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Investigation on the self-performance of young Holstein Friesian bulls, focused on body conformation, feed intake and live weight

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ABSTRACT

On the basis of genetic relationships between the bull's generation and that of his daughter's the influence of performance parameters in Bull Breed Licensing from young AI sire candidates on performance traits of the offspring was analysed. In the former Central Sire Station Meißen-Korbitz (MASTERRIND GmbH) the performance data from 1.598 test bulls and data from 257.201 animals from offspring were included in this study. The heritability of the observed parameters of young bulls were STA stature (0.36), PW pelvic width (0.31), LW live weight (0.33), DATY dairy type (0.16), LEGS overall of legs (0.23) FA foot angle (0.12) and BOM body muscling (0.38). DFI daily feed intake (0.22) from the Bull Feed Intake Testing Program was also estimated. The genetic correlations were as follows: the effects on the exterior appearance of the offspring were moderate to high. In particular, the sire features STA (r_g 0.60), DATY (r_g 0.55), LEGS (r_g 0.52), FA (r_g 0.39) and PW (r_g 0.34) showed a clear relationships to the offspring's overall classification (CLAS). An impact on the laminitis (LAM) in the offspring could be anticipated based on the sire traits LEGS (r_g -0.40) and DATY (r_g 0.71). The genetic correlation between the bulls' and their daughter's performance parameters showed that the use of the information about young bull candidates has an influence on economic and functional performance of the progeny.
(Keywords: Holstein Friesian bulls, self-performance, body conformation)

INTRODUCTION

In recent years, the rapid improvement in molecular genetics and laboratory diagnostic methods have changed the cattle breeding strategies and the way breeding values are estimated. The focus has gradually moved from the traditional information sources (bull's self-performance and progeny tests) to the genomic data. Consequently, in many countries the self- performance tests of Holstein Friesian (HF) young bulls were stopped.

On the other hand, it would be very important to see clearly the genetic correlation between phenotypic traits of bulls and productive traits of their daughters.

Based on this objective, we analyzed data collected from HF bulls in a station which had been functioning for many years, as well as the corresponding the data from the bulls` daughters.

According to the reviewed literature we focused our analysis on the traits of body conformation, feed intake and live weight of bulls.

The authors roughly agree that these characteristics have influence on stability, longevity, calving, Body Condition Score (BCS) etc. (*Brade et al.*, 2008; *Schöpke et al.*, 2013; *Bergk,* 2011; *Dechow et al.,* 2001; *Zink et al.,* 2011; *Janovick and Drackley,* 2010; *McNamara,* 2011), CAFI and FSI (*Dechow et al.,* 2001; *Gonzalez-Recio et al.,* 2007; *Eaglen et al.,* 2011).

With the selection after feed intake traits from future AI bulls, for example, an earlier study *Wassmuth* (2000) demonstrated possibilities to positively influence metabolism, cervical health and mobility. Therefore, the present examination is based on the possible influence of some characteristics of young breeding candidates on the functional features of future offspring groups. The use of selected performance information on central rearing of future AI bulls will be discussed as a possible approach to the mating system of the herds. The basis of the argumentation is the genetic correlation between performance parameters of young bulls in the Central Test Station and performance information from their female offspring.

MATERIALS AND METHODS

1. Database

The phenotypic parameters of 1.598 young bulls from the former Bull Test Station (Meißen-Korbitz) of the breeding organization MASTERRIND GmbH in Germany were recorded. Progeny testing data of 533 regional dairy herds in the period from 1995 to 2007 were also involved in the study. A minimum number of 25 daughters in the first lactation were set during the selection of bulls. Pedigree data of 3 generations with a completeness of about 96% was included in this examination.

2. Characteristics of the young bulls

The traits of young bulls were tested according to the self-performance testing regime of the Breeding Association (*Klunker,* 2005). The traits were **STA** (stature; cm), **PW** (pelvic width; cm), **LW** (live weight; kg), **DATY** (dairy type; mark 1 to 9), **LEGS** (the overall categorization of the rear legs; score 1 to 9), **FA** (foot angle of the rear legs; score 1 to 9) and **BOM** (body muscling as subjective breed specific assessment of the muscularity; score 1 to 9). Since 2002, a part of the young bulls (n = 181) have been examined by feed intake. The specific trait **DFI** (daily feed intake; kg) was recorded after the 365 days of age in a mean time period of 60 day. In *Table 1*, the features with abbreviations and explanation of scoring/ measurement scale, descriptive statistic and heritability estimates will be listed.

