factsheet
Pork Information Gateway

Feeding the Gestating Sow

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Introduction

The purpose of the breeding herd is to consistently produce a targeted number of high quality weaned pigs in an efficient manner and at low cost. Feed costs in the breeding herd constitute about 12% of the cost of producing a market hog. More importantly, the feeding program in the breeding herd can significantly influence sow productivity and longevity in the herd. Most costs, including feeding costs, in the breeding herd are fixed costs and therefore, increased breeding herd efficiency will reduce overall production costs. Therefore, there is considerable scope to reduce input costs and increase production efficiency through improvement in the feeding of the gestating and lactating sow.

Objectives

The objective of the feeding program for gestating sows is to achieve an appropriate, targeted sow weight gain during gestation that will allow optimum litter development and prepare the sow for lactation.

Feeding for lifetime productivity

All phases of the reproductive cycle are interrelated. Therefore, the feeding and management of the gestating sow can influence feed intake and sow performance during subsequent phases of her life. High feeding levels in gestation that result in backfat levels at time of farrowing of 0.83in. or more will reduce feed intake during lactation, especially in early lactation of most genotypes (Weldon et al., 1994; Revell et al., 1998). On the other hand, if sows are underfed during gestation and have low levels of backfat at farrowing, they may have reduced milk production and poor reproductive performance after weaning. Average sow replacement rates in the USA were about 60% in 2003 with a range of 33-86% (Deen, 2003). Reproductive and feet and leg problems continue to be the major causes of culling. The main factors contributing to such high replacement rates are:

- Genetics: leaner, faster growing, more prolific animals
- Disease e.g. PRRS
- Increase in farm size: less time devoted to individual animal care
- Lack of a skilled, motivated, knowledgeable labor force
- Management practices adopted in an effort to increase profit margins e.g. early weaning, early breeding, reduced labor input
- Inadequate feeding programs for gestating and lactating sows

Therefore, the aim is to neither under- or over feed the sow at any stage of her life cycle.

Guides to determining feeding allowances

During gestation the pregnant sow requires nutrients and energy to maintain her bodily functions, for weight gain and to supply the developing litter (NRC 1998). Maintenance represents 75-85% of the total energy requirement of the pregnant sow (Noblet et al., 1990). Maternal weight gain represents approximately 15-25% of the energy requirement of the sow. The composition of the maternal bodyweight gain will vary with parity, the amount of weight gained and the composition of the diet fed. Therefore, the energy cost per lb of maternal gain can vary from 1.4-2.3 Mcal ME/lb (Noblet et al., 1990).

The developing litter and its supporting tissues (products of conception) will account for about 45lb of the total weight gained during pregnancy (Aherne et al., 1999). But these tissues are very high in water content and therefore only require about 3-5% of the sow's energy requirement, usually 0.2–0.3 Mcal ME per day. Because the developing litter has a very high priority for nutrients, feeding levels during gestation have to be very low before they will reduce litters size or birth weight of sows that are in normal body condition.

The actual feed allowance to meet these energy requirements will obviously in influenced by:

- The energy density of the diet
- The weight of the sow
- The amount of weight gained and the ratio of fat to lean in that weight
- Health status
- Environmental conditions in which the sow is kept
- Method of feeding

Because so many factors influence the actual feed requirements of sows a successful feeding strategy should be based on individual sow needs. The feeding program should be based on some estimate of sow weight, backfat and/or body condition at the time of breeding. This program should be designed to:

- Allow all sows to gain sufficient weight during gestation to achieve a backfat level at farrowing of 0.7-0.8in (backfat is measured 2.5in. from the midline of the sow's back at the 10th rib)
- Allow optimum litter development
- Minimize variation in sow body condition (backfat at farrowing).

Estimating sow feed allowance

In many herds condition scoring is used to determine the feeding level of the pregnant sow. It is assumed that condition score reflects the level of fatness of the sow. Usually sows are assigned a condition score of 1-5 based on visual assessment and palpation of the sows back at the position of the hip bones. A score of 1 is given to very thin sows and a 5 would be a very fat sow, with a score of 3-3.5 considered optimal. A feed allowance based on experience is then assigned to the sows. However, condition scoring does not accurately reflect the backfat level of sows. In numerous trials and field tests sows with condition scores of 3.0 had a range in backfat of 0.4-1.1in. A similar range in backfat was found for all condition scores also, different evaluators assign different scores to the same sows and they are inconsistent over time. Regardless, of the overall condition of the sows in the herd, the condition scores always tend to range from 1.5-4.0. A further limitation of condition scoring is that even if it's done well there is no scientific basis for the assignment of a feeding level to any particular score.

