



Progress of type harmonisation

May 2016

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May 2016

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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 26 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 Skorping (2014) had classifiers from 23 countries and in Buenos Aires (2016) 26 countries attend 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 general assembly WHFF in Toronto 2012?

A. In 2014 the 10th Workshop was organised in Denmark (Skorping). Important recommendations from that workshop are:

1. Focus traits: chest width, angularity, rear legs rear view, foot angle, fore udder, udder support, locomotion and body condition.
2. Faster implementation new traits, agreed to WHFF definition, in classification programs.
3. Definition Teat Length is correct.
4. For more understanding how the trait angularity is being filed in by different countries, we request to send the genetics correlations between angularity and the other body traits to Gerben.de.Jong@crv4all.com for further analyses.
5. Continue the program of Head Classifier workshops.

Explanation on Recommendations:

1. Interbull correlations below 0.80
2. Countries which do not score all WHFF standard traits, are requested to introduce all WHFF traits and definitions in order to improve increase correlations and international conversion.
3. Genetic correlation between front teat length and rear teat length is above 0.90 (e.g. Germany found 0.92).

4. The average correlation has dropped 0.04 since 2007. The Netherlands has introduced the WHFF definition resulting in a drop of the correlation with other countries from 0.78 (in 2012) to 0.63 (in 2014). Angularity is angle of ribs and spring of ribs, not distance between ribs as still done by many member countries (practical workshop experience).
5. Data and place of next workshop will be associated with the 2016 WHFF World Conference in Argentina when possible.

B. Recommendations and explanations about the 12th workshop in Buenos Aires 2016

1. Faster implementation of new traits i.e. locomotion and body condition, in classification programs.
2. Angularity score independent from body condition score; that means in general a correlation of 0.0 between angularity and body condition score. Try to make it a linear trait, based on two aspects. Change old definition "the angle and spring of the ribs" to new definition "the spring and angle of ribs" (60/40). Openness is not part of the definition as still several countries apply.
3. Share phenotypic correlation among, body traits, feet & legs traits and udder traits. Based on the last 12 months of data. Every year, first deadline 1st of May 2016.
4. Focus traits: Chest Width, Angularity, Rear Legs Rear View, Foot Angle, Locomotion, Fore Udder, Udder Support.
5. Body depth should be scored independent from stature.
6. Front Teat Length and Rear Teat Length are highly correlated. Front teat length easier to score, it shows more spread.
7. Continue the program of Head Classifiers workshops.

Explanation on Recommendations:

- Ad1) Locomotion is not scored in 13 countries out of the 24 countries or country groups participating in Interbull genetic evaluation for conformation traits. For body condition score 9 countries do not send breeding values to the Interbull genetic evaluation.
- Ad2) The average correlation has dropped 0.05 since 2007.
- Ad3) For more understanding how the traits are scored by different countries, we request that countries send in the phenotypic correlations to stefan.rensing@vit.de and gerben.de.jong@crv4all.com every year before May 1st beginning in 2016.
- 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. It should be scored independent from stature.
- Ad6) Most countries keep scoring Front Teat Length.
- Ad7) Next workshop in 2018 in United Kingdom.

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 this discussion and later. As a group in Buenos Aires we all went over the definitions and had some discussions on fine-tuning anything that was giving the classifiers trouble but there were not any major problems expressed.

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. 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. In an attempt to answer criticism of the trait angularity, a new definition has been developed which is explained in the trait definitions.

