

Scoring Legs & Feet in the Dutch Conformation Scoring System

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Abstract

In the Netherlands three conformation traits are scored to improve the quality of legs&feet: two linear scores, for rear legs set side view and claw diagonal and one descriptive score for legs&feet, in which the locomotion of an animal is strongly weighted. Claw diagonal is a more valuable trait to score than claw angle, because it has a higher heritability (0.50 vs. 0.14), a higher economic value per genetic standard deviation (Dfl 8.63 vs. Dfl 2.21) and a higher repeatability when scoring the trait. The relation of phenotypic scores and breeding values for legs&feet traits with herdlife was studied using data of 500.000 cows. The descriptive score legs&feet, with locomotion included, had the strongest relation with herdlife, followed by claw diagonal and rear legs set. Herdlife of improved with higher score and a higher breeding value for legs&feet. For claw diagonal and rear legs set a phenotypic optimum level was found. On breeding value level, cows with shorter claws and straighter rear legs stayed longer in the herd.

In conclusions, the descriptive legs&feet score is a better predictor for herdlife than claw diagonal and rear legs set, because in the Dutch descriptive legs&feet score locomotion is taken into account.

1. Introduction

In the Netherlands cows are scored with a linear scoring system for conformation traits since 1980. In the Dutch conformation scoring system a farm is visited every 8 months. During this visit all heifers that are in the herd are scored for 14 linear traits and 4 descriptive traits. Three legs&feet traits are defined and scored: claw diagonal, rear legs set side view and an overall score for legs&feet. The first two traits are scored on a linear scale, the last trait is scored as a descriptive trait.

The aim of scoring three legs&feet traits is to improve the legs&feet quality. Information on legs&feet quality could also be collected through veterinarians and/or hoof trimmers. As this data is not available in the Netherlands, scoring the quality of legs&feet as a conformation trait is the only way to genetically improve the quality of legs&feet. This paper will describe how legs&feet traits are scored in the conformation scoring system and how the traits are defined. Further the relation of legs&feet traits with herdlife is described.

2. Traits scored

Three legs&feet traits are scored: rear legs set side view, claw diagonal and overall legs&feet.

Rear legs set side view is linearly scored on a scale of 1 to 9, where 1 is straight and 9 is sickled. The score of 1 equals to an angle in the hock of 160 degrees and a score of 9 equals to an angle of 134 degrees.

Claw diagonal is linearly scored on a scale of 1 to 9, where 1 is a long diagonal and 9 means a short diagonal. In international units the score of 1 equals to 16 centimeters and a score of 9 equals to 12 centimeters.

The trait legs&feet is scored as a descriptive trait on a scale of 70 to 99, where 70 means poor quality and 99 means excellent quality legs&feet.

Internationally claw angle is usually scored instead of claw diagonal. Analysis of Dutch data (Reurink, 1987) showed that claw diagonal is more informative than claw angle. For claw diagonal, measured in mm, a heritability was found of 0.50 and a genetic standard deviation of 0.23 mm, whereas the heritability for angle, measured in

degrees, was 0.14 with a genetic standard deviation of 0.7 degrees. Correlating claw diagonal and claw angle with herd life gave a value in Dutch guilders of 8.63 for one genetic standard deviation of claw diagonal and 2.21 guilders for one genetic standard deviation claw angle. The genetic correlations of both traits with lameness were rather equal with 0.54 and -0.63 for respectively diagonal and angle. Further classifiers found it easier to score diagonal than angle, with a repeatability of scores of 0.74 and 0.60 for respectively diagonal and angle. Also the traits heel height and claw length were analysed but these traits were by far less informative for legs&feet quality than claw diagonal and claw angle.

When the general trait legs&feet is scored, several characteristics are taken into account. The quality of rear legs setting, side and rear view, is taken into account where the more straight legs (side view) are preferred above the sickled ones. From the rear view the leg setting should be straight, no toe in or out. The quality of claws is judged where a shorter diagonal is preferred above a longer one. Further the locomotion of the cows is judged. For this the cows are judged walking freely in the barn. The usage for legs&feet is very important as the majority of Dutch cows are housed in free stalls on cubicles for about 7 months a year. In this severe environment claws are continuously exposed to concrete and manure. For scoring legs&feet, locomotion is considered to be the most important legs&feet trait, getting a weight of 70 percent in the total legs&feet score. A cow receives a high score on locomotion when she walks with strong and wide steps, without showing any crampyness. The last major point the classifier looks at is the quality of bones. The bones should be dry and the joints should be clean and thin.

