# Building a productive, efficient and resilient pig herd

Efficiency in a swine operation may be simply defined as the cost to produce a kilogram of pork. Many factors influence efficiency of pork production and hinge heavily on productivity and ensuring herd health. This minimises input cost whilst optimising the growth performance of growing pigs and the reproductive performance of sows. This article focuses on how to prepare the sow for a long productive life and the production of high quality piglets.

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Overall sow productivity can be measured by the number and quality of piglets weaned per sow per lifetime. Piglet quality affects piglet pre-weaning survivability and greatly influences the subsequent growth and productive performance. Piglet quality is determined by the management and nutritional intervention received by the gilt/sow. It is therefore important to ensure that gilts and sows are provided with the necessary management and nutritional support to achieve maximum productivity.

## Gilt preparation

The objective in gilt preparation is to ensure a long, productive life by optimising bone mineralisation, uterine capacity, ovulation rate, high conception rates, and shorter farrowing duration. These parameters also influence the quality of piglets that these gilts will produce.

Gilt preparation ultimately begins at birth if not before. Genetic selection for increased litter size has resulted in increased numbers of piglets with lower birth weight.

Replacement gilts with low birth weights had been associated with compromised growth, production and longevity. Thus, selection for increased litter size should include evaluation of the average piglet birth weight in large litters. Average litter birth weights (or the variability in birth weights within litter) may reflect the uterine capacity in large litters.

Breeder premix should be fed ideally from at least 60kg of live weight to allow gilts to build up good minerals and vitamins. Premixes for finishing pigs are designed to support optimum growth performance and carcase and meat quality, but not the requirements to optimise mineral reserves, oocyte quality and overall fertility.

It is important to note that vitamin premixes for finishing pigs typically contain lower levels of fat-soluble vitamins A, D, E, and K, and modest levels of biotin, and folic acid. Gilt developer diets that contain breeder premixes should be designed to ensure structural soundness, optimal fertility, and support immunity. Important minerals and vitamins for breeders include Ca, P, selenium, chromium, zinc, biotin, folic acid, and vitamins E, C, D and A.

Lameness is the second most common cause of sow culling (after poor reproductive performance, which ironically may be due to low-level lameness).

Lameness may be due to different factors, one of which includes nutrition. It is recommended to increase the levels of Ca and P for developing gilts by 10-15% compared with finishing pigs (bringing closer to the levels seen in gestating sow diets). This is to ensure better bone mineralisation for stronger legs and structural soundness. Moreover, the Ca to P ratio requirement to maximise bone mineralisation to support both structural soundness and milkability is higher compared with the Ca to P ratio for optimum growth. Thus, it further differentiates the requirement for minerals in finishing pigs versus developing gilts.

Premature or delayed first mating should be avoided. For optimal lifetime productivity, gilts need to meet the target weight and age at first mating and ideally be mated on their second or third oestrus. Sow survival rates and number of piglets born alive are influenced by body weight, age, and backfat thickness at first mating. The general target is 135-145kg body weight at first mating and 30-34 weeks of age, with a P2 backfat thickness of approximately 18mm (between 15-22mm). Gilts beyond this range of P2 and body weight will produce fewer piglets.

A further reason for early gilt selection is to ensure enough time for important health preparation including vaccination and quarantine. Gilts purchased from another farm require at least four weeks of quarantine before integrating them in the herd. It is important to ensure that the replacement gilts have high health status and are not a source of disease.

After the successful quarantine period, replacement gilts should be housed in groups and exposed to the rest of the herd to develop immunity to existing organisms. Gilts should also be vaccinated for pathogens that are already present in the herd. Nutritional support to the immune system such as supplementation of DHA and EPA (via marine or preferably algal sourced oil) and certain amino acids such as threonine and tryptophan is important to enhance the animal's response to vaccine.

To maximise gilt reproductive performance, energy intake should be enough during the luteal phase of first oestrus cycle as feed restriction reduces ovulation and thus may consequently reduce litter size of gilts bred at second oestrus. Ideally, gilt developer diets should be fed during the first gestation as young gilts require more amino acids to

support their body development. A gilt that is not provided with adequate nutrition during first gestation may not achieve optimal uterine capacity.

Manipulation of insulin response in gilts and sows by feeding starch or sugar as the main energy during the late luteal and follicular phase has been shown to improve ovulation rates, number of embryos, embryo weight, and placental weight.

Sows will ovulate a higher amount of eggs if they are in a positive state of growth. Both sows and gilts should be fed (preferentially using a lactation or specific mating diet) above their maintenance requirement before mating. Attempts to adjust the body condition of sows should not occur during this critical phase.

## Gestation

The prolificacy of the sows (determined by genetics) will influence their requirements for vitamins and minerals. High performing sows will have a higher requirement for vitamins and minerals to support larger litters and longevity due to greater export of these nutrients. Sows raised in environments where appetite is limited may also benefit from higher levels of vitamins and minerals. Whilst commercial premixes are often generously formulated, it is important to review the premix in line with improved genetic performance.