3. Characteristics of daughters

Performance parameters of selected test bulls were used for testing bulls' daughters (105.386) and their contemporary animals (151.815) for body conformation and animal health (*Table 2*).

Body conformation traits:

According to the scoring system of World Holstein Friesian Federation, the parameters of 257.201 animals in the first lactation were included in this analysis. The performance traits were **STR** (strength; score 1 to 9), **BOD** (body deep; sc.: 1 to 9), **BCS** (body condition score; sc.: 1 to 9), **TYP** (dairy type; sc.: 1 to 100) and **CLAS** (overall classification; sc.: 1 to 100).

Health traits:

From the health test system in Germany (*Kehr et al.*, 2007) animals were filtered in the first lactation (21.841) with illness diagnoses. Calculation of days of illness (*Fischer*, 2007) as a trait was included in testing bull daughters. The traits of animal health were **MAS** (*mastitis*), **LAM** (*laminitis*), **ENDO** (*endometritis*) and **AZYC** (*cycle disorder*).

Table 1.

Performance traits in Bull Breed Licensing by young Hosltein Friesian Bulls in the Central Test Station with descriptive statistics, heritability (h^2) estimates and standard error (se)

Trait		Scoring 1 to 9 or Dimension Value		Mean	SD	*Univariate*		*Bivariate*		
		1	9		σ_p	**h^2**	h^2se	h^2_{MIN}	h^2_{MAX}	h^2se_{MW}
Stature $_{(cm)}$	STA	138	155	141.3	4.2	**0.36**	(0.08)	0.35	0.39	(0.08)
Pelvic width $_{(cm)}$	PW	41	59	48.9	2.1	**0.31**	(0.07)	0.29	0.31	(0.07)
Live weight $_{(kg)}$	LW	425	611	509.0	55.6	**0.33**	(0.08)	0.28	0.33	(0.09)
Daily feed intake $_{(kg)}$	DFI	5.8	31.2	13.8	5.9	**0.22**	(0.05)	0.18	0.24	(0.07)
Dairy type	DATY	*beefy*	*very dairy*	6.2	1.1	**0.16**	(0.09)	0.19	0.25	(0.10)
Overall of legs	LEGS	*poor*	*very good*	5.5	1.1	**0.23**	(0.08)	0.23	0.28	(0.08)
Foot angle	FA	*low*	*steep*	5.4	1.1	**0.12**	(0.06)	0.10	0.12	(0.09)
Body muscling	BOM	*slightly*	*strong*	6.8	1.2	**0.38**	(0.07)	0,31	0.39	(0.08)

Table 2.

Performance traits in progeny testing of offspring's with descriptive statistics, heritability (h^2) estimates and standard error (se)

Trait	Scoring 1 to 9 or Dimension Value		Mean	SD	*Univariate*		*Bivariate*		
				σ_p	**h^2**	h^2se	h^2_{MIN}	h^2_{MAX}	h^2se_{MW}
STR	*small*	*wide*	5.18	1.12	**0.32**	(0.09)	0.23	0.33	(0.10)
BOD	*shallow*	*deep*	6.13	1.06	**0.20**	(0.10)	0.21	0.23	(0.10)
BCS	*thin*	*fat*	4.09	1.74	**0.23**	(0.04)	0.23	0.23	(0.09)
TYP	65	88	79.14	1.84	**0.35**	(0.12)	0.32	0.42	(0.11)
CLAS	66	87	78.65	2.28	**0.30**	(0.11)	0.30	0.37	(0.11)
MAS	0	161	3.33	9.56	**0.07**	(0.08)	0.07	0.11	(0.07)
LAM	0	252	3.82	15.36	**0.13**	(0.02)	0.11	0.17	(0.03)
ENDO	0	126	1.54	6.54	**0.03**	(0.03)	0.01	0.05	(0.02)
AZYC	0	147	1.07	5.77	**0.04**	(0.02)	0.04	0.05	(0.03)

STR strength, BOD body deep, BCS body condition score, TYP dairy type, CLAS overall classification, MAS mastitis, LAM laminitis, ENDO endometritis, AZYC cycle disorder/ acyclic *Score 1-3

