

Director's Digest

FATS AND PROTEINS RESEARCH FOUNDATION, INC.



DR. GARY G. PEARL D.V.M.
Director Technical Services

16551 Old Colonial Road
Bloomington, Illinois 61704

Telephone: 309-829-7744 FAX: 309-829-5147

<www.fprf.org>
Revised

Benefits of Supplemental Fat for Pigs¹

Gary L. Cromwell, Ph.D.
Professor, Swine Nutrition
University of Kentucky
Lexington, Kentucky 40546

There continues to be a lot of interest in using supplemental fat in swine diets. In the United States, fat use in swine diets has more than tripled during the past 15 years. Nearly 1.75 million metric tons of fat are used in animal feeds, and approximately 10% of this fat (180 million kg) is used in pig feeds.

At one time, adding fat to farm-mixed feed was not practical because the liquid fats (oils) were too expensive and the solid fats required a heating system. Today, it is both practical and economical. There are now companies in the USA that will install heated fat tanks on farms or at feed mills and deliver specific types of fat or blended fat to producers and feed manufacturers as needed.

Fat has several benefits, but like most things, it also has some shortfalls. Most of the time, the advantages outweigh the disadvantages. Research at the University of Kentucky and other institutes has shown that one can expect certain changes in performance when fat is incorporated into typical grain-soybean meal based diets. Some of these are illustrated in Table 1.

- **Increased caloric content of the diet.** Fat has more than twice as much energy as an equivalent amount of carbohydrate or protein, so when fat is added to the diet, the caloric density of the diet increases. On average, the ME (metabolizable energy) content of the diet is increased by about 1.4% (or 45 kcal/kg) for every 1 % added fat to the diet. For example, a corn-soybean meal diet, typically containing 3,200 kcal ME/kg, is increased to 3,425 kcal ME/kg when 5% fat is included in the diet.

- **Reduced feed intake.** Pigs tend to eat a given amount of energy according to their body weight and the temperature at which they are kept. So when the energy concentration of the diet is increased by fat addition, the pigs will eat less feed in order to eat a given amount of calories of energy. On average, feed intake is reduced by 3-5% for each 5% fat added to the diet. This means less feed to handle.

Presented at seminars Merida, Mexico City and Hermosillo, Mexico, June 17 19, 1997.

- **Increased weight gain.** Pigs fed added fat gain weight more rapidly. Unfortunately some of that weight gain is in the form of body fat - not all of it is lean gain. On average, weight gain is increased by 3-5% for every 5% fat added to the diet.

- **Improved feed efficiency.** Because of increased weight gain and reduced feed consumption, feed:gain is markedly improved with fat supplementation. The amount of feed per kg of gain is reduced by 8-10% when 5% fat is added to the diet. The advantage of the improved feed efficiency is that 25 to 30 kg less feed has to be mixed and handled for each pig that is marketed.

- **Decreased carcass leanness.** Unfortunately, carcass backfat is increased in pigs fed fat-supplemented diets. Typically, a 5% addition of fat to the diet increases backfat by about 2.5 mm. Overall carcass muscling does not seem to be affected, but slightly more fat in the carcass means proportionally less lean.

- **Improved feed quality.** Fat helps to prevent segregation of fine particles of feed from sifting and sorting away from the larger particles. As a result, there is less potential feed loss from feed dust and fines.

- **Improved air quality.** Reduced feed dust in swine confinement buildings when fat is included in pig feed has major advantages to both pigs and people. Airborne dust irritates lung tissue, and dust carries microorganisms that can further damage lung tissue. Research has shown that lungs of pigs fed fat in their feed have fewer lesions than lungs of control pigs. People working in buildings also have fewer respiratory problems when there is less feed dust in the air.

- **Increased reproductive efficiency.** Research with sows has shown that high fat diets during late gestation and during lactation increases the survival of newborn pigs, especially in herds having relatively poor survivability. A summary of a large number of experiments showed a 4% increase in pig survival to weaning when fat was added to the sows' gestation diet prior to farrowing. Another study at the University of Kentucky showed improvements in pig survival and growth weight during the nursing period when fat was added to lactation diets. These improvements may result from slightly heavier pigs at birth, increased milk fat, and/or increased total milk production in sows fed fat.

