Director's Digest
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FEEDING PROGRAMS FOR SOWS

Emphasis on Energy Intake

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It has been so interesting to follow the various recommendations available for feeding sows and gilts, likewise, noting the constant changes for refinement. Many of the recommendations, however, have by necessity been based on limited research. Sow research, due to the extreme variability that exists in the parameters measured (i.e., pigs born live, pigs weaned, conception and farrowing rates), all require substantial numbers of subjects per treatment to measure statistical differences. It has been determined that approximately 100 sows per treatment are required to measure a difference of 0.2 pigs weaned per litter, or 0.5 pigs born live. Thus, many recommendations are made on less than adequate science.

There are many similarities, however, among recommendations as evidenced by the comparisons of a number of commercial feed brochures obtained at the recent state Pork Producers Expos. Three primary components are usually the foundation of most commercial sow feeding programs. First, most have a specific gilt development recommendation. Secondly, most have specific feed intake recommendations for different stages during gestation. These stages and intake levels, even though they vary somewhat, are generally directed at maintaining or developing optimum body condition while recognizing the need for additional energy during the latter part of gestation. And thirdly, most all programs emphasize the metabolic challenges of lactation and the need to maximize feed/energy intake.

There is good logic and adequate research documentation on which to base these corners of the sow/gilt feeding triangle. Certainly, gilt nutrition and development play a key role in a breeding herd's success. Developing gilts that should carry genetic potential for enhancing the herd's productivity will likewise be carrying genetic potential for exploiting lean gain of their offspring. This generally means that they themselves will be leaner, and still growing and developing as they enter the herd. Thus, nutrient levels and feed intakes should reflect this added requirement.

The primary goal of gestation feeding programs is that of conditioning the sow with optimum body and back fat cover while providing the nutritional requirements for each stage of her developing litter. Recent considerations in gestating sow feeding strategies have become more precise and initially may appear more complex. However, rethinking the gestation feeding regime can help maximize productivity during lactation. Milk production in the lactating sow is influenced by several factors, including lactation feed intake and the number of piglets suckling the sow. It has been determined that gestation feeding strategy greatly influences feed intake and thus milk production in the subsequent lactation. A S-145 cooperative study conducted a number of years ago and reported by Coffey et al demonstrated the interactions of gestation and lactation feed intakes. In studies conducted more recently at the University of Nebraska, sows that were fed restricted diets consumed significantly more feed during subsequent lactation than sows fed ad libitum. Thus, one cannot concentrate on only one side of the program triangle.

The actual milk production capacity of the sow is determined by the number of secretory (milk-producing) cells as well as the activity of those cells. Both of these factors can be manipulated by the amount of feed (energy) supplied to the sow during certain critical stages of gestation. As opposed to a constant level of energy intake throughout gestation, milk production can be optimized by breaking the gestation period into at least three distinct periods with specific modifications during the breeding process and at farrowing. These periods are early pregnancy (up to 50 days), mid-pregnancy (50 to 90 days) and late pregnancy (90 days to farrowing).

Early pregnancy feeding rates should be determined primarily by sow body and back fat condition and the environmental temperature of housing. The maintenance level is generally considered to be 4 pounds per head per day for sows housed at 68°F. Feeding levels should be increased 0.1 lbs. per head per day for each 2 lbs. of early pregnancy gain desired and an additional 0.1 lbs. daily for each 1°F drop below 68°F. It is desired that most of the body weight loss of lactation be restored during the first 50 days of subsequent gestation. Sows that have lost considerable muscle and fat stores may continue to lose weight during the first 10-14 days of gestation. Trends for earlier weaning continue, and with the advent of MEW (medicated early weaning) and SEW (segregated early weaning) programs, weaning occurs from 10-17 days of age. Thus, less lactation sow weight loss occurs. This practice, along with the majority of sows housed in controlled environments, negates the need for major increases in feed intake during this phase.

Modifications are indicated prior to and following breeding. Reproductive performance has been shown to be enhanced with a high plane of nutrition at time of breeding. Conflicting research, however, is available for the effect of feeding level post breeding. Research during the late 1970s indicated that embryo implantation is negatively affected with elevated post breeding feeding rates. There have been more recent studies demonstrating no connection between feeding level in early pregnancy and litter size. The recommendation to moderate feed/energy intake for the first 13 to 14 days following breeding is a conservative approach that is still often made with some validity.

The use of animal fat to the ration during this period as well as mid-pregnancy at 1 to 1.5% for dust control and reduction in feed wastage is a sound management practice.

Recent research has suggested that the number of milk-secreting cells in the mammary gland is determined during the 50-90 days of gestation. The exact controlling factor has not been identified other than an associative negative correlation with energy intake supplied during this period has been noted. It is speculated that any excess energy is deposited as fat in the mammary tissue which would limit secretory cell proliferation resulting in fewer milk secretory cells and thus less milk production during lactation.

Consequently, the feeding strategy during mid-pregnancy should focus on body maintenance with energy levels adjusted for environmental variances. It should be noted that variances in feed intake influences the concentrations of all other nutrients (protein, amino acids, vitamins, macro and micro minerals) that must be adjusted accordingly.

