Genetics Technical Module-4)
Genetic Dissemination and Lag

In Newsletter 4 of the Genetics Technical Module we're focusing on Genetic Dissemination and Lag and how to manage it in a commercial herd.

Genetic Dissemination

Dissemination means to spread something widely. For the pig industry, genetic dissemination refers to the distribution of superior genes from the genetic nucleus to respective commercial herds. This allows continuous genetic improvement throughout commercial production systems. For all agricultural animal production, both selection for and dissemination of genetic improvement through multiplication occurs through a pyramid structure with nucleus, multiplier and commercial levels (Figure 1).

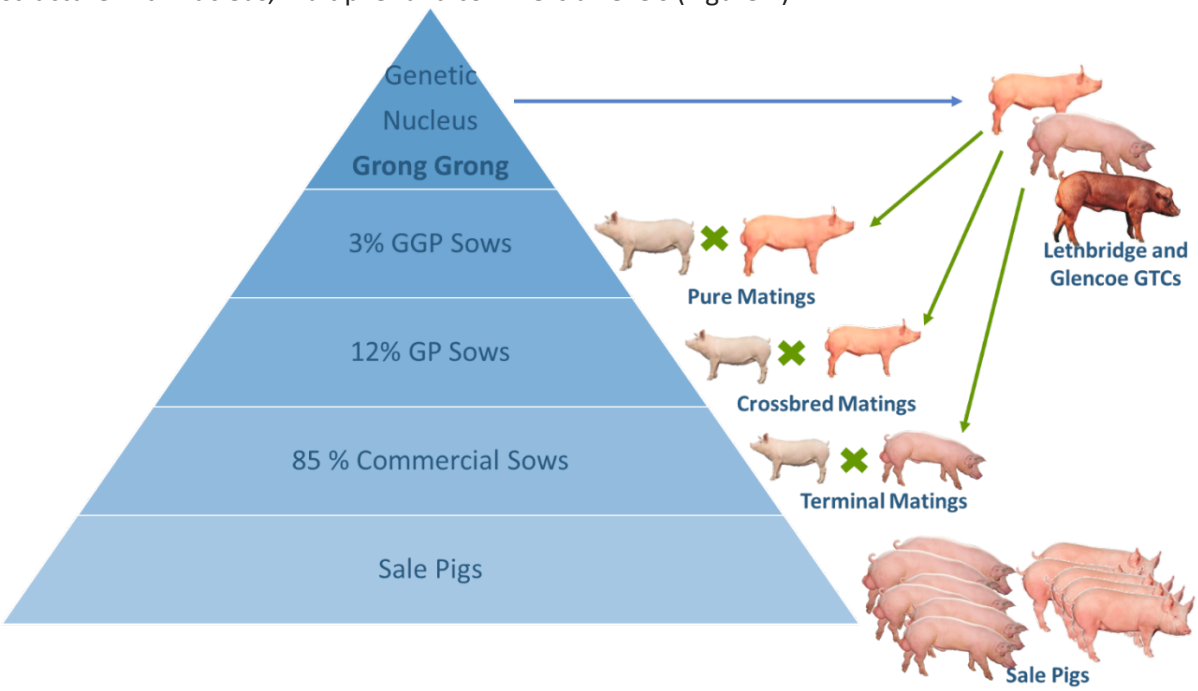

Figure 1. Pyramid multiplication structure to produce breeding stock and disseminate elite genes (GGP-Great Grand Parent; GP Grand Parent)

Selection of stock occurs at all the different levels seen in Figure 1. Genetic improvement only occurs in the genetic nucleus within Pure Line animals and when Pure Line matings are performed. The selection objectives of the nucleus are regularly reviewed to make sure that they reflect the production goals of farms supplied by the genetic nucleus both now and into the future. The objectives of a Genetic Nucleus are to:

- Improve Pure Line traits and implement programs that will optimize the profitability of the customer, when the genes are disseminated through the system
- Develop new lines
- Supply required breeding stock/semen to customers
- Supply of genetically superior boars to service client's farms through Gene Transfer Centres (GTCs)

Genetic Lag

The genetic gains selected for in the GN are not experienced on the commercial farms overnight or even within a few months. How quickly the elite genes from the Genetic Nucleus are expressed in the market pigs of a commercial farm is known as the **Genetic Lag** (Figure 2). This time period is generally between 2-5 years. Meaning that the genetic level of performance seen in current market pigs, had been selected for in the Genetic Nucleus 2-5 years ago; also, the improvements being made today in the Genetic Nucleus will not be seen in market pigs for 2-5 years. This time frame can be longer if breeding management does not keep in mind genetic management.

The importance of trying to reduce Genetic Lag as much as possible can be seen in Figure 2, where the herd with the low level of Management is over 2 years behind the high-level herd and more than 4 years behind the Genetic Nucleus. This means the genetic potential affecting the production efficiencies within the Low Level herd are well behind that of the High Level managed herd.

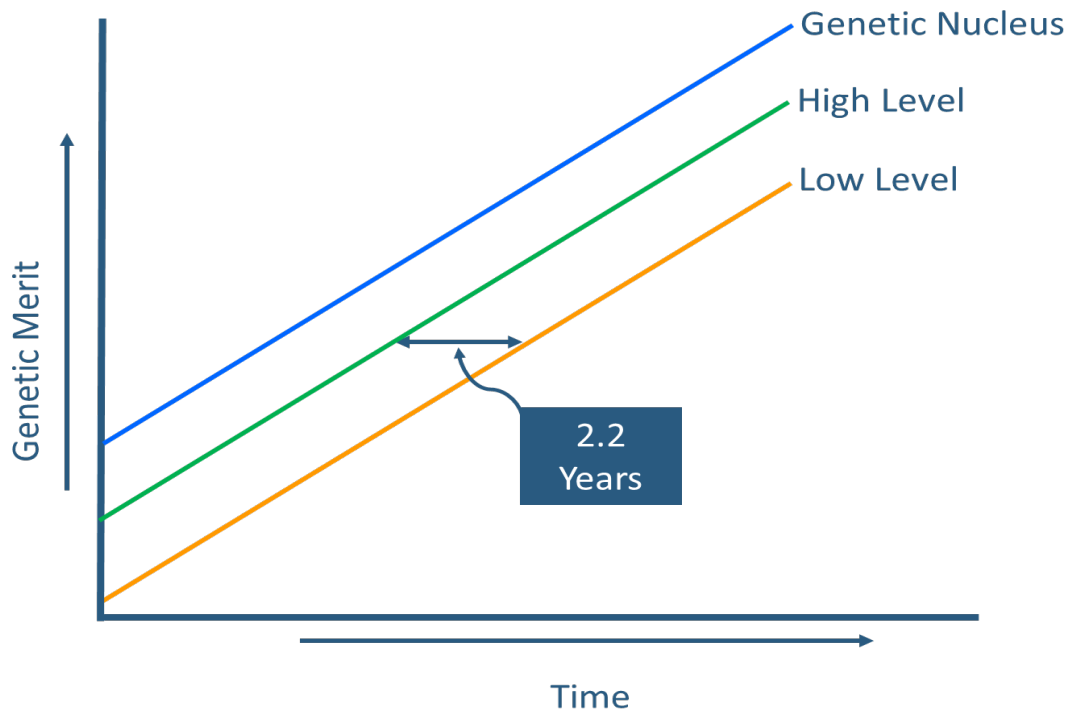

Figure 2. Differences in Genetic Lag between the Genetic Nucleus and two herds differing in the level of Genetic Management.

Every farm serviced by a genetic nucleus is different; so a one-size-fits-all approach for managing genetic lag and dissemination isn't suitable. PIC Australia manages genetic lag and dissemination on farms through three different avenues:

1. Live animal input
2. Closed Herd Multipliers

3. Use of Liquid Genes

Live animal input.

