CAUSES OF INEFFICIENCY IN THE REALISATION OF GENETIC IMPROVEMENT AT COMMERCIAL LEVEL

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INTRODUCTION

The very reason for presenting this short paper at the 'world congress on genetics applied to livestock production' is the existence of a session on 'effecting improvement in pigs and poultry'.

Apart from the day to day routine of effecting improvement, time should be taken to evaluate past and present activities. The turn of a decade is a suitable moment. The question to be answered is: did 10 years of activities bring about (genetic) improvement in pig production and if so, was the return on investment as large as possible, given the available tools. If not what are the major inefficiencies.

To quantify some of the inefficiencies of a continuous commercial improvement program, some results will be given. These results will serve as a start for further discussion.

MATERIAL AND METHODS

An arbitrary choice for the characteristic daily gain from 23 to 110 kg (common Dutch practice) was made. Data from the 4 main selection lines, grandparents to the commercial fattener, were used together with the data of a number of small research and development (R&D) lines. Numbers of animals individually tested since 1982 are presented in table 1. The synthetic boar line (sire) is under selection since 1986.

Table 1: Numbers of animals individually tested since 1982.

	boars	gilts	
boar line (sire)	3239		3239
boar line (dam)	8747	241	8988
sow line (sire)	6132	84	6216
sow line (dam)	1809		1809
R&D lines	3026	1668	4694
	22953	1993	24946

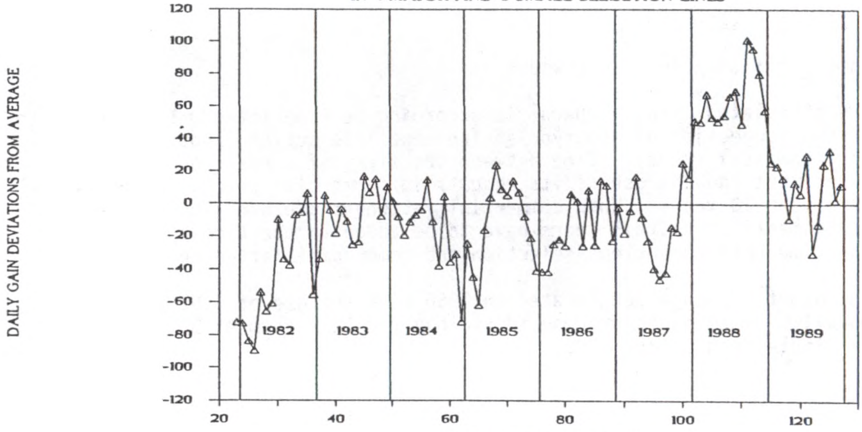
Data were analysed with an animal model correcting for sex, line and HYS.

RESULTS

The overall phenotypic change in the selection lines is around 10 gr/year (see figure 1).

FIG. 1: PHENOTYPIC TREND IN DAILY GAIN

IN 4 MAJOR AND 6 SMALL SELECTION LINES



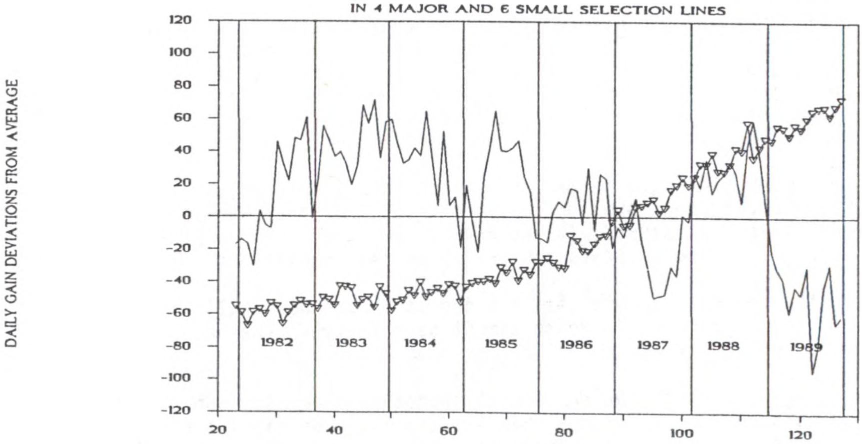
In the Netherlands the daily gain in fattening has changed with an average of around 9 gr/year over the past decade (source: Dutch advisory board). The collection of data at the commercial level in a systematic manner has, in our company, failed since 1986.

