The importance of breeding evaluation for genetic progress

Pig production keeps moving as fast as the world is changing.

Batch management system – invented in France – is not the only change that has made a revolution in pig production.

More recently, French companies have started to market fresh pig meat as antibiotic free. It means that upstream production conditions must be excellent in order to be able to raise animals from weaning to slaughter without antibiotics, while keeping production levels high. All the links in the chain are winning from this improvement.

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France is known all over the world for its high production performance achieved due to excellent genetic potential accompanied by high hygiene levels.

Issues for future years must be prepared today. The mission of pig genetic companies is to provide solutions for tomorrow's needs. The trend is to produce more rationally, while respecting producers' requests, meat processors' exigencies and consumers' expectation.

Nucleus has over 20 years of experience in genetic improvement and the company always works in order to provide added value for all links in the pig chain: pig producers, slaughterhouses and meat processors. Our GGP herd is composed of 5,000 GGP sows, making it the largest GGP herd in France.

Production criteria

Our purebred Large White sows weaned 13.8 piglets per litter, which is more than 34 piglets weaned per sow per year. The heavy birth weight of 1.400kg and homogeneous weight at birth and weaning enable our Large White line to reach 100kg in only 150 days.

On terminal lines, impressive daily gain (120 days of life to reach 100kg live weight) and very low feed conversion (close to 2.00) are the usual performances of terminal boars used by Nucleus producers.

Reduction of costs

A key point in pig production will be the reduction of production costs. Decidedly, feed is the most important intake. Regardless of feed quality, feed conversion ratio (FCR) and average daily gain (ADG) are the most efficient factors to take into account to reach this universal goal.

Beyond prolificacy, heavy and homogenous piglets born from autonomous sows will be strategic to successful pig breeding.

To achieve these objectives, the breeding goal has been well balanced between production and reproduction criteria (see Fig. 1).

Some 55% is put on maternal qualities (number of piglets born alive, average birth weight of piglets, standard deviation of birth weight of piglets) and 45% on production criteria (feed efficiency, meat percentage, meat quality . . .).

Once the breeding goal is designed, criteria, tools and rules must be defined to apply it. For example, Nucleus developed a tool to easily weigh individual piglets at birth while identifying them.

The farm manager has been trained to assess maternal qualities of sows such as their ability to farrow without assistance and their behaviour towards their piglets.

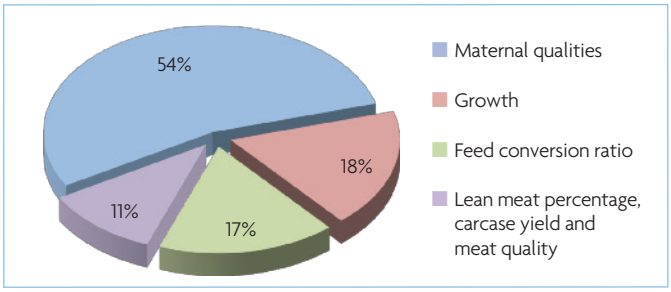

Fig. 1. Breeding goals for the female line.

Criteria	Annual expected genetic gain
Born alive	+0.53 piglets
No. of piglets weaned	+0.44 piglets
Average birth weight	+47g
Feed conversion ratio	-0.027
Lean meat percentage	+0.52%

Table 1. The annual expected genetic gain for the Large White breed based on the breeding goals shown in Fig. 1.

Genomics is routine

Genomic evaluation is now routine on female lines for faster genetic progress. For some specific markets, Nucleus has developed male line

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Identification and individual weighing of piglets at birth.

Air filtration system.

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tools and software to assess, on farm, intra-muscular fat on live animals. Moreover, feeding equipment has been implemented on farm to measure feed efficiency in boars individually. It enables producers to accurately identify the most efficient lines.

Since genetic improvement is based on data collection, all these data are registered in unique software used on all Nucleus GGP farms in France and worldwide (Spain, China, Korea) in order to carry out the same breeding evaluation. Breeding values are comparable wherever the animals are raised.

Hygiene status

In order for the expression of the breeding potential of animals to be maximised, the hygiene status of animals is a milestone.

Since its start, Nucleus has always put biosecurity rules at the heart of its core activities in order to deliver high hygiene animals to its partners.

As well as strict biosecurity rules, Nucleus have buildings under air filtration and air over pressure which is state-of-the-art for pig farms. Consequently, Nucleus is able to provide, whatever the breed, animals that are free of all the main contaminants (Mycoplasma hyopneumoniae, Actinobacillus pleuropneumoniae (1-12), PRRS, rhinitis (Pasteurella multocida toxinogena)).

Partnership worldwide

Applying the same breeding and biosecurity rules on partners' farms as on Nucleus French farms is the way and the challenge to get the same genetic progress abroad as in France. Nucleus has been managing this challenge with Spanish partners for more than 15 years and more recently in South Korea and in China.

Populated in 2013 from GGP farms in France, Huanshan Company has set up a farm in Shandong Province under air filtration.

From that time and based according to criteria registered on the Shandong farm in the breeding software, the animals are evaluated monthly according to French BLUP evaluation (see Table 2).

Late in 2015, a new Chinese farm based in Henan province was populated with Nucleus GGP animals coming from France. This farm is a joint venture between the Chinese Company Xinda Muye and the biggest French Pig Cooperative Cooperl.

This farm with buildings under air-filtration is currently under the supervision of a French manager. He is in charge to teach Chinese farm managers how to obtain and express the maximum genetic potential of Nucleus animals by applying exactly the same rules and management concepts as breeding farms in France.

Nucleus proposes win-win relationships with its foreign partners. Maintaining large GGP herds in France enables Nucleus to carry out very high selection pressure (only 2% of Nucleus' best boars enter into AIC). Foreign partners have access to these high genetic potential animals through purchase of live animals and later through semen.

Nucleus implements, through its own software, BLUP evaluation on all animals that are tested and that have performances in France and abroad. Consequently, genetic values of animals are calculated based on their own performance but also on the performance of all their relatives (parents, brothers, sisters, sons, daughters . . .) whatever the location where they are reared. This means it is possible to compare genetic level and genetic progress in each farm whatever its location.

Applying worldwide biosecurity and technical and genetic rules is the challenge to maintain high hygiene status, achieve high technical results and achieve expected genetic progress.

Nucleus provides all the biosecurity, technical and genetic support for its partners to get the expected results. Our products are ready to accompany you into the future. ■

A technical and genetic audit being carried out on a foreign partner farm by Nucleus.

Table 2. Breeding evaluation of gilts after on farm testing.

	Weight (kg)	BLUP			
		Production	Born alive	Maternal qualities	Global
353AS503319	109	109	1.2	134	135
353AS503321	109	109	1.3	135	136
353AS503323	97	101	1.4	139	133
353AS503326	100	100	1.4	138	132

References are available from the author on request