Commercial herds purchase their Camborough gilts direct from the GN and either obtain Liquid Genes from the GTC or boars from the GN, to produce market pigs. Purchasing Camborough

Use of Liquid Genes

Using Liquid Genes from the GTC reduces Genetic lag as these boars are superior sires originating from the GN. Being collected for Liquid Genes rather than performing natural services enable these superior boars to service large volumes of sows weekly, compared to a natural mating, which only allows for a single sow mating/week.

Management that affects Genetic Lag

There are several management factors within non GN farms that influence Genetic Lag. These are:

1. **Insufficient replacement rates**. Most multiplier herds are operated as commercial herds with standard replacement rates which increase genetic lag. Replacement rates within Pure herds should be set at 65% to ensure regular replacement of breeders with genetically superior gilts. “Replacement” regarding Pures doesn’t necessarily mean culling out of the herd; if they’re productive sows they can be bred to produce Camboroughs

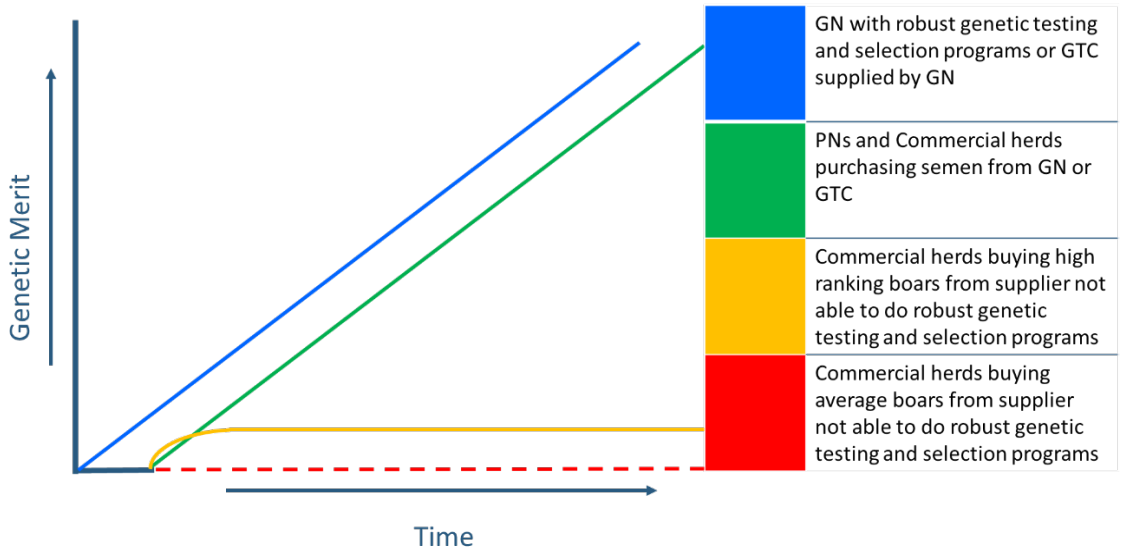

Figure 4. The importance of evaluating boar/semen suppliers (adapted from "Efficiency of Genetic Transfer using AI Technology" Todd See https://projects.ncsu.edu/project/swine_extension/genetics/selection/efficiency.htm

5. **Selection Accuracy.** All factors that relate to this point are controlled on farm; its about making sure you have enough of the correct type of gilt to disseminate genetic improvement and reduce genetic lag in your system. These factors include:
    - Using the correct semen to inseminate the correct sows and gilts;
    - Identifying the pure-bred piglets at birth;
    - Selecting required gilts on a weekly/monthly basis;
    - Mating adequate numbers to meet requirements;
    - Concentrate on quality in selections, and
    - Proper care of the pure-bred breeders.

In the next Pig Improver Newsletter, we'll be having a closer look at Genomics and the benefits it provides for Genetic Improvement.

References

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