- **Reduced heat stress.** Fat does not produce as much heat when it is metabolized by animals as do other energy sources, so it creates less of a heat burden on animals during periods of potential heat stress. Studies at the University of Kentucky have shown that the benefits from fat are considerably greater in warm or hot weather than in cold weather. Also, research at North Carolina State University showed that sows in hot farrowing houses returned to estrus sooner after weaning and had less postweaning anestrus problems when fat was included in the lactation diet. Supplemental fat should be of maximum benefit in Mexico's hot summer climate.

Several types of feed-grade fats are available for on-farm usage in the United States. The most common types are blends of animal fats (greases and tallows) and vegetable fats. These commercial blends will commonly contain recycled restaurant greases from fast-food establishments (McDonalds, Kentucky Fried Chicken, etc.). In situations where it is not possible to have fat heating equipment, vegetable oils (e.g., soybean oil) can be used, but the vegetable oils tend to be more expensive than the animal-based fats. Solid fats can be purchased in small beadlets (called pelleted or prilled fat), but research at our university shows that fat in this solid form is very poorly utilized by pigs.

Diet formulation is a bit tricky when fat is used. Because fat reduces feed consumption in ad libitum fed pigs, the dietary protein (lysine) needs to be increased so that animals obtain the necessary amount of daily lysine to allow maximum growth to take place. As a rule of thumb, every 5 kg of fat should be combined with 2 kg of soybean meal and this 7 kg substituted for 7 kg of corn. This method of substitution will maintain a constant ratio of ME:Lysine.

At the present costs of corn (\$3.00/bushel or \$.12/kg) and soybean meal (\$.32/kg) in the United States, the shadow (break-even) price of feed-grade fat is about \$.35 per kg. This assumes that 5% fat will increase growth rate by 4%, feed efficiency by 9%, and backfat by 2.5 mm, and assumes that fixed costs are \$.20/day and that the increased backfat reduces the carcass value by \$.75/pig. The economic value of fat does not take into consideration the improvements in feed and air quality that goes along with the performance advantages. Today, the going rate for feed-grade fat delivered to farms or feed mills is about \$.34 per kg.

Table 1. Fat Supplementation of Diets for Growing-Finishing Pigs⁸

Item	Control	+ 5% Fat
Average daily gain, kg	. 81	. 85
Average daily feed, kg	2 . 62	2 . 51
Feed:gain	3 . 25	2 . 98
Carcass traits		
Backfat, mm	31 . 5	34 . 3
Ham-loin, % of carcass	43 . 4	42 . 3
Lean, % of carcass	49 . 5	49 . 5

⁸Eight experiments at the University of Kentucky and the University of Nebraska involving 300 growing-finishing pigs from 29 to 99 kg. Carcass ham-loin percentage was determined in five experiments and carcass lean percentage was determined in one experiment.

Diet formulation is a bit tricky when fat is used. Because fat reduces feed consumption in ad libitum fed pigs, the dietary protein (lysine) needs to be increased so that animals obtain the necessary amount of daily lysine to allow maximum growth to take place. As a rule of thumb, every 5 kg of fat should be combined with 2 kg of soybean meal and this 7 kg substituted for 7 kg of corn. This method of substitution will maintain a constant ratio of ME:Lysine.

At the present costs of corn (\$3.00/bushel or \$.12/kg) and soybean meal (\$.32/kg) in the United States, the shadow (break-even) price of feed-grade fat is about \$.35 per kg. This assumes that 5% fat will increase growth rate by 4%, feed efficiency by 9%, and backfat by 2.5 mm, and assumes that fixed costs are \$.20/day and that the increased backfat reduces the carcass value by \$.75/pig. The economic value of fat does not take into consideration the improvements in feed and air quality that goes along with the performance advantages. Today, the going rate for feed-grade fat delivered to farms or feed mills is about \$.34 per kg.

Table 1. Fat Supplementation of Diets for Growing-Finishing Pigs^a

Item	Control	+ 5% Fat ^b
Average daily gain, kg	.81	.85
Average daily feed, kg	2.62	2.51
Feed:gain	3.25	2.98
Carcass traits		
Backfat, mm	31.5	34.3
Ham-loin, % of carcass	43.4	42.3
Lean, % of carcass	49.5	49.5

^aEight experiments at the University of Kentucky and the University of Nebraska involving 300 growing-finishing pigs from 29 to 99 kg. Carcass ham-loin percentage was determined in five experiments and carcass lean percentage was determined in one experiment.

^bChoice white grease (Griffin Industries, Cold Spring, KY) or soybean oil (Pennyryle Ag. Oil, Hopkinsville, KY) in the University of Kentucky experiments.