4. Statistical analyses

In the model selection, the individual factors were tested for significance and optimal consideration. The parameter estimation was carried out using the software program VCE 6.0.2 (*Kovac et al.*, 2008). Due to the amount of data and the size of the systems of equations the linear mixed animal model was applied for the estimation of genetic parameters (heritability **h²**, genetic correlation $\mathbf{r_g}$,) using single trait and bivariate models. The following linear animal model was used for the univariate and bivariate analyses:

Bull Breed Licensing:

У = BJQ + BF + FI + LC + *age (sl)* + A + E

Bull feed intake

У = TJQ + TG + *age (fi)* + A + PE + E

Offspring body traits:

У = HYS + EX + *age (c)* + *dim* + A + E

Offspring animal health:

У = HYS + CAL + STBI + *age (c)* + A + E

The standard abbreviations in all models used are defined as follows: **У** observation value, **E** residual effect, **A** additive genetic effect and **PE** permanent environmental effect

Special abbreviations for the fixed effect in the models used are defined as follows: **BF** birth farm (classes, 1 to 199), **BJQ** birth year quarter (classes, 1 to 56), **TJQ** test year quarter (classes, 1 to 40), **TG** testing bull group (classes, 1 to 17), **EX** examiners (classes, 1 to 4), **FI** feed entrance examination (classes, 1 to 2), **LC** licensing commission, after the leader (classes, 1 to 6), **HYS** herd year season (classes, 1 to 22.443), **CAL** calving ease (classes, 1 to 3) and **STBI** stillbirth (1 live, 2 dead) (classes, 1 to 2).

Special abbreviations for the variables in the models used are defined as follows: ***age (sl)*** age of licensing (quadratic), ***age (fi)***, age of feed intake testing (quadratic), ***age (c)*** age at calving (linear) and ***dim*** day in milk (quadratic).

RESULTS AND DISCUSSION

1. Heritability

Heritability for the bull traits was shown in *Table1*. Estimated univariate heritability ranged from 0.12 (FA) to 0.38 (BOM). In comparison to the univariate estimation, the results of the bivariate estimation were in similar range and corroborate the findings of *Potthas et al.* (2000) and *Tholen and Müsch* (2004). Similarities can also be seen in the heritability of the claw trait, for comparative studies (*Anacker and Germand*, 2006; *Hinrichs et al.*, 2003).

Heritability for the performance features of the progeny testing were shown in *Table 2*. Heritability estimates of the population based on univariate and bivariate models showed analogous results in the medium range. Offspring's had the highest values in the conformation traits. Compared to the studies by *Berry et al.* (2004) lower value was indicated in the present study (BCS 0.33, BOD 0.37).

Extremely low heritability was estimated for the traits connected to the animals' health. The highest value in the univariate estimation was *laminitis* (0.13). In comparison with other studies, such as *Buch et al.* (2011) or *Stoop et al.* (2010), the health characteristics were similarly low.

2. Correlations between bull traits

The genetic correlations between the different bull traits are summarized in *Table 3.* The genetic correlations between conformation traits were positive with the exception for the correlation between DFI and DATY on Bull Breed Licensing (-0.20). The present analyses demonstrate that more attention should be paid in the future to the daily feed intake in rearing of young bulls. From DFI to the feed and legs traits no relationship were found. However, the body and conformation features were highly dependent on DFI.

High correlation at the end of the rearing of young AI sire could be shown between DFI and BOM (0.90), or DFI and STA (0.97). Furthermore, value among DFI and PW (0.75) are highly correlated. In the analyses by *Tholen and Müsch* (2004) similar results were also calculated for the relationships between daily forage dry matter intake and body features, but in a low range (STA 0.16; PW 0.07).

3. Genetic correlations between young bull traits and offspring characteristics

STATURE OF BULL /ST/

The result of bull stature measured on the 365th live day revealed positive correlation with BOD in offspring, but with medium value (0.31). Also bull stature to 365 live days offered parallel genetic effects to the offspring traits TYP and CLAS (0.42, 0.60), as it can be seen in *Table 4.* From the present study it is inferred that paying attention to the stature of bulls has an influence on the daughter characteristics BOD, TYP and CLAS.

PELVIC WIDTH OF BULL / PW/

The h^2 of pelvic width of bulls was 0.31 (*Table 1.*). This value illustrates the paternal influence on calving ease and stillbirth rate of their daughters'. This observation was confirmed by *Nogalski*, (2002). In this study, the selection based on rump width and rump angle resulted in indirect improvement of calving ease in heifers and cows. Similar results were also shown by *Oliveira and Gheller* (2009) since the long rumps and wide rumps, with the large pelvic area are conducive to calving ease. To the health trait ENDO (-0.36) this fact could also account for fewer days of illness due to fewer injuries in the pelvic region.