In Table 1 the heritabilities of the legs&feet traits can be found together with the genetic correlations among them as found in the Dutch national data set (De Jong, 1995). From this it can be seen that a high score for legs&feet goes together with rear legs which are straighter than average ($r_g = -0.39$) and shorter claw diagonals ($r_g = 0.56$). Further, shorter claw diagonals are more frequently found with animals having straight legs ($r_g = -0.64$).

3. Relation with diseases

Groen (1994) showed that the score for legs&feet had a genetic correlation of -0.24 with legs&feet problems, saying that cows with better scores for legs&feet had less problems or diseases related to their claws of legs. In the same study a genetic correlation of -.01 was found between rear legs set and legs&feet problems.

4. Herd life

A way to value legs&feet traits is looking at the effect of the three traits on the herd life of cows. Research was carried out with scores for rear legs set (side view), claw diagonal and legs&feet score from the Dutch national conformation scoring system. For 504,696 black&white cows, having a first calving date between 1st of January 1986 and 31st of December 1990, conformation scores and breeding values for conformation traits were selected. Of these cows all calving dates were taken from the national database and survival at the beginning of 2nd, 3rd and 4th lactation was determined. Data were analysed with the following two models:

$$Y = HYS + M + CS + \text{error} \quad [I]$$

and

$$Y = HYS + M + BV + \text{error} \quad [II]$$

where:

Y = culling score (0/1, 0=not culled, 1= culled) at the beginning of 2nd, 3rd or 4th lactation for a cow;

HYS = herd*year of calving effect, fixed effect;

M = deviation from herd mean class for heifer 305-days milk yield, adjusted to an age of 24 months at calving, 30 classes where defined with the yield deviation from herd mean: 1= deviation from herd mean is 1350 or more below herd mean, 2= deviation of 1349 to 1250 below herd mean, ..., 15= deviation of 49 below to 49 above herd mean, etc.. fixed effect;

CS= conformation score for rear legs set (1-9), or claw diagonal (1-9) or legs&feet score (65-99), fixed effect;
 BV = cow's breeding value, with mean 100 and genetic standard deviation of 4.5, fixed effect. Breeding value above 100 means for rear legs set sickled, for claw diagonal short and for legs&feet good quality.
 Error = unexplained.

The average culling rate at the beginning of 2nd, 3rd and 4th lactation was respectively 15.7%, 36.0% and 54.1%.

Graph 1 shows the relation between the least square solutions for phenotypic rear legs set score (1-9) and survival at the beginning of the third lactation. It is obvious that on phenotypic level rear legs set is an optimum trait. The extreme scores, 1 and 9 should be avoided in cows, where sickled legs are more unfavourable than straight legs setting.

Graph 2 shows the relation between the cow's breeding value and culled before the beginning of the 2nd, 3rd or 4th lactation. There is hardly any difference on straight or sickled, but cows having a breeding value for more straight legs survive slightly longer. Per point higher breeding value (more sickled) 0.1% and 0.2% less cows started the 3rd and 4th lactation.

Graph 3 shows the relation between the least square solutions for phenotypic claw diagonal score (1-9) and culled before the beginning of the third lactation. The graph shows that claw diagonal has a phenotypic optimum. Long claw diagonals result in a higher culling rate than short claw diagonals and a score of 6 (one point above average) results in the lowest culling rate. A linear relation was found between the cow's breeding value for claw diagonal and the chance of being culled before the start of

the third lactation (graph 4). Shorter diagonals give less culling. Per point higher breeding value for claw diagonal respectively 0.6%, 1.2% and 1.4% less cows were culled before beginning the 2nd, 3rd and 4th lactation.

Graph 5 shows that a higher score for the descriptive trait legs&feet results in a higher survival rate at the beginning of the 3rd lactation. The cow's breeding value for legs&feet was also linearly related with survival at the beginning of the 2nd, 3rd and 4th lactation (graph 6). Per point higher breeding value for legs&feet respectively 0.9%, 1.4% and 1.6% less cows were culled before beginning the 2nd, 3rd and 4th lactation.

