

# MU Guide

## Nutrient Requirements of Swine and Recommendations for Missouri

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Feed is the largest single item among the costs of producing pork. Pork producers should adopt a comprehensive feeding program based on sound nutrition principles and tailored to a specific operation. This guide provides the basis for such a feeding program.

The nutrient requirements presented in Tables 1–6 are adapted from the 1998 edition of *Nutrient Requirements of Swine* compiled by the National Research Council (NRC) [Board on Agriculture, National Research Council, 1998. *Nutrient Requirements of Swine*, 10th revised edition. Washington, D.C.: National Academy Press]. The NRC values are thought of as minimum requirements without any safety allowances; therefore, the NRC requirements should not be considered as recommended allowances.

The recommendations for Missouri swine producers are similar to those made by professional swine nutritionists throughout the swine industry and are in close agreement with recommendations of other Midwest universities. All Missouri nutrient recommendations equal or surpass the NRC requirements (1998). These nutrient recommendations are influenced by cost, genetics or expected performance of pigs, herd health, facilities, and general management on a Missouri swine operation.

Swine producers should keep in mind that while it is common practice to formulate diets on the basis of an amount per pound or per ton, pigs require given amounts per day. This becomes important where such animals as replacement gilts or gestating sows are fed limited amounts per day.

Table 1. Nutrient requirements for growing pigs fed ad libitum (90% dry matter).

| NRC recommendations |             |             |             |             |             | Missouri recommendations |            |            |            |             |             |             |
|---------------------|-------------|-------------|-------------|-------------|-------------|--------------------------|------------|------------|------------|-------------|-------------|-------------|
| 6–10                | 10–20       | 20–45       | 45–110      | 110–180     | 180–265     | Live weight (lb)         | 6–10       | 10–20      | 20–45      | 45–110      | 110–180     | 180–265     |
| 0.35                | 0.6         | 1.1         | 1.5         | 1.8         | 1.7         | Expected gain (lb/day)   | 0.35       | 0.6        | 1.1        | 1.5         | 1.8         | 1.7         |
| Percent in diet     |             |             |             |             |             | Percent in diet          |            |            |            |             |             |             |
| 26                  | 23.7        | 20.9        | 18          | 15.5        | 13.2        | Crude protein            | 27         | 26         | 22.5       | 18.5        | 16          | 14          |
| 0.90                | 0.80        | 0.70        | 0.60        | 0.50        | 0.45        | Calcium                  | 0.90       | 0.90       | 0.80       | 0.70        | 0.55        | 0.55        |
| 0.70                | 0.65        | 0.60        | 0.50        | 0.45        | 0.40        | Phosphorus (total)       | 0.80       | 0.80       | 0.70       | 0.60        | 0.50        | 0.50        |
| 0.55                | 0.40        | 0.32        | 0.23        | 0.19        | 0.15        | Phosphorus (available)   | 0.60       | 0.55       | 0.40       | 0.30        | 0.21        | 0.21        |
| 0.59                | 0.54        | 0.46        | 0.37        | 0.27        | 0.19        | Arginine                 | 0.59       | 0.54       | 0.46       | 0.37        | 0.27        | 0.19        |
| 0.48                | 0.43        | 0.36        | 0.30        | 0.24        | 0.19        | Histidine                | 0.48       | 0.43       | 0.36       | 0.30        | 0.24        | 0.19        |
| 0.83                | 0.73        | 0.63        | 0.51        | 0.42        | 0.33        | Isoleucine               | 1.02       | 0.90       | 0.78       | 0.63        | 0.51        | 0.39        |
| 1.5                 | 1.32        | 1.12        | 0.90        | 0.71        | 0.54        | Leucine                  | 1.5        | 1.32       | 1.12       | 0.90        | 0.71        | 0.54        |
| <b>1.5</b>          | <b>1.35</b> | <b>1.15</b> | <b>0.95</b> | <b>0.75</b> | <b>0.60</b> | <b>Lysine</b>            | <b>1.7</b> | <b>1.5</b> | <b>1.3</b> | <b>1.05</b> | <b>0.85</b> | <b>0.65</b> |
| 0.86                | 0.76        | 0.65        | 0.54        | 0.44        | 0.35        | Methionine + Cystine     | 0.94       | 0.83       | 0.72       | 0.58        | 0.47        | 0.36        |
| 1.41                | 1.25        | 1.06        | 0.87        | 0.70        | 0.55        | Phenylalanine + Tyrosine | 1.41       | 1.25       | 1.06       | 0.87        | 0.70        | 0.55        |
| 0.98                | 0.86        | 0.74        | 0.61        | 0.51        | 0.41        | Threonine                | 1.11       | 0.98       | 0.85       | 0.68        | 0.55        | 0.42        |
| 0.27                | 0.24        | 0.21        | 0.17        | 0.14        | 0.11        | Tryptophan               | 0.31       | 0.27       | 0.23       | 0.19        | 0.15        | 0.12        |
| 1.04                | 0.92        | 0.79        | 0.64        | 0.52        | 0.40        | Valine                   | 1.04       | 0.92       | 0.79       | 0.64        | 0.52        | 0.40        |