A very remarkable result is the relationship between pelvic width and STR (0.64). Stronger correlations (*Ulbricht et al.,* 2014a) were found in bulls rearing between hip wide and pelvic width (0.91), between hip wide (bull) and offspring pelvic width (0.43) and between pelvic width and dairy character (-0.16), which are interpreted in the present study as valuable parameters in judging the width of the bovine breast. *Duru et al.* (2012) indicated that these traits are in medium correlation with the rump width and strength in offspring (r_g 0.32, r_p 0.22). In summary, it appears that consideration of the bulls' pelvic width may influence the calving ease, stillbirth rate and possibly on the reduction in the number of ENDO disease in the daughters' groups. Furthermore, it suggests the expedience of using these data on the overall assessment and estimating the daughters' strength.

Table 3.

Genetic correlations between the performance parameters of young bulls on the Test Station (genetic correlation (r_g) and standard errors (se r_g))

	STA	PW	LW	DFI	DATY	LEGS	FA	BOM
STATURE *cm to licensing*		0.323 (0.149)	0.381 (0.089)	0.972 (0.185)	0.699 (0.148)	0.052 (0.057)	0.350 (0.108)	0.223 (0.116)
PELVIC WIDTH *cm to licensing*			0.896 (0.075)	0.754 (0.148)	-0.016 (0.109)	0.129 (0.168)	0.335 (0.114)	0.715 (0.105)
LIVE WEIGHT *kg to licensing*				0.884 (0.101)	0.261 (0.130)	0.035 (0.069)	0.382 (0.171)	0.842 (0.191)
DAILY FEED INTAKE *kg /d*					-0.195 (0.103)	-0.083 (0.082)	0.087 (0.193)	0.901 (0.168)
DAIRY TYPE *scoring to licensing*						0.935 (0.056)	0.261 (0.188)	0.244 (0.100)
OVERALL OF LEGS *scoring to licensing*							0.412 (0.102)	0.364 (0.299)
FOOT ANGLE *scoring to licensing*								-0.113 (0.184)
BODY MUSCLING *scoring to licensing*								

Table 4.

Genetic correlations (r_g) between performance features of the young bulls on the Test Station and their Daughters in progeny testing in the Holstein Breed (standard error (se r_g))

BULLS PERFORMANCE TRAITS	PERFORMANCE CHARACTERISTICS OF OFFSPRING PROGENY TESTING								
	BODY					HEALTH			
	STR	BOD	BCS	TYP	CLAS	MAS	LAM	ENDO	AZYK
STA	0.145	0.310	-0.224	0.423	0.603	0.089	0.163	0.225	0.105
	(0.114)	(0.110)	(0.106)	(0.102)	(0.136)	(0.215)	(0.149	(0.183)	(0.141)
PW	0.643	0.079	-0.140	-0.119	0.342	0.056	-0.077	-0.356	-0.099
	(0.136)	(0.184	(0.197)	(0.213)	(0.151)	(0.138)	(0.114)	(0.166)	(0.201)
LW	0.118	0.196	0.286	-0.246	0.089	0.219	0.066	0.088	-0.167
	(0.066)	(0.092)	(0.098)	(0.077)	(0.128)	(0.161)	(0.092)	(0.246)	(0.190)
DFI	0.368	0.456	0.631	-0.122	-0.277	0.117	-0.247	0.336	-0.391
	(0.158)	(0.194)	(0.153)	(0.258)	(0.293)	(0.137)	(0.300)	(0.123)	(0.133)
DATY	-0.505	-0.191	-0.208	0.389	0.548	0.071	0.709	0.120	-0.463
	(0.191)	(0.218)	(0.101)	(0.146)	(0.157)	(0.205)	(0.289)	(0.203)	(0.598)
LEGS	-0.160	-0.202	0.284	0.111	0.522	-0.004	-0.403	0.141	0.456
	(0.124)	(0.118)	(0,108)	(0.243)	(0.127)	(0.179)	(0.201)	(0.537)	(0.661)
FA	-0.005	-0.069	-0.080	0.318	0.386	0.104	0.138	0.370	0.125
	(0.137)	(0.235)	(0.121)	(0.265)	(0.182)	(0.196)	(0.359)	(0.229)	(0.323)
BOM	0.543	0.398	0.373	-0.140	0.148	0.256	-0.014	0.316	-0.386
	(0.086)	(0.102)	(0.093)	(0.092)	(0.121)	(0.208)	(0.150)	(0.184)	(0.189)