Note

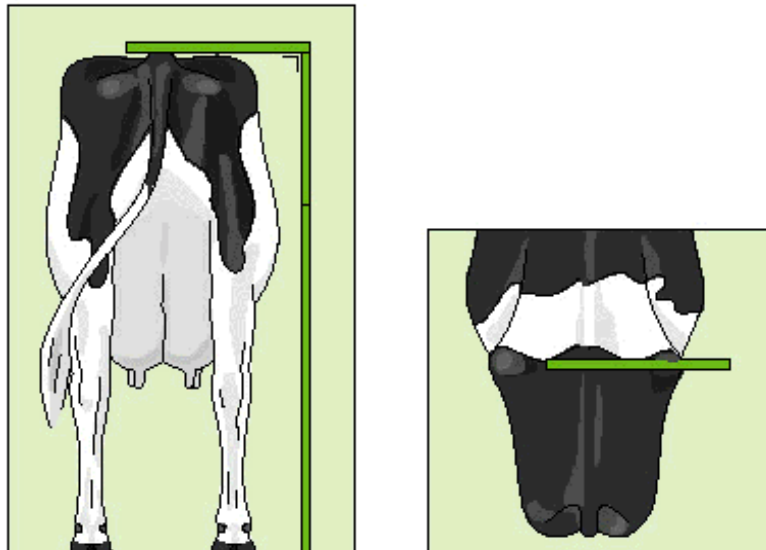
The linear scale used must cover the expected biological extremes of the population in the country of assessment. The precise measurements in the scale given, may be used as a guide and should not be treated as an exact recommendation.

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

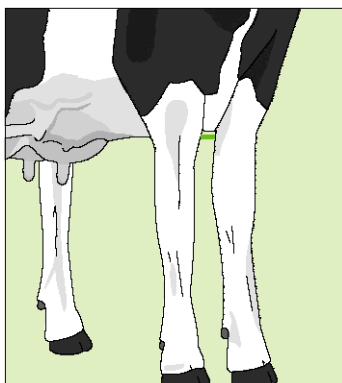


2. Chest Width

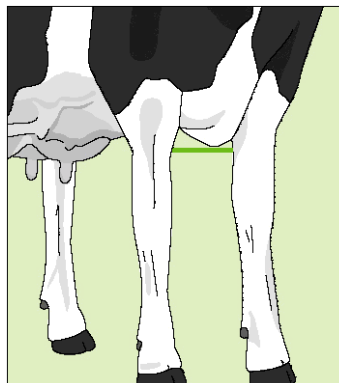
Ref. point: Measured from the inside surface between the top of the front legs.

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

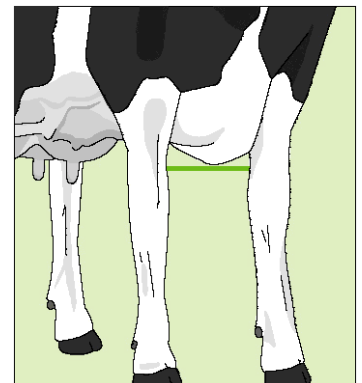
Reference scale: 13 cm – 29 cm; 2 cm per point



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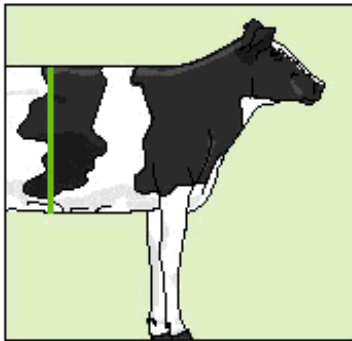
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3. Body Depth

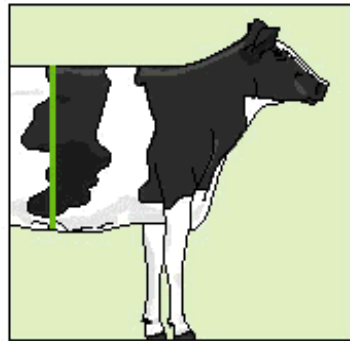
Ref. point: Distance between the top of spine and bottom of barrel at last rib – the deepest point. Independent of stature.

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

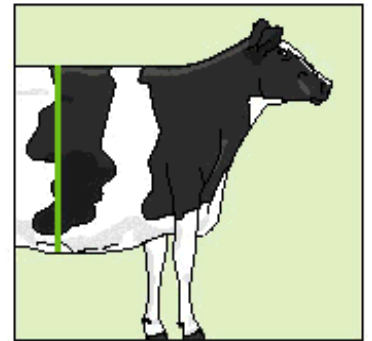
Reference scale: optical in relation with the balance of the animal



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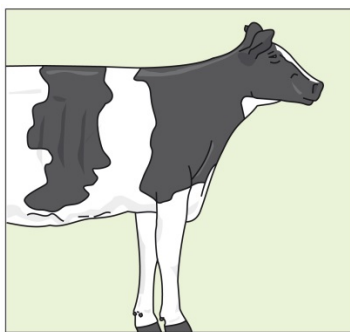


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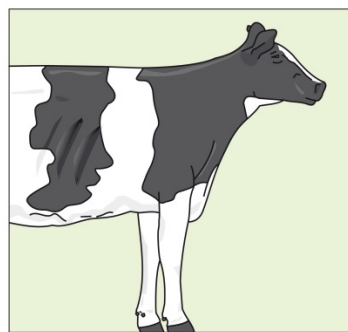
4. Angularity

Ref. point: The 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.

