

ITE: The New Selection Index for the Italian Brown Swiss

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Abstract

In May 2005 ANARB (Italian Brown Cattle Breeders' Association) has changed the selection index (ITE: Total Economic Index), re-examining the ITE adopted since 1998. The introduction of a new selection tool was done because milking speed and somatic cell score EBVs were available for all sires. Milking speed, especially, has an economical relevant value in Brown Swiss and, in general, functional traits are improving their economical and managing relevancy. For this reason, it's very important to include milking speed and somatic cell score (SCS) evaluation in genetic selection. In order to achieve this aim, the 85:15 relative emphasis between production and longevity in the old ITE, was moved to a ratio of 70 for production and 30 for functional traits (longevity, milkability, SCS) in the new selection index. The new ITE production components are protein yield (58%) and protein % (12%), the functional components include indirect longevity (12%), milkability (12%) and SCS (6%). The relative emphasis for each trait was chosen analysing the rate of genetic progress. The new selection index gives greater boost to % protein, milkability and longevity than the old ITE.

Keywords: Selection Index, Brown Swiss, Breeding Objective, Milking Speed

Introduction

The selection index (ITE) is a main tool to direct genetic progress of the breed.

The previous selection index, adopted since 1998, was focused on quality (the main part of Italian Brown Swiss milk production is for cheese yield) and on longevity.

The production component in old ITE includes protein yield (56.5%), fat yield

(19%), protein % (7.5%) fat % (2%) and longevity (15%), achieving a ratio production - longevity of 85:15.

As shown in figure 1, the index selection in use until May 2005, allowed us to obtain a positive genetic trend during the last 10 years of selection (+387 kg for milk yield, +16 kg for fat yield and +13 kg for protein yield respect to genetic merit of the animals born in 1995).

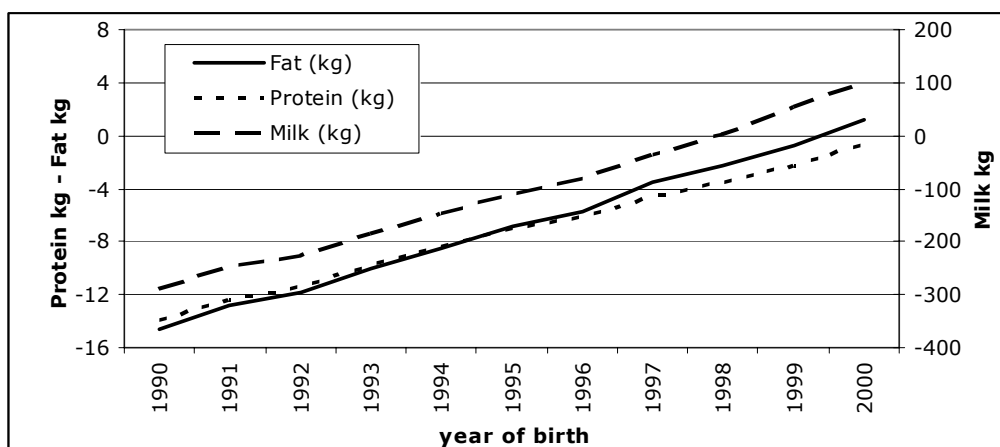


Figure 1. Genetic trend in last 10 years in Italian Brown Swiss.

The new selection index

The update of selection index is a very important tool for the genetic progress gain.

We make the choices that will determine the features of the breed in the next years.

The guidelines for the new ITE are:

- Kg protein and milk quality confirm their importance: they are distinctive features, as well as traditional, in goals of the breed.
- Milking speed introduction with high weight is due to the trait's importance.
- Incorporate SCS with low weight.
- Reduce emphasis of fat yield.
- Verify the introduction of other conformation characters.

Table 1 shows the weight and the relative percentage value of each trait included in the new ITE .

Table 1. New selection index.

Traits	weight	emphasis (%)
Protein (kg)	5	58
Protein %	1	12
Longevity	1	12
Milkability	1	12
Somatic cell score	-0.5	6

The new selection index places 70% emphasis on production and 30% on functionality.

Production components

The quality, characteristic of the Brown breed's milk, is still the main selection goal for the breed. Because of this, the selection weight for protein content and protein % are confirmed as the most important traits. Moreover, the weight of the protein content and protein % have been increased in the new ITE, in order to balance their reduced weight due to inclusion of some new traits.

Due to the milk destination, k-casein confirms its extra value: +5% of protein yield

for k-casein BB, +2.5% for k-casein AB and no extra value for k-casein AA.