The need to respond to the rapidly-developing fetus during late gestation has been demonstrated in many research studies. Each fetus will gain approximately 40% of its final weight during the last 21 days of gestation. Increasing the feeding and energy level starting at 90 days of gestation provides several benefits. Rations supplying 5% supplemental fat during this last gestation period has been shown to increase pig size, increase in body fat stores and thus greater body energy. These characteristics enable the pig to suckle sooner after birth, more aggressively and thus obtain even more energy, enhancing its chances for survival. The positive correlation of increased pig weight on pig survivability has been demonstrated many times. Supplemental fat has also resulted in increased milk production and fat concentration of both colostrum and milk. It has been recently reported that the major enzymatic changes in the sow's mammary gland starts around day 90 of pregnancy to prepare the gland for lactation. The activity of the secretory cells established during mid-pregnancy can be enhanced by providing extra energy which further enhances lactation milk production and increased litter weights. Therefore, the feeding of 6 to 7 pounds of late gestation ration containing added fat (5 to 10%) is a prelude to optimum farrowing and lactation performance. During the imminent days surrounding farrowing, it is best to limit ration intake to 3 to 4 pounds. This allows the digestive tract to empty and stimulate appetite as well as reduce the incidence of pre and post farrowing-related diseases/conditions.

Following farrowing, the emphasis should be on maximizing energy intake. Lactation

demands for energy are becoming more pronounced as the genetic potential and gestation feeding refinements enhance the ability to produce milk. Evidence of high-producing sows producing up to 30 lbs. of milk per day during peak lactation is available. Unfortunately, most sows are unable to consume sufficient dietary energy to fuel the processes of milk synthesis. She must mobilize body stores of fat as well as protein. The problem is again accentuated as litter size increases, as milk production is correlated to number of pigs nursing. Therefore, nutritional programs that incorporate strategies to maximize energy intake and minimize weight loss must be used. In addition to the important production measurement of litter weaning weights, the sow must be able to rebreed. Days to estrus, nonproductive sow days, and sow longevity (turnover rate) are some of the primary economic evaluators of a swine operation. Excessive weight loss during lactation can affect all of these measurements by contributing to longer rebreeding intervals and increased culling rates.

Fats play a unique and beneficial role as a concentrated source of energy-yielding nutrients in modern swine diets for high-biologically productive sow herds. There are many reports in the literature concerning the beneficial influence of feeding fat-supplemented diets during pre-farrowing and lactation relative to both sow and pig performance. Studies that involve single lactations perhaps do not always measure the full advantages of optimum energy intake. Research involving studies over multiple lactations and/or evaluate subsequent reproduction, generally show fat-supplemented diets exhibit even more beneficial results that include enhanced longevity. R. N. Kirkwood and his associates at the University of Saskatchewan demonstrated that sows fed higher-energy (fat-supplemented) diets during lactation had larger litter sizes at the second and subsequent farrowings when compared to sows on control corn-soybean meal diets. The results indicated a greater number of live pigs at birth as well as number and weights weaned. But equally as important, the sows fed the high-energy diets experienced greater longevity with a greater number of sows that obtained four parities. In this study, 58% of fat-supplemented sows farrowed at least four litters, compared to 47% of the control sows. Thus, it was concluded that energy intake of the sow during lactation influences its subsequent reproductive performance and longevity. When evaluating cost analyses, it is important to monitor and document culling rates, replacement rates and average herd parity (longevity).

One recent evaluation of a production model, conducted by Tom Stein, DVM, of Knowledgeworks, Inc., utilized the Pigtales(R) database. Dr. Stein reported that herds ranking in the lower 10% of profitability had culling rates and replacement of 52.9 percent and 59.8 percent, respectively, compared to 43.9 percent and 49.9 percent respectively for those herds in the top 10 percent of profitability. Please refer to the following Table.

	Bottom 10%	Bottom 33%	Average	Top 33%	Top 10%
Sow inventory	500	500	500	500	500
Nonproductive sow days	111.5	90.5	67.2	47.6	41.6
Culling rate	52.9%	51.7%	48.5%	46.5%	43.6%
Sow death rate	6.9%	7.7%	7.3%	6.8%	6.3%
Replacement rate	59.8%	59.3%	55.8%	53.3%	49.9%

Figures noted above taken from Pigtales(R) database Source:
Tom Stein, DVM, Knowledgeworks, Inc.

Without doubt, among the many dramatic changes occurring in the swine industry, history has shown feeding recommendations for sows one of the areas in constant change. Emphasis on productivity and proliferacy has necessitated these changes. The Fats and Proteins Research Foundation has been very instrumental in supporting research in this important area. Many of the basic current concepts of energy nutrition influences upon reproductive efficiencies were founded upon FPRF-funded research. There still are many unanswered questions that continue to be raised as swine production continues to change at an unprecedented rate. The dedication of the research community to seek out these answers will continue to be ever present, for which we are appreciative. FPRF will continue to assist in this endeavor.