

Pig production, health and genetics

by Ir. Marc Cox, PIC Europe, PO Box 49, 5240 AA Rosmalen, The Netherlands.

The pig industry in Europe has changed enormously in the last 40 years and is likely to change at least as radically in the next 10 years. Average herd size has steadily increased and the number of herds decreased. Scientific advances in genetics and performance, production methods, nutrition and disease control along with improvements in welfare, food safety and marketing have been widely applied and will continue to be applied.

Nevertheless, the current pig production has to cope with a number of developments affecting its future, like an increase of costs of labour, farm buildings, energy, environmental costs and welfare. and at the same time at the very best a constant but more likely decreasing level of prices for meat or piglets. Those two facts together mean a continuous pressure on cost of production (per piglet and/or per kilogram carcass produced) and on total farm revenue.

Therefore, improvement of technical results is required to control cost of production and to increase total revenue; health management is a very important aspect to achieve that.

All over the world the larger producers are focused on the health status of their herds because the economical impact of diseases in both acute and chronic stages is enormous. In different US market surveys between the larger producers, health is in almost all cases considered as the most

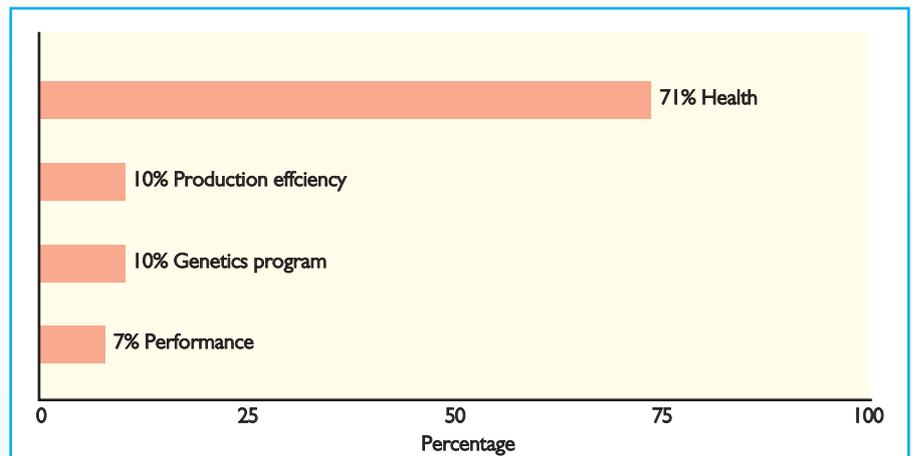


Fig. 1. Factors considered most important when selecting swine breeding stock or semen results taken from Swine Health Issues Study.

important factor influencing the financial result of the production herds (see Fig. 1).

In most markets the health status of pig production farms has gone down due to increasing farm sizes, more intensive production methods and introduction of new pathogens.

For the countries in the Benelux, we estimate that over the last 25 years, the increasing health problems in pig production have negatively influenced the profitability with €10-12 per finishing pig due to increasing vaccination, medication, veterinary costs and lower production results (see Fig. 2).

For these countries it is estimated by the industry that the difference between conventional and high health production would be 7-10% in cost of production per finishing pig (see Table 1).

The importance of health

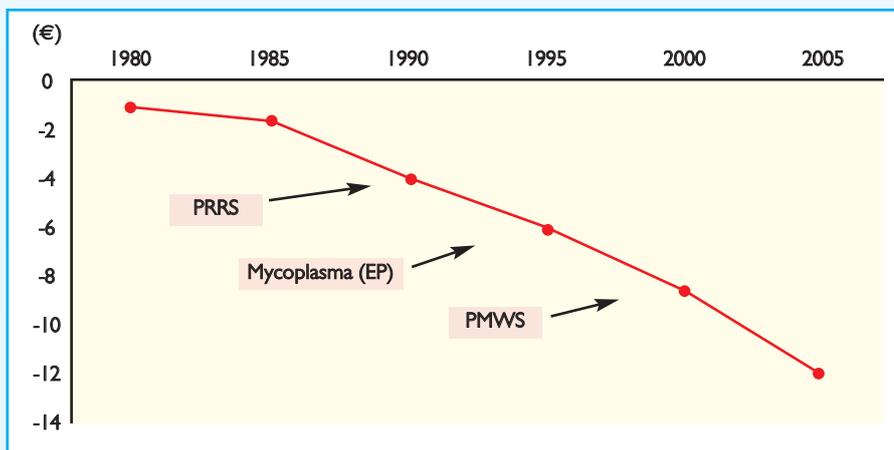
Health assurance and health control are crucial for breeding companies and health therefore, is always one of the key drivers for the business of breeding companies. First of all, breeding companies are the beginning of the pork chain and logistically very often the top of almost every production pyramid.

The direct contact between animals is the biggest transmitter of pathogens. Therefore, the top of a production pyramid has to be as free of diseases as possible because of the high risk that almost all diseases at the top may be transmitted to the lower parts of the pyramid resulting in a less efficient and less economical production.

