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METHODEN FUER DIE ZUCHTPLANUNG BEIM ZWEINUTZUNGSRIND

ABHANDLUNG

zur Erlangung des Titels eines

DOKTORS DER TECHNISCHEN WISSENSCHAFTEN

der

EIDGENOESSISCHEN TECHNISCHEN HOCHSCHULE
ZUERICH

vorgelegt von

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Summary

The aim of this thesis is the further development of methods on breeding planning and the application in specific situations of the Swiss dual-purpose cattle populations, including the economic aspects.

The gene flow method developed by Hill (1974) is based upon clear matrix definitions. It can be adapted to nearly all possible situations. In this paper it is called the static gene flow method. However, this static gene flow method contains some gaps:

- Neither the population structure, nor the economic or genetic parameters can change with time.

- The creation of subpopulations and crosses between populations or between subpopulations cannot be described correctly.

Therefore, on the basis of the static gene flow method, the dynamic gene flow method was developed. Contrary to the static method, the dynamic gene flow method is based not upon one but upon several cycles of selection, which follow each other in time and consider changes, with time, in population structure and selection strategy.

With some planning calculations, on one hand the possibilities of the dynamic gene flow method are demonstrated and, on the other hand some possible alternatives for the Swiss cattle breeding programmes are discussed.

An extension in the capacity of the performance testing station for bulls with regard to beef performance, combined with a low

selection proportion, leads to a significant improvement in the genetic gain and the breeding profit, as compared to the present situation.

The economic weights of the individual traits do not account for the time lag between breeding decision and profit realization. Therefore, in the total breeding value and for the index selection, the weighting with the corresponding cumulative discounted expressions of the dynamic gene flow method is required.

Compared to the young bull system, the semen storage system leads to more success if maximum genetic gain is to be achieved for competitive reasons. The young bull system, however, gives higher breeding profit. Should, on the other hand, the change from the semen storage system to the young bull system be included in the planning calculations, the breeding profit advantage of the young bull system is insignificant.

If in one population, consisting of two subpopulations, there is a one-way cross from one subpopulation into the other, the genetic difference is dependent on the proportion of genes. It was demonstrated that the genetic difference in the individual traits between the two subpopulations remains constant after a certain time, if over several years the crossing from one subpopulation to the other is similar. In both subpopulations, the annual improvement of the genetic level is dependent on the selection program in the pure breeding subpopulation.