TRAITS BULL BREED LICENSING:
STA Stature, PW Pelvic width, LW Live weight, DFI Daily feed intake, DATY Dairy type, LEGS Overall of rear legs, FA Foot angle, BOM Body muscling

FEATURES OF THE DAUGHTERS IN THE PERFORMANCE TEST:
STR strength/ brisket wide, BOD body deep, BCS body condition score, TYP dairy type, CLAS overall classification, MAS mastitis, LAM laminitis, ENDO endometritis, AZYC cycle disorder/ acyclic*LIVE WEIGHT OF BULL /LW/*

Almost an exact genetic correlation between young bulls LW, offspring traits BCS (0.29) and TYP (-0.25) were found (*Table 4.*). Thus, the present results revealed a genetic relationship that heavier bulls produce daughters with low dairy type. Although the genetic correlation of LW of bulls and STBI of offspring was rather low (0.19), *Bergk,* (2011) showed similar results between live weight of heifer at calving and daily weight gain of heifer to calving to CAL (0.41, 0.34) and STBI (0.37, 0.13) in the first lactation. The moderate heritability of bull LW (0.33) and the above-mentioned correlation results indirectly confirms the negative effect of the LW from bulls to CAL and STBI on the offspring groups. Furthermore, attention in using bulls with high weight in bulls licensing is considered to have a positive effect on BCS and negative effects on offspring's TYP.

DAILY FEED INTAKE OF BULL /DFI/

The bull DFI has a moderate genetic correlation value with the offspring body traits (STR 0.37, BOD 0.46 and BCS 0.63). Regarding the results of positive correlation in rearing (*Table3*) of bulls between DFI and BOM (0.90) and between DFI and LW (0.88) a relationship exists between DFI and daily weight gain during the rearing which has an impact on the offspring. In the present study, a relationship was found between bull DFI and BCS (0.63) in the offspring's (*Table 4*). Similar correlation between daily feed intake and linear type traits in growing was also shown by *Basarab et al*. (2003) and *Berry and Crowley* (2013).

In the present study a relationship is surmised between the food intake of young bulls and the health characteristics of the daughters ENDO (0.34) and AZYC (-0.39). A similar result was reported by *Wassmuth* (2000). In summary, bulls with higher feed intake will produce daughters with increasing STR, BOD and BCS. Special attention must be paid to the daughters' fertility traits CAL, STBI because these are markedly deteriorating. Therefore, health traits of offspring can be inferred from the bull DFI to achieve the reduction in the number of illness days.

DAIRY TYPE OF BULL /DATY/

In spite of the fact that the heritability index of DATY is only 0.16, in the present analysis correlations were found between bull DATY and offspring's STR (-0.51), BCS (-0.21), TYP (0.39) and CLAS (0.55). The results underline that the dairy form of HF cows was associated with body characteristics such as strength, body depth and body conformation, and that there were negative genetic correlations among these traits. Dairy form of the bull had positive estimates of genetic correlations with dairy type and overall classification. These general relationships of the dairy form of body to linear type trait in breeding groups were also shown by *Degroot et al*. (2002) (STR -0.39, BOD -0.07, CLAS 0.38). Furthermore, DATY of bull showed a strong correlation with LAM (0.71).

Not expressed in such a high value, but the trend was also found between milk type (100 point system, 0.34) and LAM (*Ulbricht et al.,* 2014a). This effect shows that high TYP leads to susceptibility to *laminitis*, but only of female dairy cattle. These effects in offspring can be attributed to the fact that increasing milk type reinforces a negative energy balance postpartum and that energy deficit is positively correlated with the increase in *laminitis* (*Mülling and Lischer*, 2002).

In summary, the use of dairy bull with higher dairy type could lead to positive effect on offspring dairy type and overall classification, although it has a pronounced negative effect on body strength (brisket wide) and health traits (*laminitis*).