To protect the companies' breeding and multiplication pyramid and the customers' production pyramid, the breeding company has to establish and maintain the highest health status possible at the top of its breeding pyramid. The importance of health in breeding companies is, for example, reflected in the objective of the PIC Health Assurance Programme – to improve and

Continued on page 20

Fig. 2. Decrease in profitability per slaughtered pig in the Benelux due to health costs.



Continued from page 19

protect the health of PIC and customer herds so they can realise their genetic potential and maximise production and profitability. As an example of a health assurance programme, the PIC programme consists of four overall principles:

- **Start-up:** All breeding herds should be established in safe locations with the healthiest pigs available.

- **Protect:** All breeding herds must be protected against the introduction of infectious diseases. This is known as biosecurity for which there are very strict rules.

- **Monitor:** Because biosecurity will never be perfect, herds will occasionally break down with serious infections. In order to minimise the spread of these infections to customers' herds, all breeding herds must be regularly monitored for infection.

In most countries PIC for example uses a combination of routine herd clinical inspections primarily by a regional veterinarian, slaughter house inspections and laboratory follow-up if a disease is suspected.

- **React:** When a new serious infection is detected, PIC has mechanisms in place for rapid action to prevent its spread to customers' herds. It is essential that a breeding company has mechanisms to quickly and accurately identify the pathogen and to take rapid action. Herds may be shut temporarily and at a later stage reopened, or permanently closed depending on the disease diagnosed.

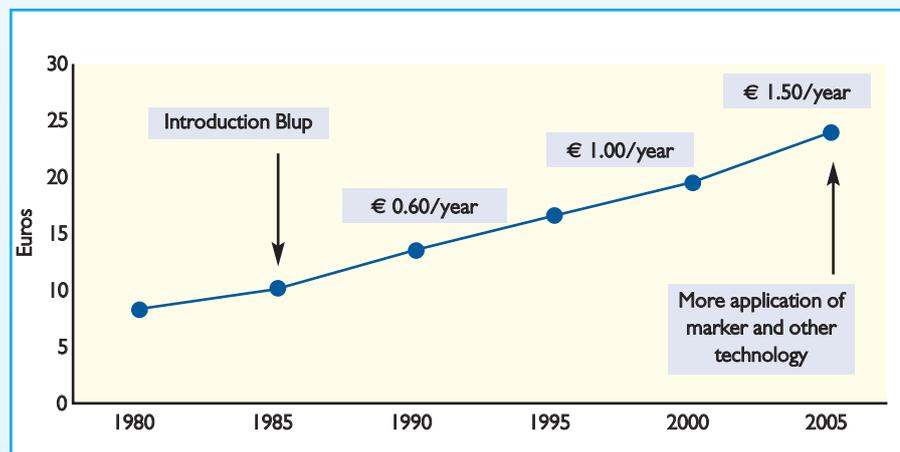
Genetic potential

Another important driver for breeding companies to focus on health assurance and health control is to ensure that the genetic improvement they establish can be utilised by their customers.

Over the last decades the breeding companies have made impressive genetic improvement both on individual traits and on the total economical merit of all the trades combined (see Fig. 3).

High health environments give pigs the possibility to express their full genetic

Fig. 3. Improvement in profitability per finishing pig due to genetic improvement.



	Conventional	High health	Difference
Sows			
Litters/sow/year	2.34	2.43	0.09
Number born alive per litter	11.7	12.5	0.8
Pre-weaning mortality (%)	11.8	10.6	-1.2
Weaned/sow/year	24.15	27.16	3.01
Feed/sow/year (kg)	1136	994	-142
Finishing pigs			
Average daily gain (g/d)	768	929	161
Feed conversion	2.64	2.31	-0.33
Mortality (%)	3.4	3.1	-0.3

Table 1. Technical differences between conventional and high health systems. (Wageningen UR, based on Agro-vision data – July 2002 to June 2003).

potential for fast and efficient lean growth and high prolificacy.

A genetically better pig will, even under lower environmental conditions, on average perform better than a genetic inferior pig. But the higher the genetically potential of the pig, the more it can benefit from a better environment (see Fig. 4).

Differences between the genetically different pigs, which might be economically relatively small (€2-3) under low environmental

also come with a trade off. We have improved our pigs and other production animals, like broilers and dairy cattle, intensively on the economically relevant traits. But, we also know there is interaction between the genetic potential of animals and the susceptibility to their environment.