A feeding strategy based on an estimate of sow weight and backfat level
Sow weight

The maintenance energy requirement of the sow will depend on the weight of the sow. For every 100lb increase in sow body weight her maintenance requirement will need to increase by about 1/3 of a pound of feed per day. Therefore, any feeding system that ignores sow weight will be unsatisfactory. But most farms are not equipped or prepared to spend the time, effort or expense of weighing sows. Therefore, feeding tables must be developed on visual estimates of sow weight or from regression equation developed at Kansas State University using flank to flank measurements obtained by use of a cloth tape (Figure 1; Young et al 2004) The regression equation developed was:

Sow weight, lb = 26.85 x (Flank measurement in inches) – 628

This equation was then used to develop the estimates of sow weight shown in Table 1.

Flank to flank, cm	Sow appearance	Estimated Sow wt., lb	Backfat at breeding, mm			
			< 12	12-14.9	15-18	> 18
83 to 90	Very light	250 to 330	5.3	4.6	4.2	3.5
91 to 97	Light	330 to 395	5.7	5.3	4.6	4.2
98 to 104	Medium	395 to 475	6.2	5.7	5.3	4.6
105 to 112	Heavy	475 to 550	6.8	6.2	5.7	5.3
113 to 127	Very heavy	550 to 650	7.3	6.8	6.2	5.7

Table 1. Feeding allowances (lb/d) based on backfat (condition score) and a "guesstimate" of sow weight (day 0 to 100) Adapted from Young et al., (2004)

Backfat measurement

There is no convincing evidence that backfat thickness, by or of itself, has an influence on sow reproductive performance. In many studies and on most farms there are sows that perform well even though they have low levels of backfat. In a recent study at Kansas State University, sows with relatively low levels of backfat (0.49in.) at breeding had reproductive performance as good as sows with high levels of backfat (0.73in.; Young et al., 2004). Therefore, backfat by itself is not a reliable predictor of subsequent sow reproductive performance. It is likely that a thin sow that is gaining weight and putting on backfat will be more productive than a fatter sow that is losing weight or backfat. However, backfat level is a good indicator of the sow's body reserves. The less backfat she has, the less reserves she has and so the margin for error in underfeeding the sow is very small. If a thin sow has to draw on body reserves during lactation to support milk production and has little backfat, she will mobilize her protein tissues as an energy source to meet her needs. It has been shown that if a sow mobilizes more than 12% of her protein stores during lactation, litter growth rate will be reduced and subsequent reproductive efficiency will be compromised (Clowes et al., 2003). Backfat can be measured electronically. These machines are durable, relatively inexpensive and are easy to use after some training.

Figure 1. Pictorial illustrating flank to flank measurement.

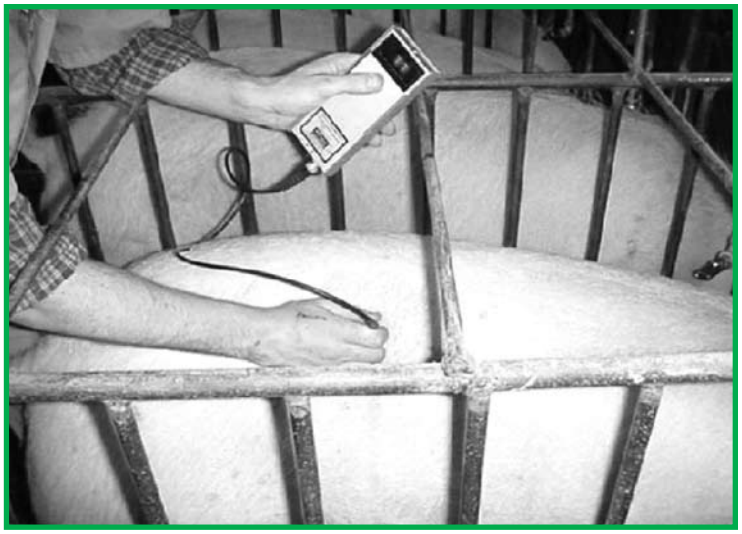

Figure 2. Illustration of Renco Lean Meater being used to measure backfat thickness

Measuring backfat

Suggested target backfat levels for sows might be :

Backfat level, in.*
At breeding 0.60-0.65
At farrowing 0.75-0.80
At weaning 0.60-0.65
*backfat measured at the last rib, 2.5-3.0in. off the midline of the sows back (Figure 2).

It is important to note that the target backfat levels are not average herd values but are targets to be reached by every sow. A target of 0.7-0.8 in backfat at farrowing allows sows to lose 0.15-0.20in of backfat. It has been shown that sows with backfat levels of less than 0.55in at weaning have lower reproductive performance and are more difficult to get back in condition (Tantasuparuk et al, 2001; Young et al, 2004).