The results for herd life show that rear legs set side view is hardly a predictor for a cow's whereas the trait legs&feet and claw diagonal show a clear, linear relationship between their breeding values and the percentage of cows starting a 2nd, 3rd or 4th lactation. This also shows that locomotion, weighted for 70% in the trait legs&feet, is a valuable trait for improving herd life.

References

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- Reurink, A. 1987. Klauwen en fokkerij. Publication nr 5, Animal Breeding Department, Wageningen University, The Netherlands.

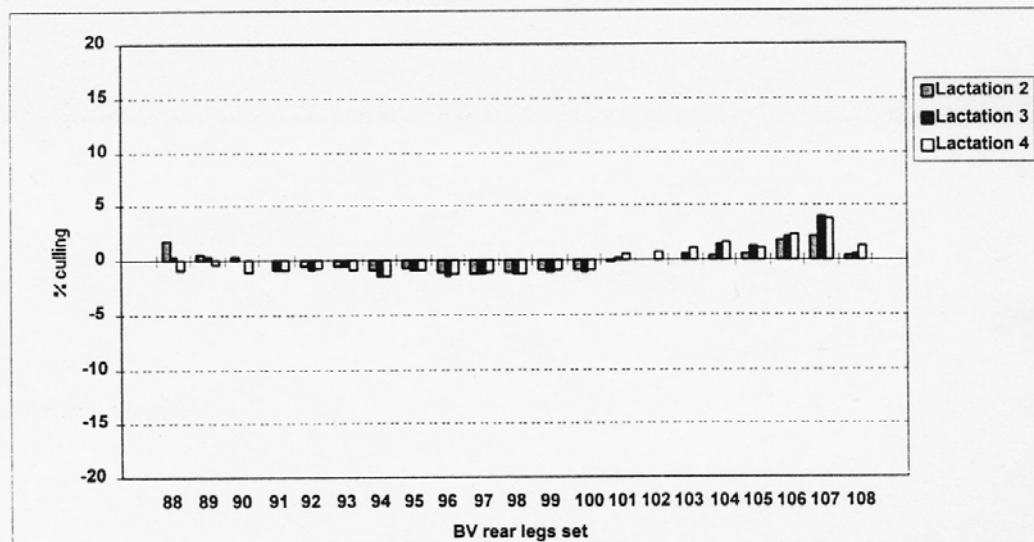
Table 1. Heritabilities of rear legs set (side view), claw diagonal and legs&feet in Dutch cows. Under the diagonal are the genetic correlations

	rear legs set	claw diagonal	legs&feet
rear legs set	0.24		
claw diagonal	-0.64	0.15	
legs&feet	-0.39	0.56	0.17

Score Rear leg set (corrected)