Realised generation interval is 493 days.
Realised selection differential in standard deviations of lean tissue daily gain (which is the selection index) is 1.1.

Genetic and environmental trends were calculated using the animal model and are given in figure 2.

FIG. 2: GENETIC AND ENVIRONMENTAL TREND

IN 4 MAJOR AND 6 SMALL SELECTION LINES



DISCUSSION

Concerning the results

Some inefficiencies are obvious.

The calculated genetic change is according to expectation, but there is a strong suggestion of genotype-environment interaction (negative environmental trend). Time between the start of a basic physiological experiment and the use of its results in commercial practice tends to be more than 10 years. When commercial fatteners are used for such experiments an extra 5 years have to be added to the timelag, because of the time between nucleus selection and commercial fattening.

The genetic change accelerated in 1986 with the use of BLUP (sire model). Breeding theory and technology for this form of BLUP were available long before 1986.

General

A prerequisite for defining a degree of inefficiency is to agree on a goal, an objective towards which all efforts are directed. This should be an attainable objective with the available means and it must be sought for by all the components of an organisation. If this is not the case, the major cause of inefficiency then is of course managerial incompetence.

COMMERCIAL PHENOTYPE = GENOTYPE + ENVIRONMENT + INTERACTION

A commercial breeding company must effect progress in the commercial phenotype and even when investment in improving the genotype has a much higher long term return, investments often have to be made in environmental control.

One of the main tools in environmental control is a well organised production pyramid in which health status and phenotypic performance at delivery is guaranteed.

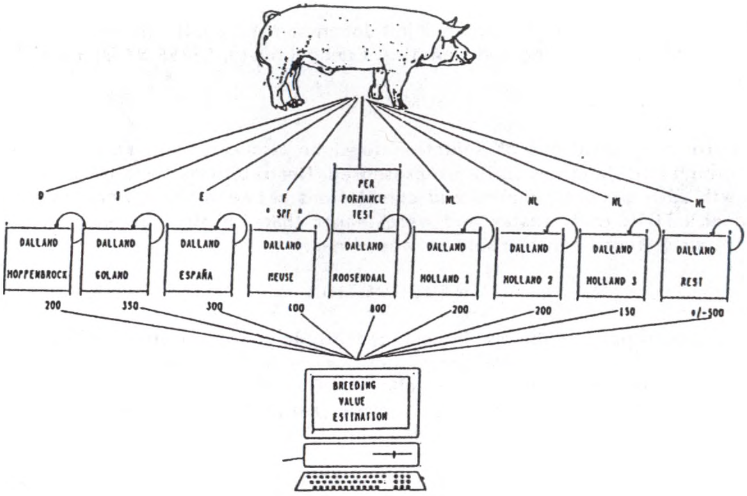
A well organised production structure generates a sufficiently large positive cash flow to finance present and future operations.
With some adaptations this structure can generate a very usefull flow of information on environmental influences and can help in testing animals on the basis of their offspring. In figure 3 these adaptations are given in short.

On a number of closed farms, sows of the sow line (dam), are kept and used for own replacement and for replacement at crossbreeding level. The genetic link is assured via the use of the same boars. Information is used for breeding purposes and environmental comparisons.

With the new data communication technology, the possibilities of such a production structure increase almost as rapidly as the necessity of having such a structure.

In changing markets the commercial phenotype changes. Short lasting changes should be handled within the available possibilities of the production pyramid. Long lasting changes can affect the breeding goal.

SATELLITE - NUCLEUS - SYSTEM



CONCLUSIONS

Not using available knowledge on breeding value estimation and physiology (to overcome possible genotype-environment interaction) is a hardly forgivable inefficiency.

Understanding future market demands is very important but very difficult and is therefore a potential source of inefficiency.

Organising a very flexible production pyramid to be able to channel gene-, information- and cash- flows and to react as soon as necessary on market changes is the main task of the management of a breeding organisation.