Thin sows (<0.50in. BF) have lower insulation levels, much higher activity levels, spend more time standing and therefore their maintenance requirements are much higher than those of fatter sows, for

some by as much as 1.25lb, feed per day (Young et al., 2004). In contrast sows with greater than 0.8in. BF at farrowing tend to have lower lactation feed intake, leading to poorer subsequent reproductive performance.

Suggested feeding allowances for gestating sows

Using data from published reviews (NRC 1998; Young et al., 2004b). A spreadsheet can be developed to determine the daily feeding levels for each sow based on her weight and backfat level at breeding. These feeding allowances also take into account the sow weight gain needed to attain the targeted increase in backfat required for each sow. The maintenance requirement is then calculated on the predicted mid-gestation sow weight. Therefore, these feeding levels can be fed from breeding to day 100 of gestation.

For those reluctant to use the cloth tape to take flank to flank measurement, the sows should be assigned to weight classes as shown in Table 1 based on visual appraisal. For farms not using backfat measurement they could replace the four backfat classes with condition scores of 1-2, 2-3, 3-4, >4. Thus this same feeding allowance table could be used with visual estimates of sow weight and condition scores.

Kansas State researchers have shown that adoption of a feeding system based on sow weight
and backfat will:

- Lower feed cost per sow per year by approximately $10
- A higher proportion of sows in the target backfat range of 17-21mm.

For this feeding program the diet fed should have a nutrient and energy content similar to that shown in Table 2. The suggested nutrient levels are based on NRC (1998) recommendations with an added margin of safety which is influenced by the price of the ingredient and on-farm experience.

A suggested amino acid pattern based on total amino acid levels is presented in Table 3.

It is assumed that the sows are individually fed and that the automatic feeding systems (drop boxes or electronic sow feeder) are accurate. Because gestation lasts for 113-116 days, small differences in daily feed intake can lead to large differences in sow weight gain and backfat levels at farrowing.

Barn temp should be kept at 68-70°F for sows in stalls with concrete slated floors. Below these temperatures a daily increase of 2-3oz. feed per day is required for each 2°F below these temperatures if the cold persists for long periods of the day. This feeding program could also be used for loose housed sows on electronic sow feeding systems. In such group housed sows kept on concrete or straw the lower critical temperature would be 60°F and 50°F, respectively.

Because gestating sows are usually fed once daily, it is not recommended that synthetic lysine be used to meet the lysine requirements.

Nutrient	Unit
ME, Mcal/lb	1.5
Total lysine, %	0.55
Digestible lysine, %	0.45
Crude protein	13.5
Fat, %	2.5
Calcium, %	0.90
Phosphorous, %	0.75
Av. Phosphorous, %	0.40
Salt, %	0.40
Zinc, ppm	100
Iorn, ppm	80
Manganese, ppm	40
Copper, ppm	10
Iodine, ppm	0.60
Selenium, ppm	0.20
Vitamin A, IU/kg	4500
Vitamin D, IU/kg	800
Vitamin E, IU/kg	30
Menadione, Mg/kg	2
Choline, Mg/kg	300
Niacan, Mg/kg	20
Riboflavin, Mg/kg	4.5
D-panthonenate, Mg/kg	15
Vitamin B12, Mcg/kg	17
Folic acid, Mcg/kg	600
d-biotin, Mcg/kg	100*

Table 2. Nutrient allowances for gestating sows. * Increase to 250 Mcg/kg if high wheat diets are fed.

Amino acid	Ratio relative to lysine
Lysine	100
Methionine + Cystine	64
Threonine	72
Tryptophan	20
Valine	65
Isoleucine	55

Table 3. Suggested amino acid pattern based on total or true illeal digestible amino acid formulations for gestation sows

Pattern of feeding

It is recommended that gilts be fed 4.5–5.0lb/day for the 2-3 days around the time of mating. All other sows can be assigned a regular feeding schedule (Table 1). On the majority of farms there is no advantage of feeding other than a constant daily intake from day 3 to 100 of gestation.

Late gestation

The energy and nutrient requirements of sows increase with advancing pregnancy especially in the last 10 days of gestation. Therefore, it is recommended that sows be fed 2.0lb extra feed from day 100 of gestation until farrowing. This higher level of feeding will prevent loss of sow condition (body stores) and prepare sows for increased feeding levels in lactation without any deleterious effects on the sow.

Summary

An essential part of any strategy to optimize sow reproductive performance, increase efficiency of feed usage and lower culling rate, is to control weight and backfat gain during gestation and weight and backfat loss in lactation. This is best achieved by individually feeding each sow a well balanced diet, and basing daily feed allowances according to an estimate of sow bodyweight and backfat thickness.

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