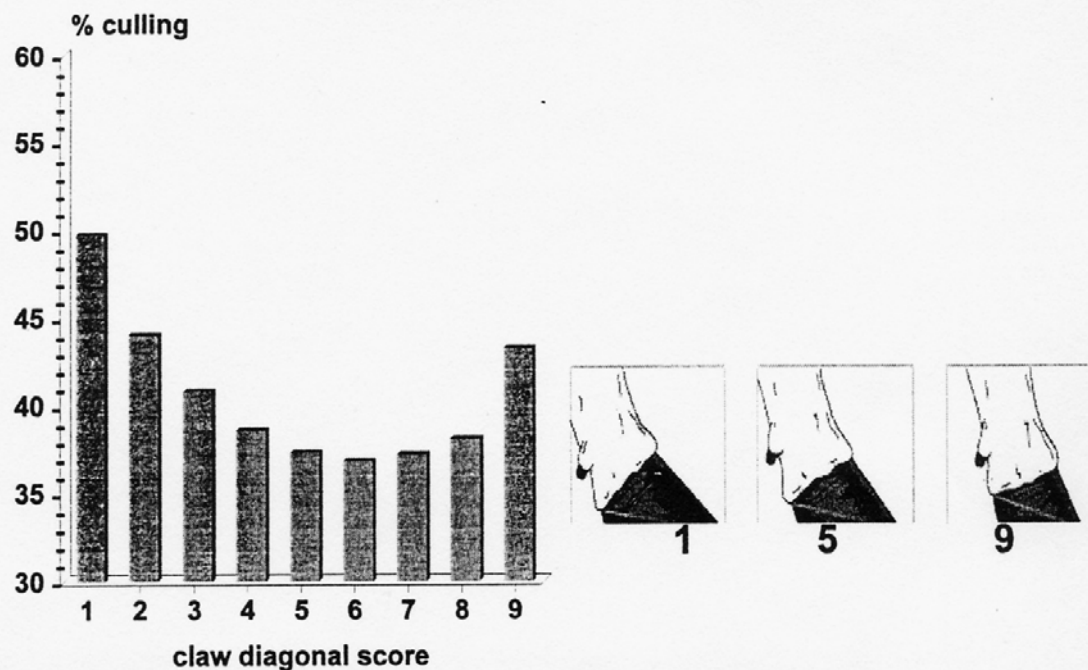


Graph 1. Relationship between phenotypic score for rear legs set and least square solutions for culling rate before starting the 3rd lactation in Dutch Black&White cows..

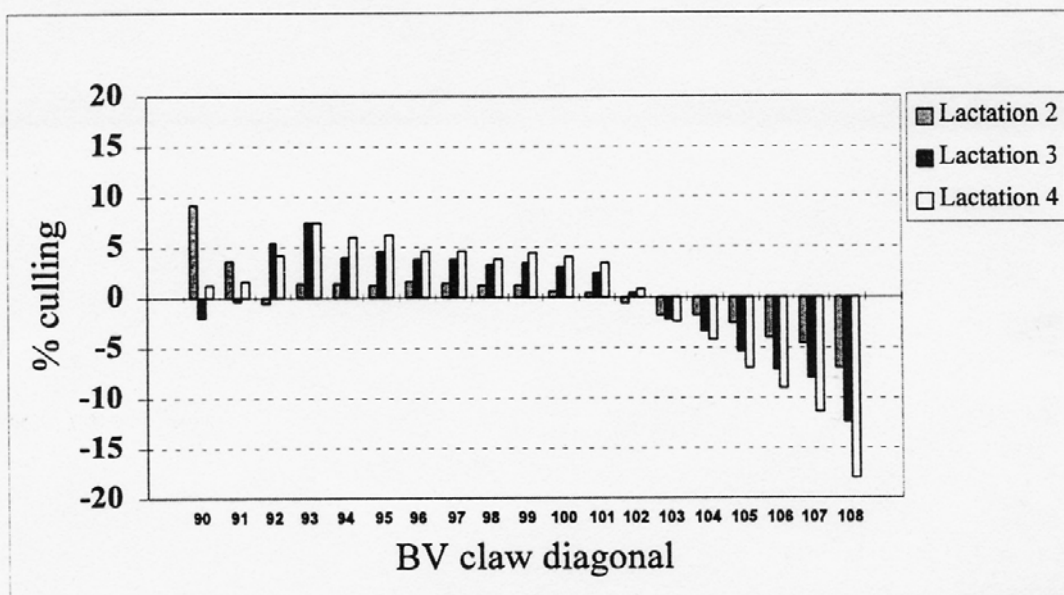


Graph 2. Relationship between cow's breeding value for rear legs set and least square solutions (deviation from mean) for culling rate before starting the 2nd, 3rd or 4th lactation.

Score claw diagonal (corrected)