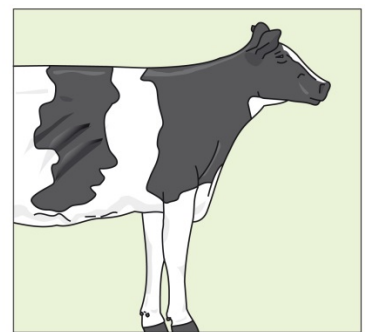
- 1 – 3 Lacks angularity (little spring of ribs and ribs are facing down)
- 4 – 6 Intermediate angularity
- 7 – 9 Very angular (much spring of ribs and ribs are pointing rearward)



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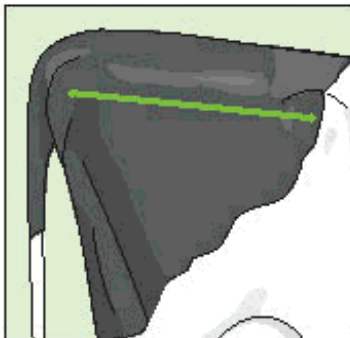


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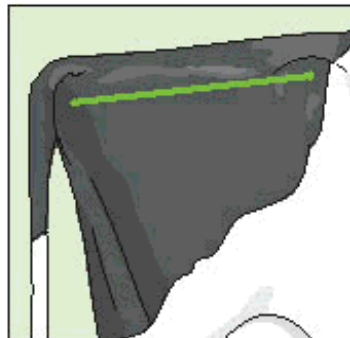
5. Rump Angle

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

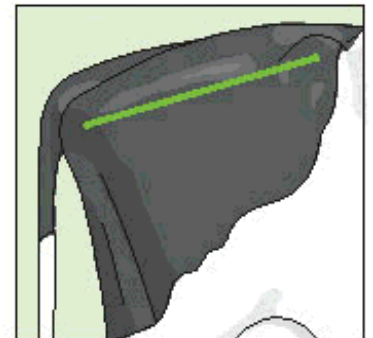
1 High Pins	(+4 cm)
2	(+2 cm)
3 Level	(+0 cm)
4 Slight slope	(-2 cm)
5 Intermediate	(-4 cm)
6	(-6 cm)
7	(-8 cm)
8	(-10 cm)
9 Extreme slope	(-12 cm)



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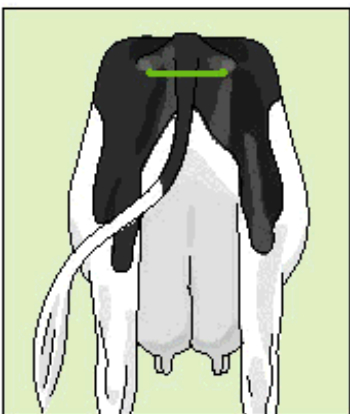
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6. Rump Width

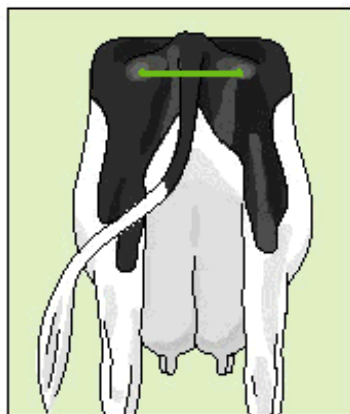
Ref. point: The distance between the most posterior point of pin bones.