**Table 2. Missouri recommended nutrient additions per ton in grow-finish diets.**

| Nutrient                | Unit                         | Additions per ton             |                                  |
|-------------------------|------------------------------|-------------------------------|----------------------------------|
|                         |                              | Grower period<br>10 to 135 lb | Finisher period<br>135 to 260 lb |
| Salt (NaCl)             | pounds                       | 3 to 6                        | 3 to 6                           |
| Iron                    | grams                        | 150                           | 125                              |
| Zinc                    | grams                        | 150                           | 125                              |
| Manganese               | grams                        | 30                            | 25                               |
| Copper                  | grams                        | 15                            | 12.5                             |
| Iodine                  | grams                        | 0.27                          | 0.27                             |
| Selenium*               | grams                        | 0.27                          | 0.27                             |
| Vitamin A               | million international units  | 6                             | 5                                |
| Vitamin D               | thousand international units | 900                           | 750                              |
| Vitamin E               | thousand international units | 25                            | 20                               |
| Vitamin K               | grams                        | 2.5                           | 2                                |
| Riboflavin              | grams                        | 5.4                           | 4.5                              |
| Niacin                  | grams                        | 30                            | 25                               |
| Pantothenic acid        | grams                        | 18                            | 15                               |
| Vitamin B <sub>12</sub> | milligrams                   | 25                            | 20                               |

\*Maximum legal addition is 0.27g/ton (0.3 ppm)

**Table 3. Nutrient requirements of breeding swine (90% dry matter).**

| NRC recommendations        |                                     |  | Nutrients                | Missouri recommendations   |                                     |  |
|----------------------------|-------------------------------------|--|--------------------------|----------------------------|-------------------------------------|--|
| Boars<br>(sexually active) | Gestation<br>(440 lb w/ 12<br>pigs) | Lactation<br>(385 lb w/ 0.44<br>lb/day gain) |                          | Boars<br>(sexually active) | Gestation<br>(440 lb w/ 12<br>pigs) | Lactation<br>(385 lb w/ 0.44<br>lb/day gain) |
| <b>Percent in diet</b>     |                                     |  | <b>Percent in diet</b>   |                            |                                     |  |
| 5.0                        | 4.0                                 | 12.0   | Daily feed intake (lb)   | 5.0                        | 4.0                                 | 12.0   |
| 13                         | 12                                  | 17.5   | Crude protein            | 20                         | 13.5                                | 19   |
| 0.75                       | 0.75                                | 0.75   | Calcium                  | 0.90                       | 0.90                                | 0.90   |
| 0.60                       | 0.60                                | 0.60   | Phosphorus (total)       | 0.80                       | 0.80                                | 0.80   |
| 0.35                       | 0.35                                | 0.35   | Phosphorus (available)   | 0.50                       | 0.50                                | 0.50   |
| -                          | -                                   | 0.48   | Arginine                 | -                          | -                                   | 0.48   |
| 0.19                       | 0.16                                | 0.36   | Histidine                | 0.19                       | 0.16                                | 0.36   |
| 0.35                       | 0.30                                | 0.50   | Isoleucine               | 0.35                       | 0.30                                | 0.50   |
| 0.51                       | 0.42                                | 0.97   | Leucine                  | 0.51                       | 0.42                                | 0.97   |
| <b>0.60</b>                | <b>0.52</b>                         | <b>0.91</b>                                  | <b>Lysine</b>            | <b>1.05</b>                | <b>0.65</b>                         | <b>1.0</b>                                   |
| 0.42                       | 0.36                                | 0.44   | Methionine + Cystine     | 0.42                       | 0.36                                | 0.60   |
| 0.57                       | 0.49                                | 1.0  | Phenylalanine + Tyrosine | 0.57                       | 0.49                                | 1.0  |
| 0.50                       | 0.43                                | 0.58   | Threonine                | 0.55                       | 0.48                                | 0.72   |
| 0.12                       | 0.10                                | 0.16   | Tryptophan               | 0.14                       | 0.13                                | 0.20   |
| 0.40                       | 0.34                                | 0.76   | Valine                   | 0.40                       | 0.44                                | 1.0  |

