



Challenges for the pig industry and the role of future-proofed genetic improvement

The PIC®800 – a practical example

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The pig sector has undergone a continuous development during the last decades, a process that has accelerated during the last 5 years due to increasing globalization and the implementation of new technologies. Genetic companies have to face these challenges and adapt to the accelerated process of changes. In consequence they need to provide more efficient, more sustainable genetics and services to pig producers globally to ensure and further improve their competitiveness.

In Europe these trends have manifested with a concentration of genetic companies and increasing cooperation among them. For example, PIC acquired Hermitage and entered into a strategic relationship with a Danish nucleus (Møllevang) to increase its portfolio of genetic material, in addition to continue applying selection and technology to existing lines to ensure the competitiveness of products and producers.

Over the past ten years the two most relevant factors that have provided the greatest achievements in genetic improvement are undoubtedly the implementation of new technologies combined with the capture and processing of more and more performance data in Elite Farms and in commercial environments. But these, by themselves, would not be of use if they are not applied to an adequate structure and with well-defined processes. Lets have a look at the challenges of the future pig sector:

Expanding populations increasing selection intensity

Considering the genetic improvement programme for the PIC®800 as a practical example: The PIC®800, PIC's Terminal Sire Duroc Line, is a direct result of the relationship with the Møllevang Nucleus Farm in Denmark. The number of Duroc mothers has been expanded by factor 10x globally which allows for more selection intensity with a greater number of available elite boars, and a detailed focus on the consistency and processes of modern data capture.

Key to any genetic program is the collection and incorporation of large volumes of meaningful data. These data should be captured in nucleus, multiplication and – quite important - even in commercial production farms where crosses of these purebred animals are made to consider the genetic expression in various production systems and different environmental conditions.

With this understanding PIC introduced its Genetic Nucleus Crossbred programme (GNXbred programme) in 2003 and has been using and continuously expanding it ever since. This programme allows PIC to test elite genetics in commercial environments. Young elite boars are used to produce crossbred pigs in real-world production facilities to measure traits like wean to finish mortality, pH, primal values, and defects. This information significantly accelerates the genetic progress for robustness and ensure value throughout the entire production chain.

Measuring the right things

Using the PIC800 Duroc line as a specific example of how to focus on the whole pork chain for sustainable improvement. We understood that the line we started with from Møllevang had inherent strengths in terms of growth and efficiency, however, there were still areas of opportunity. These opportunity areas included novel traits like IMF, feet and legs structure and also adding the herd sires into the global GNXbred programme. Meanwhile the GNXbred programme has been applied to the PIC®800 for the last two years. PIC continues strive for new and innovative traits. By adding cooked tenderness to the breeding index, the future direction for the PIC800 Duroc line fully aligns to the needs both, farmers and consumers, are addressing in the market. Cooked tenderness is the closest trait possible linked to an enjoyable eating experience for consumers currently in an active global breeding program. Multiple validation trials and farmer feedback are showing clear differences between the PIC800 and other industry Durocs in multiple geographies.



Use of genomic technologies

The term 'genomic technologies' is often used in a more generic way. However, the details are making the difference and its real impact depends on numerous factors: Since when it is used (e.g. PIC implemented the use of genomic information in autumn 2013 in the form of Relationship-Based Genomic Selection), secondly, to what extent genomic data are collected (e.g. PIC continues to



invest heavily in this system with over 220k animals per year currently being genotyped), and thirdly the scientific knowledge and research power behind such a programme (e.g. PIC has a team of PhD level geneticists who work with leading research institutes in Europe and the Americas to make sure the form of genomic selection PIC implements is of industry-leading level). And last but not least, it is also important to understand this is not a ‘finished’ technology and the science of use of this genomic information continues to develop.

Looking towards the next generation of technology

As described above, it is not all about having the right technology in place today and working on optimisation of the current generation of technology. To remain competitive in this demanding sector it is necessary to invest in addressing the still open questions, like the biological understanding of the genome, data analytics and machine learning, new ‘omic’ technologies such as metabolomics, behaviour assessment using automated technology, next generation reproductive technologies, genome editing for PRRS virus resistance, to only name a few.

A good example of how PIC is on the very edge of innovation is the completion of a recent project in association with the Roslin Institute. In this project, we fully sequenced the genomes of over 8,000 PIC breeding animals in what is the largest livestock sequencing project globally to date. This sequence information will provide many avenues for future research with the end goal of further optimising PIC's genetic improvement for local farmers.

Genetic management

Genetic improvement is only meaningful if it is visible in producers’ operations realised in improved performance. For this, the genes need to be disseminated from the Elite Farms to the commercial farms in a healthy and safe way. Therefore, all the lines offered by genetic companies should have an adequate size and geographic distribution. This factor becomes even more relevant in a context of increased infection pressure caused by global pandemics. If all nucleus farms are located within one country or region given today’s real, regional and global, health risks it is a real risk. PIC realises these risks and has invested to ensure that the best genetic material can get to farmers no matter the local health situation, or in other parts of the globe. As stated earlier, expanding the population size of the PIC800 population went hand in hand with the establishing Elite Farms with meaningful size across the globe, from Europe to the Americas and Russia.

As with the new lines from Møllevang, the traditional PIC lines have all our genetic management tools deployed so we can

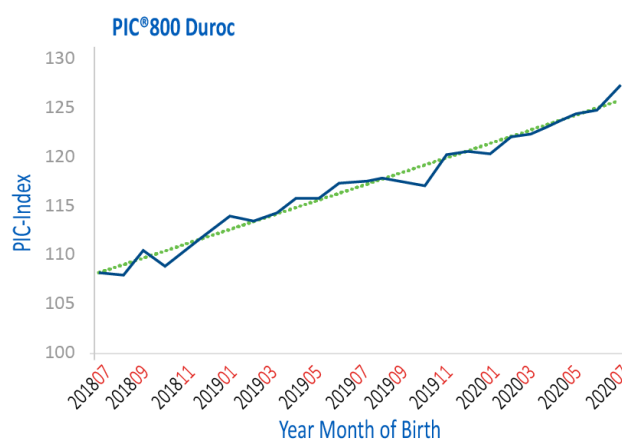


Figure 1 - Actual index trend for the PIC800



offer a fully transparent and real-time suite of genetic management reports and tools available for customers. It is important to us to deliver the best.

Picking up our example of the PIC800 again: With the implementation of the new index including additional traits and data, we can already see that the population is moving in the right direction. The graph shows the index trends for the PIC800 to demonstrate the improvement achieved.

In Summary

PIC has done significant work during the last years both on the new lines acquired, but also in the traditional lines with the absolute aim of resulting in a positive to impact customer systems. Regardless of genetic line the alignment of selection intensity, data capture, genetic tools, and genomic information result in a robust and cutting-edge program that will result in best genetic gain and deliver the most value to our customers. PIC is confident, that all the above, combined with the knowledge and expertise of the local PIC teams in the markets will result in best results for European farmers as we focus on the long term and futureproofed success.

For further information

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