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

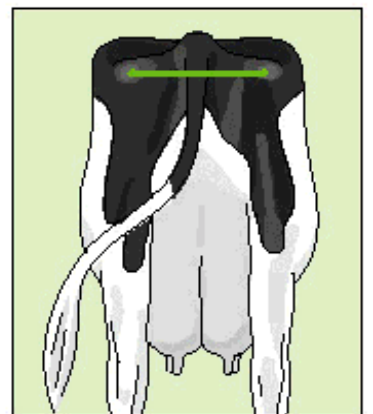
Reference scale: 10 cm – 26 cm; 2 cm per point



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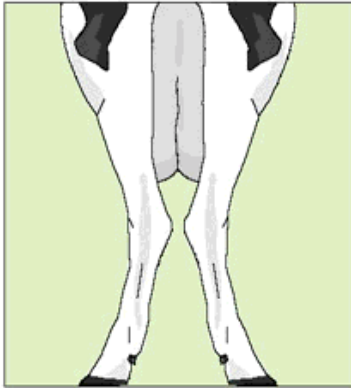


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7. Rear Legs Rear View

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

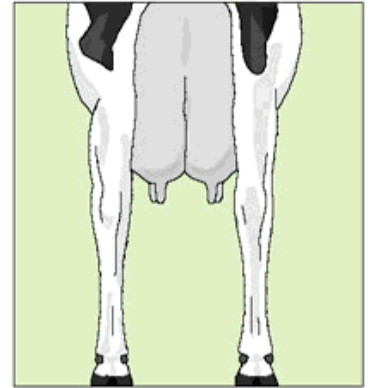
- 1 Extreme toe-out
- 5 Intermediate; slight toe-out
- 9 Parallel feet



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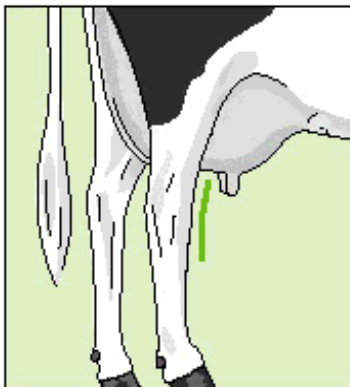


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8. Rear Legs Set

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

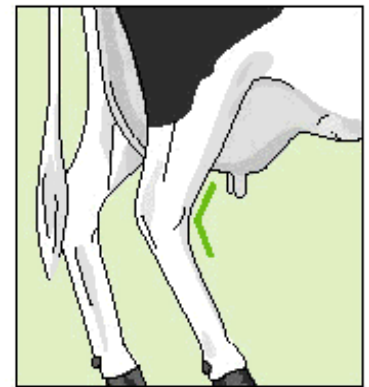
- | | |
|--------------------|---------------|
| 1 – 3 Straight | (160 degrees) |
| 4 – 6 Intermediate | (147 degrees) |
| 7 – 9 Sickle | (134 degrees) |



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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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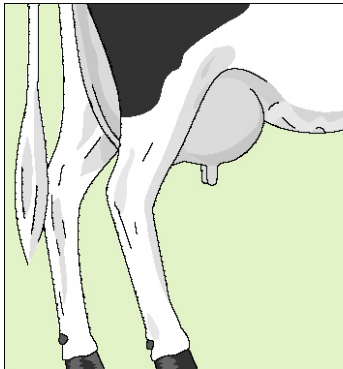
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11. Fore Udder Attachment

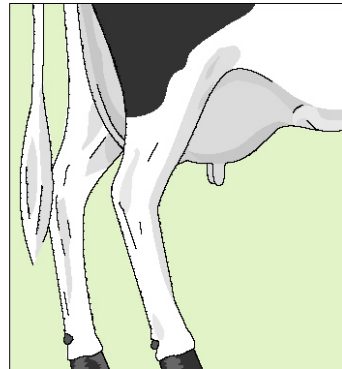
Ref. point: The strength of attachment of the fore udder to the abdominal wall.
Not a true linear trait.

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

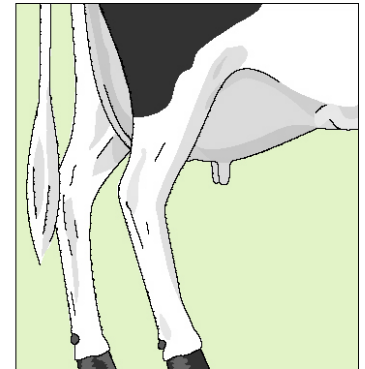
In case of a significant difference in the quality of udder attachment of both sides by scoring fore udder attachment, than the worse side must be scored. This only if the udder is healthy.