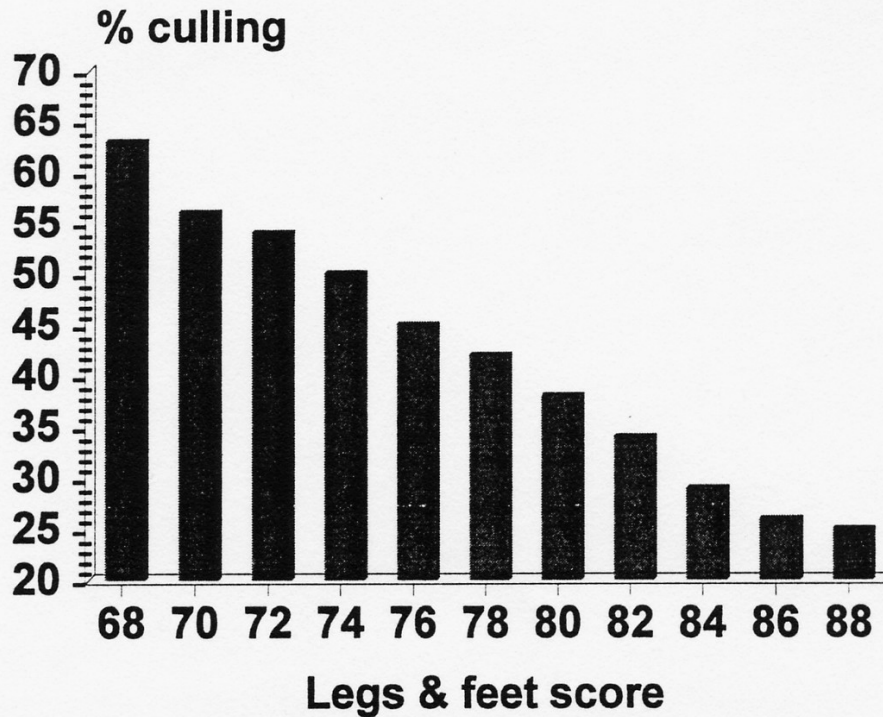


Graph 3. Relationship between phenotypic score for claw diagonal and least square solutions for culling rate before starting the 3rd lactation in Dutch Black&White cows.

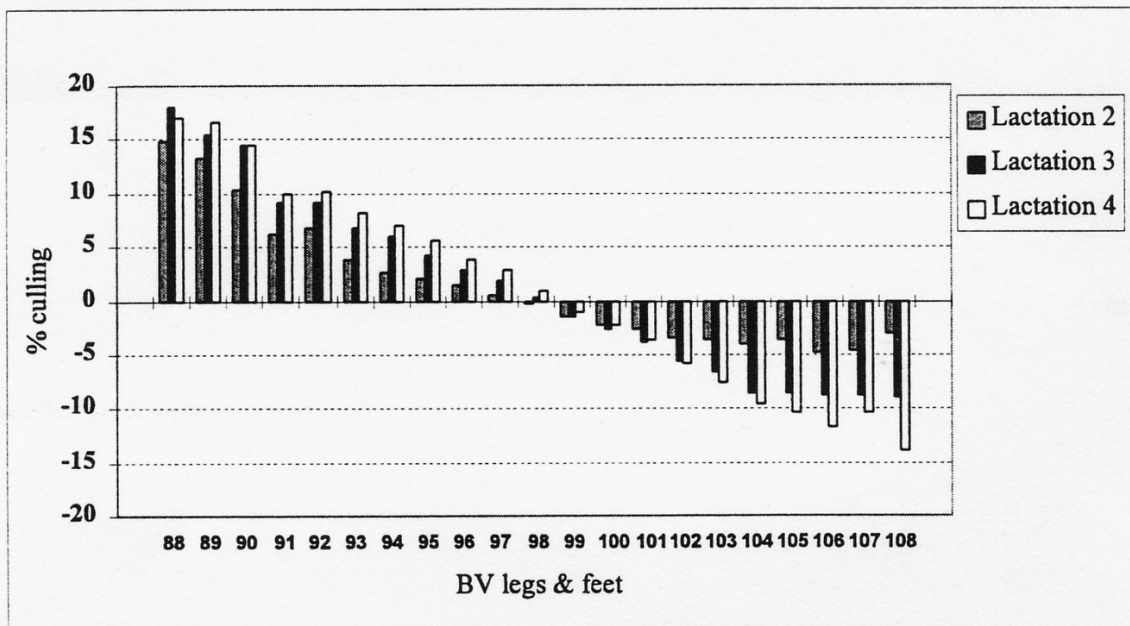


Graph 4. Relationship between cow's breeding value for claw diagonal and least square solutions (deviation from mean) for culling rate before starting the 2nd, 3rd or 4th lactation.

Score legs & feet



Graph 5. Relationship between phenotypic score for legs&feet trait and least square solutions for culling rate before starting the 3rd lactation in Dutch Black&White population.



Graph 6. Relationship between cow's breeding value for legs&feet and least square solutions (deviation from mean) for culling rate before starting the 2nd, 3rd or 4th lactation.