Application of a Beef-Index in German Dual Purpose Cattle Populations

(Simmental and Gelbvieh)

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1. Introduction:

Recording of beef traits has been introduced in Germany since the late fiftieth. While in the beginning progeny testing has been emphasized, station performance testing was started in 1969. Due to the lack of testing capacity and the high costs of central testing, other possibilities of recording have been exploited. Contract farms as well as a field test with the collection of data in slaughter houses have been or are used, the results of which have been reported (Schild 1988 a, Averdunk 1988). This variety of sources of information led to the need of combining the different information into a selection criteria, which could be used under practical conditions. A selection index was developed (Schild 1988 b), which partially still is under discussion and adaptation.

2. Traits and parameters used

Table 1 gives an overview of the different types of progeny tests available in Southern Germany. Depending upon the different types of tests a variety of differently defined traits are combined. Three different traits are used for growth rate: gain on test, daily gain (comparable to weight per day of age) and net gain, the last of which is part of the aggregate genotype. Table 2 gives information about traits and types of test.

Lean meat content is estimated rather precise in station test, while in contract farms internal fat and weight of feet are used. EEC-conformation score is collected at slaughter houses on the EUROP-scale, despite of the fact that within a breed a wider range of grades would be useful. A subjective muscling score, especially for the rump and round is applied (range 1 - 9) to evaluate life animals. Critical is the linear assessment of daughters regarding this score about three months after calving. Calf weight and calf price on auction sales are included, the last of which measures the acceptance on the market.

The genetic parameters used for the different traits are given in table 3. Most of these estimates originate from older, less sophisticated analysis (e.g. Averdunk et al 1987) and should be revised. These parameters are in the range of published results; station results for meat content and dressing may be inflated by common environment. The high heritability for meat content in contract farms should be mentioned, which is estimated by a linear combination of different 1 traits. Here we observe the same tendency as in pigs: the heritability of such an estimate tends to be higher as the simple traits for prediction.

Table 4 contains some of the genetic correlations between traits, which are the most critical part of our index, because of the lack of positive definite solutions. Most of these correlations have been derived indirectly from correlations between breeding values. Some of these correlations should be reavaluated, but a lot are estimated from a limited sample size.

3.) Description of the beef-index

Table 5 gives some information about the index. Economic weights were derived from market prices and are considered to be linear. At least in the range of values achieved with Simmental and Gelbvieh this holds for the conformation score. The aggregate genotype contains two carcass traits, meat content and the EEC-conformation score, which tend to be rather independent. Since the information for meat content is limited and the variation of the EEC-score is very low, the aggregate genotype is mainly determined by net gain. One reason is the relatively small price differentiation between the U- and P-grade under Southern German conditions. The index is expressed as a relative breeding value with a mean of 100 and a standard deviation of true breeding values of 12.

A rolling base is applied comparable to that used for milk yield. The sire birth years 1982 - 1984 are used until the next evaluation in the end of Juli 1992. The evaluation is conducted four times a year in connection with the dates for the Animal-Model evaluation for milk traits and the data base is updated, including all herdbook results. Table 6 contains the distribution of all bulls in the base years. Of course all bulls contained in the data base include a lot of bulls with low accuracy, having only a field performance test. The lower part of the table contains only bulls with an accuracy of ≥ 0.25. These data show nearly a normal distribution, while all bulls tend to have a higher proportion of negative bulls, the reason of which is not yet known. Means and standard deviations for the index and the breeding values for net gain, meat content and conformation score are given in table 7. Bulls with a progeny test tend to be some what superior in all traits, but have of course a larger variation.

4. Experience with the Beef-index

The beef-index is applied since 1988 and smaller revisions have been applied continuously. The main advantage is the combination of various test informations into one number, the RBV for meat production or the so-called "Beef-value" (Fleischwert). As already mentioned, animals with high growth rate and/or growth capacity tend to have higher RBV's. There is a need to get more carcass information with better reliability, especially with regard to grading. Hopefully, the technical development in slaughter houses in connection with electronic identification gives the possibility to get better information about internal fat and bone content of the carcass.

Farmers tend to use bulls with high RBV's for intrabreed beef-matings, if the calving ease score is acceptable. Bulls with low RBV's for beef are avoided in planned matings and gradually are discriminated in dairy matings.

In the near future the information of the sire and the maternal grandsire will be included in the index.
This will also be used to consider the beef side in bull dam selection in the dual purpose breeds Simmental and Gelbvieh. Further plans include an Animal-Model application for beef, combining ancestor information with performance and progeny data.

There will be a need for converting breeding values for beef traits between EEC-countries and INTERBULL should be prepared to follow up the discussions for this trait group.

References

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Table 1: **Types of progeny tests for beef in Southern-Germany**

station test

fattening to constant age (500 days)
information on carcass composition and beef quality.
limited capacity (< 20 %)

field test data (slaughter house)

carcass weight and EEC-classification
identification from calf to slaughter house
pathway fattening farm --> slaughter house
highly variable environment

contract farms (Schwäb.-Hall, Landshut, Gelbvieh)

carcass weight and EEC-classification
carcass composition with indirect traits
comparable environment, systematic distribution
high distribution cost, limited capacity

station performance test

gross gain, muscling score
fattening to constant age (420 days)
products from planned matings
only for bull-sires, comparable environment

auction sales

gross gain, muscling score
products from planned matings
pre-selection, variable environment

linear classification of daughters

chest girth --> weight
muscling score
influenced by lactation stage

calf value (auction sales)

price per kg --> beef conformation
age corrected weight
identification at early age (< 7 weeks)