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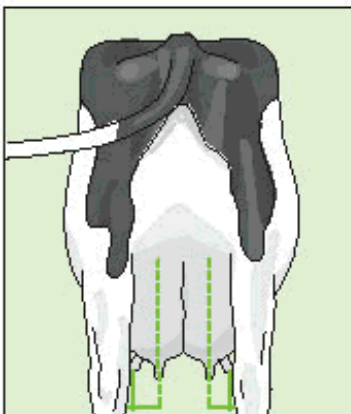


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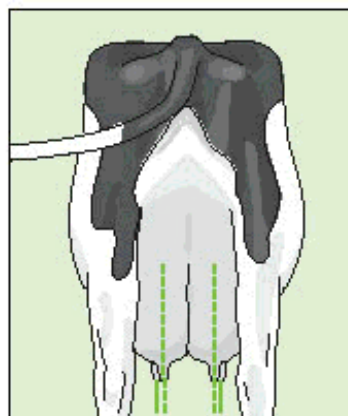
12. Front Teat Position

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

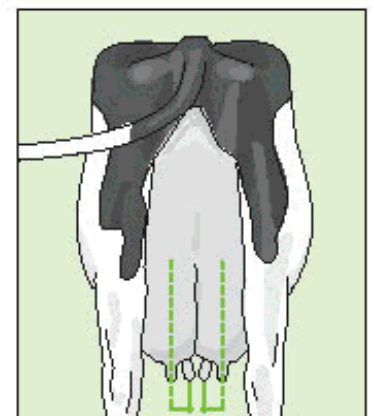
- 1 – 3 Outside of quarter
- 4 – 6 Middle of quarter
- 7 – 9 Inside of quarter



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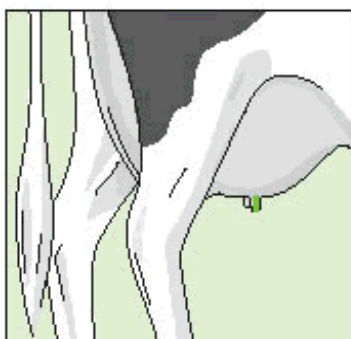
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13. Teat Length

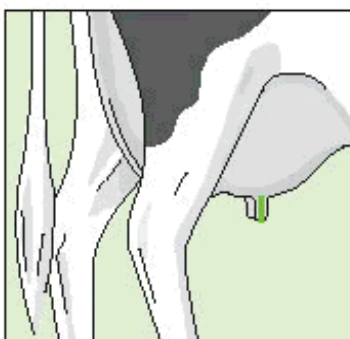
Ref. point: The length of the front teat.

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

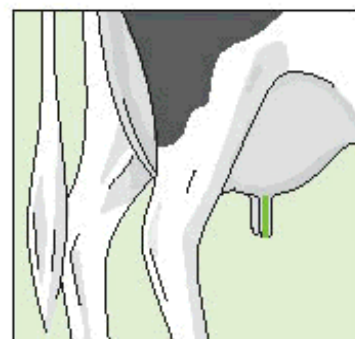
Reference scale: 1-9 cm; 1 cm per point



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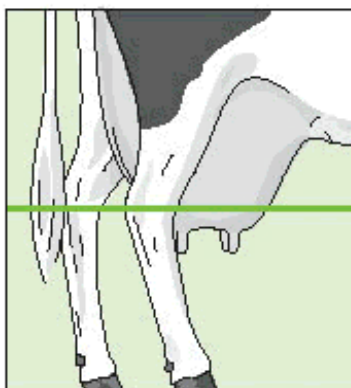
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14. Udder Depth

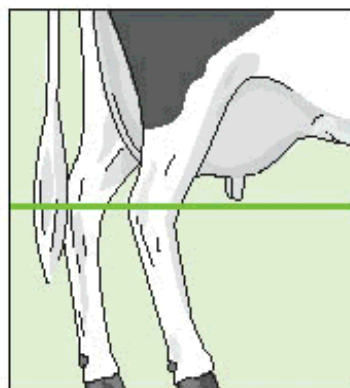
Ref. point: The distance from the lowest part of the udder floor to the hock.