Broilers were highly selected for heavy body weights and confronted with big problems in legs soundness and increased mortality. Although the broilers were

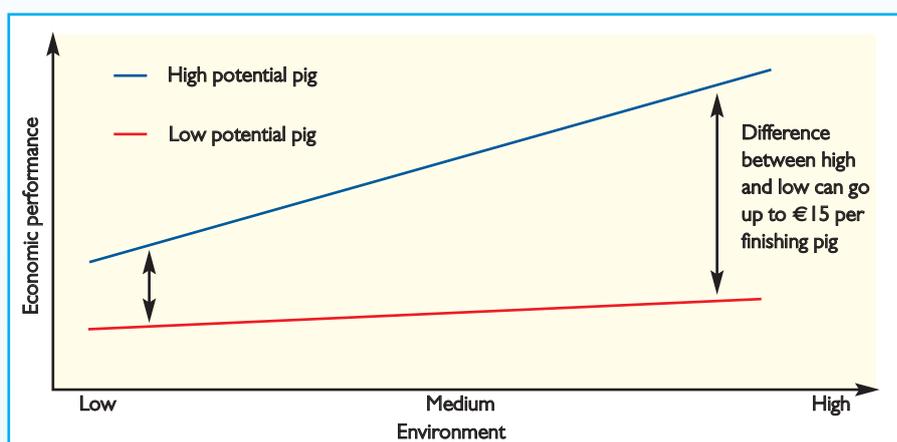


Fig. 4. The performance difference between high performance potential pigs and low performance potential pigs in different environments.

circumstances, can become much higher (up to €15 per finishing pig) under high health circumstances.

Another important factor to realise is that the decades of genetic improvement have

confronted with these fitness constrains much earlier than the pig sector, the pig sector is also experiencing the negative effect of years of intensive selection.

Years of intensive single trait selection on litter size has decreased the vitality of the piglets and increased mortality. Frank et al. (1997) showed that the mortality rate was higher in pigs which are challenged with a high infection level when compared with pigs with a low infection level (see Fig. 5).

Furthermore, they demonstrated that the mortality rate in pigs with a high lean tissue growth capacity plus a high infection level was much higher in comparison to pigs with low lean tissue growth capacity or a low infection level.

Breeding objective

Looking over the past 20 years, breeding objectives have evolved considerably. From relatively simple breeding objectives taking into account only finishing and carcass traits

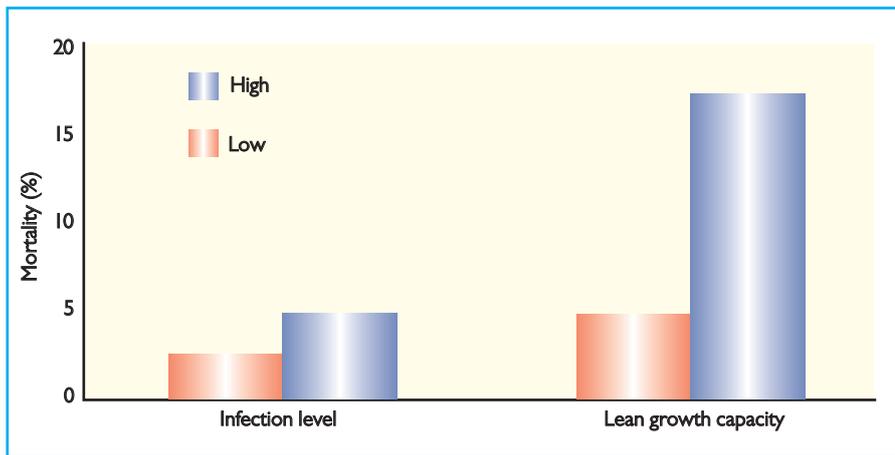


Fig. 5. Differences in mortality between high and low lean growth capacity pigs in different environments (Frank et al. 1997).

in the 1980s, through breeding objectives with more attention for fertility and meat quality in the 1990s, to the current breeding objectives taking into account also robustness and survivability traits.

Due to the availability of more powerful computers, better software, improved data collection and databases and of course application of marker technology, breeding objectives are not only taking into account more traits, but also generate a higher total genetic merit (as an economic value).

Today's PIC breeding objective contains traits connected to health, vitality and robustness like leg scoring, sow mortality, grower and finisher mortality, pre weaning survival and more (Fig. 6).

Depending on the lines used, these traits can together form over 30% of the breeding objective on final product level.

Summary

Health status of pig farms has an important impact on the cost of production per kilogram of meat or per piglet produced. An important part of the industry recognises the economic impact health can have on

pork production. As a pig breeding company, PIC is giving a very high priority to health because of the importance for its own and its customers' herds to ensure that the PIC products can realise their maximum potential in performance and profitability.

Also, in the genetic improvement programme, health or the ability to cope with more challenging production environments has become an essential breeding objective for future improvement, which is established through quantitative and molecular tools applied to breeding.

Today's pigs can perform far beyond the industry's average obtained. A part of this gap will be closed by the breeding companies through changes in breeding objectives towards robustness and vitality. But another part of this gap can also be closed by controlling and improving the environment the pigs are produced in.

The whole industry can contribute to reducing the limiting factor of the environment through improvement of health, nutrition, housing and management of pigs.

That way a contributor to a better environment multiplies his own improvement by enabling genetics to perform better and more economically. ■

Fig. 6. Current crossbred breeding objective. C23 x sireline average.

