THE NATIONAL BREEDING PROGRAMME

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INTRODUCTION

The ability to adapt a breeding programme quickly in relation to possibilities and requirements from the surroundings is decisive of whether the breeding programme is capable of surviving in the long run. To a certain extent a fast adaption depends on the historical development, but first and foremost it depends on who the decision-maker is and his financial power to carry through changes. In this contribution we shall give a short historical review of the Danish breeding programme. Further, we shall outline the financing of breeding in Denmark in connection with which the decision processes will be described. Finally, by specific examples, we shall give an impression of the ability of adaption of the breeding programme.

FINANCING

The Danish breeding programme was founded about 1900. In 1912 the slaughter house industry, which is owned by the pig producers, started contributing to the costs of research and testing. From that time the trade organization of the slaughter houses has paid costs of testing, costs of data processing, advisory service to the breeders, supervision etc. Today the total costs which are financed through a production levy amounts to approx. DKK 24 mio. (£ 2 mio.). No direct subsidies are granted to the breeder who has to secure his income merely by the sale of breeding stock and from AI-boars. The subsidy to the breeding programme from the pig producer through the slaughter house industry means that breeding plan, traits under selection, breeding objectives, regulations for testing, the use of AI, the system for breeding value estimation etc. are determined by the pig production through a nation-wide committee.

STRUCTURE

Through the years the Danish breeding programme has been highly marked by the fact that Danish pig industry exports approx. 80 ptt of its production to high quality markets. Up to 1970 the slaughter house industry was of the opinion that only a production based on purebred Landrace would meet the criteria of quality
established by the export markets. In the 1970's crossbreeding was introduced. The first step was the importation of Large White which was used in a backcrossing system and later Duroc and Hampshire were introduced. This resulted in the 3 and 4 breed crossing systems which are now widely used. The number of herds, sows and the sale of breeding stock from the Danish breeding programme appear from table 1.

<table>
<thead>
<tr>
<th>Race</th>
<th>Herds</th>
<th>Sows</th>
<th>Boars</th>
<th>Gilts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landrace</td>
<td>70</td>
<td>2.000</td>
<td>1.800</td>
<td>9.800</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>90</td>
<td>3.400</td>
<td>6.100</td>
<td>12.200</td>
</tr>
<tr>
<td>Duroc</td>
<td>40</td>
<td>1.500</td>
<td>3.700</td>
<td>900</td>
</tr>
<tr>
<td>Hampshire</td>
<td>10</td>
<td>400</td>
<td>500</td>
<td>20</td>
</tr>
<tr>
<td>Multiplication</td>
<td>225</td>
<td>25.000</td>
<td>4.400</td>
<td>141.000</td>
</tr>
<tr>
<td>Production</td>
<td>30.000</td>
<td>850.000</td>
<td>15.6 mio.</td>
<td></td>
</tr>
</tbody>
</table>

ESTABLISHMENT OF BREEDING OBJECTIVES

One of the most difficult and most important problems to be solved in a breeding system is the establishment of the breeding objectives. In Denmark it has always been a matter of reaching a balance between production and carcass traits. The breeding objectives (the value) of the production traits are easy to calculate and to relate to each other. As opposed to this, drastic political decisions have always been made on the part of quality. Denmark, however, has the advantage of a nation-wide payment and grading system, which states an exact price of the meat content in the carcass.
Problems arise when the value of for instance PSE frequency, colour of meat, content of intramuscular fat and protein, weight of cuts etc. are to be determined. During the first 80 years of this century the slaughter houses succeeded, through their political influence, in attaching a disproportionate importance to the carcass quality while production traits were broadly ignored. Through the past ten years producers as well as the slaughter houses have started to appreciate the necessity of balancing these two sets of traits against each other. At the moment a large project is carried through in which the four breeds and three sexes are used in the test production of a range of finished pork products. The quality of these products are evaluated by slaughter houses and by consumer groups in order to establish reasonable breeding objectives for the said quality parameters. The coordination of breeding objectives for the whole growth period of the pig and until the products have been consumed by a satisfied customer has now been started. This means that at present an understanding exists between the slaughter houses and the producers with regard to breeding objectives.

TESTING PROCEDURE

Due to historical reasons the Danish breeding programme has so far been based on central test stations. An alteration of the programme to include records obtained on a decentralised basis in the breeding herds will, however, have to be followed by some kind of control of the reported records. Until March 1990 a test group consisted of a gilt and a castrate from the same litter. The individual breeder himself selects the animals from the litter and decides which litters are to be tested. As a main rule a sow can only be tested by one progeny group. A two stage selection, however, allowed top sows to be tested by more progeny groups consisting of two boars for performance test. The system may seem very strict and slow to manoeuvre, but it is in fact possible to carry through changes as proved by the following example.

By December 1988 it was evident that despite the use of test stations an effect of the herd of origin could be proved in the data from the test stations. This was particularly clear regarding the second stage selection of boars for performance testing as their sires and dams had been selected partly because of a positive herd of origin effect. The performance of the tested boar himself was also influenced by the herd of origin. When these boars were progeny tested with sows from other breeding herds they failed to come up to expectations.
It was decided to suspend performance tests, work out a BLUP-procedure by which it would be possible to correct old data for herd of origin effect and to receive pigs at a younger age for testing from the breeders to limit the influence of herd of origin. This made necessary the building of a central rearing station for test pigs weighing from abt. 6 kilos and up to 30 kilos, the weight at the start of the test period.

The central rearing station was put into service in May 1989, and the BLUP-procedure was ready in the beginning of September 1989. The procedure was developed by D. Sorensen, the National Institute of Animal Science. While changing the method of estimation, data was limited to include only records made after 1 July 1987 as well as small changes of genetic parameters and economic weights were carried through. Comparisons between the new and the old evaluation were submitted to the nation-wide committee. The relation between the two evaluations was poor - correlations ranging from 0.49 to 0.79 dependent on breed and sex.

The alterations were adopted and a new instructive evaluation was sent to the breeders. This reduced trade in breeding stock drastically until the new evaluation was made official. The composition of test groups has now been changed to two boars that are performance tested. Despite bad experiences with performance tested boars the nation-wide committee has been convinced that this will be rational.

THE TRANSFER OF BREEDING PROGRESS TO PRODUCTION

The transmission of genes from nucleus level to production level takes place when the producer buys purebred stock of both sexes or crossbred stock direct from breeding or multiplier herds. Furthermore the producer may purchase semen from purebred boars on AI-stations. The producer experiences a constantly improving meat percentage at the slaughter houses but no attempt is made to measure improvements in feed conversion ratio and daily gain at production level.