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

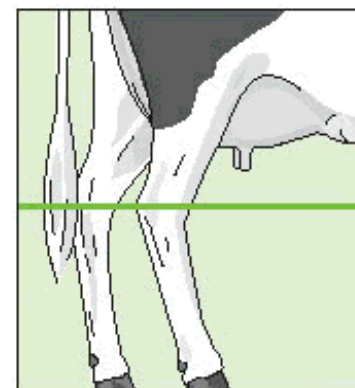
Reference scale: level=2 (0 cm); 3 per point



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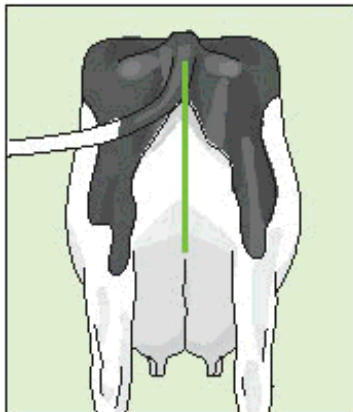
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15. Rear Udder Height

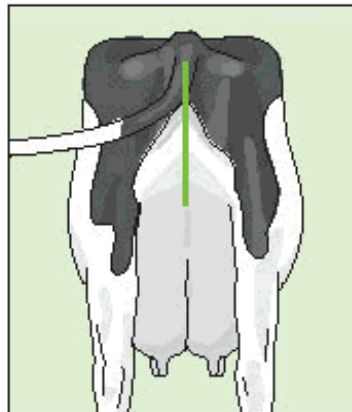
Ref. point: The distance between the bottom of the vulva and the milk secreting tissue: in relation to the height of the animal.

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

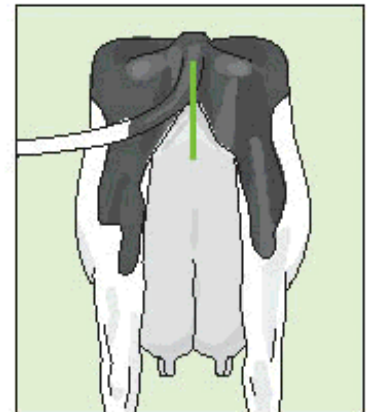
Reference scale: measured on a scale between the bottom of the vulva and the hock; the midpoint represents a score 4 (29 cm); 2 cm per point



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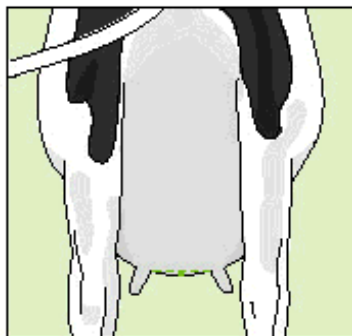


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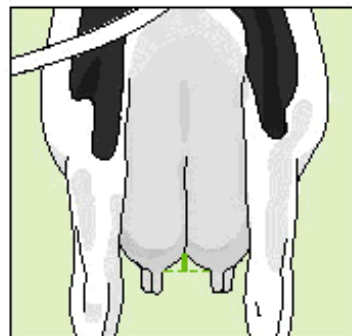
16. Central Ligament

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

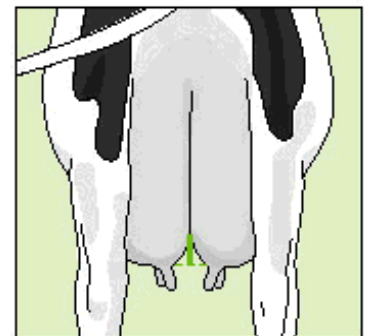
- 1 Convex to flat floor (+1 cm)
- 2 (+0.5 cm)
- 3 (+0 cm)
- 4 Slight definition (-1 cm)
- 5 (-2 cm)
- 6 (-3 cm)
- 7 Deep definition (-4 cm)
- 8 (-5 cm)
- 9 (-6 cm)