Another evidence is that the fat lost its economical importance, so its weight became null; anyway fat improvement is not affected by its correlation with other selection traits.

Milkability and somatic cell score

The introduction of milkability as one of the selection goals is the main change made in the new total genetic index of the Brown breed. In addition, the somatic cell score index was also included.

Since the end of 2004, both the milking speed and SCS evaluation became available for all sires and now they are part of Italian genetic evaluation.

These two traits will add greater importance to functional traits, which have higher and higher managerial and economic value for breeders (A.F. Groen, 1996).

The milking speed is unfavourably correlated with a lot of traits, the most important of which are shown in table 2.

Table 2. The most important unfavourably correlations of milking speed.

	Milking speed
Protein %	-0.26
Udder depth	-0.25
Rear leg side view	0.28
Somatic cell score	0.46

Anyway, the economical importance of this trait pushes to introduce it in selection with some cautions.

Consequently, the weight of protein % is increased and SCS is included with a slightly negative weight to avoid a further worsening of this trait in the Brown Swiss population due to selection. Important results in the reduction of the SCS with the selection are not expected, because of low heritability of the trait.

Longevity

In Italian Brown Swiss, functional longevity (LF) is an index which combine five linear traits: stature (weight -31%), rear leg side view (weight -2%), fore udder attachment (weight +17%), udder depth (weight +33%) and teat length with weight -17%.

In new ITE, LF has been assigned a higher weight, but its relative value ranges from 15% to 12%, because of the new traits included. Anyway, due to correlations with other selection traits, LF will increase expected genetic gain.

Response to selection

The response on selection (L. Dale, 1987) with the new ITE is presented in table 3, compared with the results obtainable using the old selection index. In the same table the relative weights of the two indexes can be found.

Table 3. Response to selection in 10 years.

Trait	weight		response	
	old ITE	new ITE	old ITE	new ITE
Milk (kg)	0	0	1122	1079
Fat (kg)	1	0	50	47
Protein (kg)	3	5	44	43
Fat (%)	0.1	0	0.07	0.05
Protein (%)	0.4	1	0.04	0.05
Somatic cell score	0	-0.5	0.00	0.02
Milkability	0	1	0.11	0.19
Longevity	0.8	1	0.37	0.85

The phenotypic scale used for each trait: kg fat and kg protein, fat percentage and protein percentage, points on a logarithmic scale for cells, kg/min for milkability, and months of productive life for functional longevity.

Analysing the expected genetic progress of the selected traits, the main point is a substantial genetic improvement of milkability, +0.19 kg/min in ten years compared with +0.11 in previous selection index.

As expected, the level of SCS is conserved.

Functional longevity, with +0.85 months of productive life in ten years, has a good improvement.

The genetic protein yield gain is maintained and the percentage increased. Moreover, fat yield, excluded from genetic goals, doesn't decrease substantially.

The rank correlation between sires' evaluations with old and new selection indexes is 97.6. This value is attended: the changing selection's tools, gives different sires' ranking.

This new selection index allows the breeders to increase their profit, not only through the improvement of the production yield but also through a more functional cow.

Future research

The following steps are to study more the breeding objective for Italian Brown Swiss.

Correlations between type traits and longevity have been recalculated in order to update those values in Brown Swiss population. An analysis on functional longevity is been carried out. A feasibility for direct functional longevity estimation is been studied, with the aim to integrate direct and indirect methods in routine genetic evaluation.

Moreover, type traits do not concern functional longevity only, but they involve other functional aspects of cows. With this aim, further researches are being carried out to adopt other type traits as selection goal.

Another important study is undergoing, regarding the possibility to predict an early and reliable fertility EBV.

In fact, the genetic improvement on productive traits reduces reproductive efficiency in dairy cows (Castillo-Juarez *et al.*, 2000). It is known, how milk production level is negatively related with fertility and body condition score (Pryce *et al.*).

The last part of this research is in cooperation with University of Padua and it's investigate the possibility of including Body Condition Score (BCS) in selection scheme as predictor of fertility.

Conclusion

- The main selection goal for Brown Swiss is quality of productions.
- The influence of production component in ITE is reduced from 85% to 70%, giving more weight to functionality (12% longevity, 12% milkability, 6% SCS).
- Introduction of milkability in new ITE, gives a great improvement in milking speed.
- In the next future we will evaluate the possibility to introduce BCS and some conformation traits in the selection index.

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