Table 2:
Traits in beef index and information sources used

Trait	Information Source: Perfor.test stat.	auct.	Progeny test sta-tion	auc-tion	perf. stat.	contr. farms	field test	daug. eval.	calf-auct.
gain on test (TG)	X				X				
daily gain (DG)		X		X					
net gain (NG)			X			X	X		
est. meat-content (M%)			X			X			
dressing percent (D%)			X			X			
EEC-conf. (EC) score			X			X	X		
muscling score (MS)	X	X	X	X	X			X	
chest girth (DC)								X	
calf-weight (CW)									X
calf-price (CP)									X

Table 3:
Traits and genetic parameters used for the beef index

Information		h^2	genetic correlation with: net gain	meat %	EEC-conf.score	s_A
PE-stat.	dev.daily g./test	.40	.64	-.04	.16	52
"	muscling score	.40	.34	.25	.30	0.62
PE-auction	dev.. gain	.15	.64	-.04	.16	49
"	muscling score	.20	.34	.25	.30	0.44
PR-station	EBV-est. meat %	.57	.00	.80	.13	1.2
"	EBV-dressing %	.60	.34	.23	.29	1.1
"	EBV-Net gain	.40	.80	.00	.45	43
"	Muscling score	.40	.34	.25	.30	0.5
"	EEC-conform.sc.	.30	.45	.13	.80	0.05
PR-contr. farm	EBV-Net gain	.33	1.00	.00	.47	31
"	EBV-EEC-conf.sc.	.27	.47	.13	1.00	0.26
"	EBV-dressing %	.26	.34	.23	.29	0.85
"	EBV-est.meat %	.57	.00	1.00	.13	1.2
PR-field	EBV-Net gain	.14	1.00	.00	.45	19
"	EBV-EEC-conf.sc.	.09	.45	.13	1.00	0.05
PR-calf auctions	EBV-weight	.10	.32	-.30	.10	3.52
"	EBV-price/kg	.07	.10	-.10	.26	0.07
PR-daught. (visual)	muscling score	.25	.25	.22	.17	1.05
"	chest girth	.30	.19	.11	-.07	5.90

PE=performance test PR=Progeny test

Table 4:
Genetic correlations used for beef index

Trait 1	DG	MS	NG	M%	EC	D%	CW	CP	DM	DC
	Trait 2									
DG	.60	.36	.64	-.04	.16	.11	.59	.19	.12	.31
MS		.60	.34	.25	.30	-.16	.12	.22	.20	.15
NG			.70	.00	.45	.34	.32	.10	.25	.19
M%				1.00	.13	.23	-.30	-.10	.22	.11
EC					.60	.29	.10	.26	.17	-.07
D%						.80	-.02	-.01	.12	-.01
CW							1.00	.33	.22	.23
CP								1.00	.29	.10
DM									1.00	.58

diagonals: genetic correlations between traits in different tests.

1. (DG) daily gain (PE-station, auction, PR-station)
2. (MS) muscling score male (PE-station, auction, PR-station)
3. (NG) net gain (PR-station, contract f., field)
4. (M%) meat % (PR-station, ")
5. (EC) EEC-conf.score (PR-station, contract f.field)
6. (D%) dressing % (PR-station, contract farms)
7. (CW) calf weight (calf auctions)
8. (CP) calf price/kg (calf auctions)
9. (DM) muscling score fem. (daughter classif.)
10. (DC) chest girth fem. (daughter classif.)

Table 5:

Beef index

as a combination of all
information on beef traits:

classical selection index approach

Aggregate genotype (H):

net gain

meat content in carcass

EEC-conformation score

Economic weights:

net gain	2	DM / g.
meat content/carc.	30	DM / %
EEC-conf.score	3.60	DM / Pfg. value

Expression as a relative breeding value

Mean : 100 points

s_A (true BV) : 12 points

Base: rolling base

comparable to milk yield
at present : sire birth years 1982 - 1984

Table 6: Distribution of Beef Index for Simmental bulls

a l l b u l l s

	N	%	Accuracy
< 83	11	0.2	0.61
83 - 87	53	1.2	0.48
88 - 92	174	3.8	0.35
93 - 97	993	21.8	0.15
98 - 102	2348	51.6	0.11
103 - 107	734	16.1	0.19
108 - 112	169	3.7	0.40
113 - 117	50	1.1	0.49
> 117	22	0.5	0.56
Total	4554	100.0	0.16
SD			0.19

b u l l s w i t h a c c u r a c y > 0.24

	N	%	Accuracy
< 83	11	1.0	0.61
83 - 87	48	4.4	0.51
88 - 92	116	10.5	0.46
93 - 97	207	18.8	0.46
98 - 102	295	26.8	0.45
103 - 107	218	19.8	0.46
108 - 112	138	12.5	0.45
113 - 117	47	4.3	0.51
> 117	22	2.0	0.56
Total	1102	100.0	0.47
SD			0.12

Table 7: **Means and standard deviations for RBV and composite traits**

	all bulls		bulls with $r_{AI}^2 > 0.24$	
	$\bar{x}$	SD	$\bar{x}$	SD
n	4554		1102	
Index	100	5	101	8
BV-Net gain	-1	11	+1	18
BV-Meat %	+0.01	0.17	+0.06	0.28
BV-EEC-Conf.	-0.1	1.5	0.0	2.8
Accuracy	0.16	0.19	0.47	0.12