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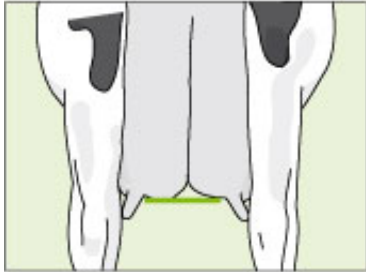
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17. Rear Teat Position

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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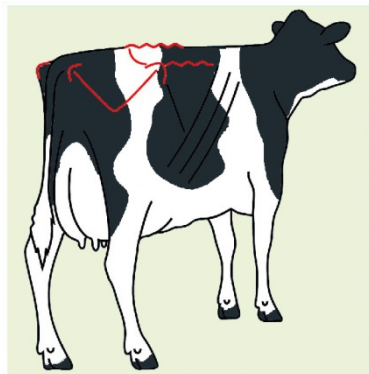
18. Body Condition Score

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

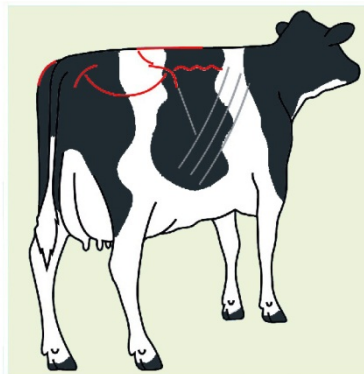
Ref. Point:

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

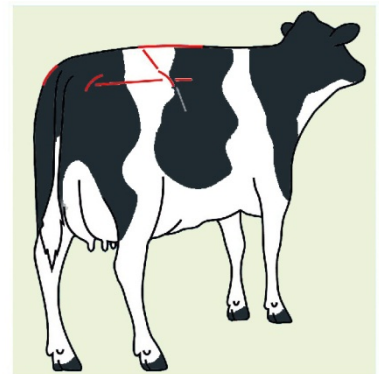
The loin is the main area to observe for scores 1-6, while the tail implant is important with the higher score (7 – 9)



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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					
	<i>May 2001</i>	<i>September 2005</i>	<i>January 2010</i>	<i>August 2012</i>	<i>May 2014</i>	<i>December 2015</i>
Stature	0.89	0.92	0.91	0.91	0.90	0.90
Chest width	0.76	0.80	0.80	0.78	0.76	0.76
Body depth	0.75	0.82	0.81	0.81	0.81	0.80
Angularity	0.76	0.78	0.75	0.74	0.73	0.72
Rump angle	0.93	0.95	0.94	0.94	0.93	0.93
Rump width	0.75	0.84	0.87	0.87	0.86	0.86
Rear leg set side view	0.82	0.85	0.84	0.83	0.82	0.82
Rear leg rear view	0.77	0.76	0.74	0.74	0.72	0.72
Foot angle	0.57	0.68	0.74	0.73	0.72	0.73
Fore udder	0.74	0.83	0.83	0.83	0.79	0.78
Rear udder height	0.74	0.84	0.82	0.82	0.80	0.80
Udder support	0.77	0.80	0.78	0.77	0.75	0.75
Udder depth	0.90	0.96	0.97	0.96	0.94	0.93
Teat placement	0.89	0.94	0.93	0.93	0.92	0.91
Teat length	0.96	0.96	0.94	0.94	0.94	0.94
Rear teat placement	--	0.96	0.90	0.89	0.91	0.92
Locomotion			0.72	0.66	0.70	0.65
Body condition			0.77	0.80	0.77	0.85
Overall conformation	0.67	0.73	0.74	0.74	0.70	0.70
Overall udder	0.74	0.78	0.81	0.80	0.77	0.77
Overall feet & legs	0.60	0.69	0.69	0.69	0.65	0.67
Number of countries/groups	18	19	20	22	25	24

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. 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:

Type Harmonisation Working Group, April 2016:

Gabriel Blanco (Spain)	Gabriel.blanco@conafe.es
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Corrado Zilocchi (Italy)	Corradozilocchi@anafi.it

7. References

De Jong, Gerben, 2016, Overview of Genetic Correlations Between Countries for Conformation Traits in December 2015.

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