Body condition scoring throughout gestation is important to ensure gilts and sows have the ideal body condition score at farrowing – too fat or too thin sows/gilts may not milk well and experience prolonged farrowing. Sows/gilts that are over-conditioned during the gestating period tend to eat less during the lactation period due to the elevated levels of non-esterified fatty acids (NEFA), consequently reducing milk output. The last stage of gestation to farrowing has elevated nutrient requirements due to increased foetal growth and mammary development. However, overfeeding of sows at this stage may have a negative impact on mammary development and consequently on milk production. Underfeeding of sows at this stage may result in reduced birth weights, increased variability in birth weights, and increased risk of mummified or stillborn piglets.

## Lactation nutrition and management

To maximise suckling stimulus and drive milk output and subsequent fertility, heavier and larger numbers of piglets should be fostered to primiparous sows. Piglets with a heavier birth weight are more efficient in obtaining milk than lighter piglets. Milk yield of primiparous and multiparous sows are similar if standardised for the number and weight of piglets, even though gilts generally consume an average of 18% less feed.

If appropriate multiparous sows are available, after the initial colostrum intake period, swapping light to average litter weight piglets from gilts may reduce variation in weaning weight within a population.

- **Primiparous sows:**

Ideally, it is best to use a gilt lactation diet for the first lactation. If this is difficult logistically, a top dress can be made for gilts and pure-bred sows. Gilt lactation diet accounts for the lower feed intake capacity of gilts compared with older sows and aims to support litter growth, avoid protein tissue loss, and allow modest body fat loss (10-20kg) gained during the gestation period. This strategy can also be applied to pure breed sows that generally have lower appetites.

- **Second litter syndrome:**

The effectiveness of a gilt preparation programme can be evaluated by reviewing the herd data. The success will be evident in a high conception rate of parity one sows (within 5% of the farm conception rate), a higher litter size in parity two versus parity one sows, and a stable parity profile. If the second parity litter size is lower than the first parity litter size and the conception rates are significantly lower for parity one sows versus the rest of the herd, this indicates that the sows have lost too much body condition (normally protein) during the first lactation and are not in a good physical condition to reproduce again.

- **Older sow management:**

Daily mineral intake relative to body weight of sows with at least parity three is between 15-23% less compared with first parity sows. This may also be one of the reasons why average sow lifetime is only 3-4 parities instead of 5-6 parities. Adequate gilt preparation can minimise the rate of mineral depletion and structural decay, to ensure sows are retained within the herd beyond parity six.

## Piglet quality

As mentioned above, piglet quality is highly influenced by the management and nutritional strategies given to gilts and sows from pre-mating to the lactation period.

Gestating and lactating diets should also be formulated to satisfy nutrient requirements for better health and performance. Piglet pre-weaning survivability is determined by birth weight and intake of colostrum and milk. Hence, gestating and lactating diets should be designed to support production of heavier piglet birth weight and optimise colostrum and milk production during lactation.

Several nutritional interventions have been evaluated to improve piglet birth weight. This includes increasing the feeding level in late-gestation in gilts, increasing essential amino acids during the late gestation in multiparous sows, and supplementation of L-carnitine, among others.

The quality, quantity and intake of sow colostrum and milk are important to support immunity and growth of piglets. Innate immune response and the intestinal epithelial barrier are fundamental components of the first line of piglet defence against diseases. Maternal antibodies (IgG, IgM, and IgA) and immune cells are not transferred to the piglet via the placenta. However, maternally derived antibodies are transferred via colostrum and milk to provide passive immune protection to maintain piglet health and immunity in later life. Vitamin D plays a non-classical role in the development of innate and adaptive immunity of piglets, including the healthy intestinal epithelial barrier in piglets. It regulates immune cell proliferation and its function.

The combined transfer of maternal antibodies, immune cells, and 25OHD3 via colostrum and milk will aid in boosting both the innate and adaptive immunity and promote gut integrity and reduce inflammation. It is therefore important to ensure that each newborn piglet suckles enough colostrum within six hours of birth and has access to adequate milk supply throughout the lactation period.

Sow/gilt nutrition influences colostrum and milk yield and quality. Colostrum yield may be improved by supplementing specific types of fibre during gestation. Increasing the concentration of vitamins A and E in the gestating diet has been shown to increase the level of these vitamins in the colostrum. Increasing the level of vitamins A, C, or E in the gestating diet improved the IgG status of piglets by improving IgG absorption in piglets. The form of minerals also needs to be considered when supplementing gestating and lactating diets. Use of organic selenium during late gestation resulted in increased selenium concentration in the colostrum compared with sows supplemented with inorganic selenium.

## Conclusion

An important way of ensuring herd efficiency is by preparing gilts appropriately for a long productive life. This may start as early as birth, ensuring that the potential gilt is coming from good quality piglets. Management and nutritional interventions that are needed to prepare the gilt for the succeeding pregnancies should then be adopted. Once a well-bred and fed gilt is operating in the herd, it is important to continue to feed it well, especially at critical points during pregnancy and lactation.

By doing so, the sow will be in the best position to produce more, high quality piglets and be able to support them throughout lactation for better survivability and growth performance. ■

**References are available from the author on request**