OVERALL OF LEGS OF BULL /LEGS/

The overall classification of the rear legs at Bull Breed Licensing is a complex trait (rear legs- side view, rear legs- rear view, hock quality). In our analysis a weak genetic correlation was found between the quality of bull LEGS and offspring body traits, (STR -0.16, BOD -0.20, BCS 0.28; *Tab. 4.*). The largest effect of the LEGS quality of the bull is on the offspring's overall classification (0.52). Indeed, *Degroot et al*. (2002) emphasize the influence of the hind leg position on the CLAS (rear view 0.21, side view -0.35) in the progeny groups. In the study by *Ulbricht et al.* (2014b) also a usable correlation was found between bull and offspring in rear legs (rear view 0.62, side view 0.38) and revealed important impact on the choice of AI-sire to influence the rear legs of the daughters with the effect on the total points in the overall classification.

However, a negative correlation was found between LEGS and the health trait LAM (-0.40). Bad limbs were already shown to co-occur with lameness in performance tests of offspring by *Uggla et al*. (2008) and *Van der Waaij* (2005). *Capion* (2008) also reported that abnormal legs were associated with disease of the hoof and lameness. Consequently, the use of dairy types' bull (DATY) possessing higher quality in LEGS results in positive effect on the female offspring's overall classification, and on *laminitis*.

FOOT ANGLE OF BULL /FA/

Thus, as it can be seen above, as bulls' LEGS impacts on daughters' CLAS likewise bull FA has influence also on one of the daughters' characteristics, CLAS (0.39) (*Table 4*). Heel height of the bulls, similarly to the bull FA, has a positive effect on the overall classification of feet and legs of the daughters (0.38). This could also explain the positive effect the FA of young sire on the overall classification of the daughters. A genetic effect of bull FA on offspring TYP was estimated to be 0.32. However, the high level of SE (*Table 4*) doesn't confirm this correlation.

Although during bull rearing high correlation between FA and DATY was found (*Table3*, 0.26) and it appears that higher milk type cows derive from bulls having a greater FA, no usable relationship of sire to his daughter can be detected. An interesting observation confirming the findings of the study by *Duru et al*. (2012) reveals an indirect connection: with increasing thickness (less TYP) of the daughters the FA decreases (-0.54). In summary, from our data it can be inferred that the observance of the bull FA has a potential impact on overall classification of the daughters.

BODY MUSCLING OF BULL /BOM/

The heritability of breed-specific musculature is located in the moderate range (0.38). Therefore, it is not surprising that young bulls with high BOM, have a similar effect on their daughters' characteristics (STR, BOD, BCS). A higher musculature may also be due to the deterioration of the health characteristic ENDO (0.32) by increasing *dystocia* and stillbirth rate. Also *Bergk* (2011) reported an increasing number of problems in the first birth. He attributes birth problems and fertility behaviour of the animals to fat degeneration and calf size. However, it appears that a higher muscling of bull daughters after calving has a positive influence on the interval between the calving and first insemination (-0.29). This subsequently leads to a shorter time interval between the calving and first insemination, which also has a positive effect on health trait cycle disorder AZYC (-0.39).

The strongest effect of the Bull muscling could be shown on the physical characteristics of the daughters. Genetic correlations between bull BOM and offspring's body traits were found to be positive and useable (STR 0.54, BOD 0.40, BCS 0.37).

CONCLUSIONS

Our findings show that the expression of the body- and skeletal traits of young bulls and subsequently AI bulls was found again in the body- and skeletal traits of the offspring's. In particular, the genetic relations in the strength, body condition score, dairy type and overall classification of the daughters are markedly manifested.

Especially the influence of the increasing milk character on the milk type of this experimental population was apparent. Similar tendency as in other HF populations in the offspring groups was noticed in the successive decrease in the body condition score and muscular tissue, reduction of the body reserves after the first birth as well as their effects on the animal classification of the daughters. In fulfilling the breeder's main objective pertaining to the higher overall quality of the offspring's, the most important considerations are the bull's information STA *stature*, PW *pelvic width*, DATY *dairy type*, LEGS *overall of rear legs* and FA *foot angle*. In the functional period of the bulls' daughters' fertility, the former's traits such as PW *pelvic width* and DFI *daily feed intake* point to a possible genetic effects in the daughters manifested in the CAL *calving ease* and STBI *stillbirth*. Additionally, bulls with higher feed intake will produce daughters with increasing STR *strength*, BOD *body deep*, and BCS *body condition score*.

Whether the consideration of these factors is worth in terms of the economic aspects of breeding can only be analyzed in the context of breeding plans. It could alternatively be translated into ensuring a sufficient number of such phenotypes stemming from performing random checks for the derivation of value functions within the scope of the genome selection and breeding value.

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