear leg set side view	0.82	0.85	0.84	0.85	0.85	0.84	0.83	0.82	0.82	0.84
Rear leg rear view	0.77	0.79	0.76	0.76	0.74	0.74	0.74	0.72	0.72	0.72
Foot angle	0.57	0.68	0.66	0.68	0.72	0.74	0.73	0.72	0.73	0.75
Fore udder	0.74	0.79	0.80	0.83	0.84	0.83	0.83	0.79	0.78	0.80
Rear udder height	0.74	0.81	0.82	0.84	0.85	0.82	0.82	0.80	0.80	0.82
Udder support	0.77	0.80	0.78	0.80	0.81	0.78	0.77	0.75	0.75	0.76
Udder depth	0.90	0.94	0.95	0.96	0.96	0.97	0.96	0.94	0.93	0.94
Teat placement	0.89	0.92	0.91	0.94	0.93	0.93	0.93	0.92	0.91	0.92
Teat length	0.96	0.96	0.95	0.96	0.96	0.94	0.94	0.94	0.94	0.94
Rear teat placement	--	--	0.96	0.96	0.96	0.90	0.89	0.91	0.92	0.94
Locomotion	--	--	--	--	--	0.72	0.66	0.65	0.65	0.64
Body condition	--	--	--	--	--	0.77	0.80	0.83	0.85	0.85
Overall conformation	0.67	0.73	0.70	0.73	0.75	0.74	0.74	0.70	0.70	0.74
Overall udder	0.74	0.77	0.76	0.78	0.81	0.81	0.80	0.77	0.77	0.79
Overall feet & legs	0.60	0.67	0.67	0.69	0.69	0.69	0.69	0.65	0.67	0.68
Number of countries/groups	18	18	22	19	20	20	22	25	24	23

6. Where do we go from here?

As stated at the beginning, we are in a global market for genetics. This is an exciting time to be a breeder or Holstein enthusiast. It also is a time to make sure we are all collecting the most accurate, economically important information that is possible as classifiers and as herdbooks. As someone who has been involved on the committee from the beginning, I am pleased to report that the committee has from the start put the Holstein cow and her owner's first instead of trying to advance a particular country's agenda. The welfare of our breed looks bright around the world, but we still have much to do. The discussion of an international classification program goes on and I'm sure many of you will talk about this very thing this week. Each country has their own breeding goals but our members seem to like the same kind of cow regardless of where she comes from. It will be an exciting future. Hopefully we can continue to make much progress in evaluation of the

functionality and durability of the Holstein cow. I would like to thank the members of the working committee who have worked very hard on your behalf, especially Gabriel Blanco who has been chairing this group since 2016 and has been many years enthusiastic member:

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7. References

De Jong, Gerben, 2018, Overview of Genetic Correlations Between Countries for Conformation Traits in April 2018.

World Holstein Friesian Federation website: <http://www.whff.info/>