**Table 4. Missouri recommended nutrient additions per ton in gestation, lactation, and boar diets.**

| Nutrient                | Unit                         | Breeding Stock |
|-------------------------|------------------------------|----------------|
| Salt (NaCl)             | pounds                       | 10             |
| Iron                    | grams                        | 150            |
| Zinc                    | grams                        | 150            |
| Manganese               | grams                        | 36             |
| Copper                  | grams                        | 15             |
| Iodine                  | grams                        | 0.27           |
| Selenium*               | grams                        | 0.27           |
| Vitamin A               | million international units  | 10             |
| Vitamin D               | million international units  | 1.5            |
| Vitamin E               | thousand international units | 40             |
| Vitamin K               | grams                        | 4              |
| Riboflavin              | grams                        | 9              |
| Niacin                  | grams                        | 50             |
| Pantothenic acid        | grams                        | 30             |
| Vitamin B <sub>12</sub> | milligrams                   | 40             |
| Biotin                  | milligrams                   | 200            |
| Folic acid              | grams                        | 1.5            |
| Choline                 | grams                        | 500            |
| Pyridoxine              | grams                        | 13.75          |

\*Maximum legal addition is 0.27g/ton (0.3 ppm)

**Table 5. Partial composition of feeds commonly used in swine rations (90% dry matter).**

| Feedstuff              | Crude protein % | Energy (ME) Kcal/lb | Calcium % | Total phosphorus % | Amino acids |                        |              |
|------------------------|-----------------|---------------------|-----------|--------------------|-------------|------------------------|--------------|
|                        |                 |                     |           |                    | Lysine %    | Methionine + Cystine % | Tryptophan % |
| Corn U.S. #2           | 8.3             | 1,554               | 0.03      | 0.28               | 0.26        | 0.36                   | 0.06         |
| Grain sorghum          | 9.2             | 1,518               | 0.03      | 0.29               | 0.22        | 0.34                   | 0.10         |
| Wheat                  | 11.5            | 1,500               | 0.04      | 0.39               | 0.38        | 0.49                   | 0.26         |
| Oats                   | 11.5            | 1,232               | 0.07      | 0.31               | 0.40        | 0.58                   | 0.14         |
| Soybean meal (44%)     | 43.8            | 1,445               | 0.32      | 0.65               | 2.83        | 1.31                   | 0.61         |
| Soybean meal (48%)     | 47.5            | 1,536               | 0.34      | 0.69               | 3.02        | 1.41                   | 0.65         |
| Meat & bone meal       | 51.5            | 1,011               | 9.99      | 4.98               | 2.51        | 1.18                   | 0.28         |
| Fish meal (menhaden)   | 62.3            | 1,527               | 5.21      | 3.04               | 4.81        | 2.34                   | 0.66         |
| Alfalfa meal           | 17              | 832                 | 1.53      | 0.26               | 0.74        | 0.43                   | 0.24         |
| Dicalcium phosphate*   | -               | -                   | 20 to 24  | 18.5               | -           | -                      | -            |
| Monocalcium phosphate* | -               | -                   | 17        | 21.1               | -           | -                      | -            |
| Limestone*             | -               | -                   | 35.84     | 0.01               | -           | -                      | -            |

\*Check actual values on feed tags.

**Table 6. Energy composition of selected fats-oils-carbohydrates.**

| <b>Feed</b>         | <b>Dry matter %</b> | <b>Ether extract %</b> | <b>Linoleic acid (18:2) %</b> | <b>Digestible energy (Kcal/lb)</b> | <b>Metabolizable energy (Kcal/lb)</b> |
|---------------------|---------------------|------------------------|-------------------------------|------------------------------------|---------------------------------------|
| Lard                | 100                 | 100                    | 10.2                          | 3,766                              | 3,614                                 |
| Poultry fat         | 100                 | 100                    | 19.5                          | 3,873                              | 3,718                                 |
| Beef tallow         | 100                 | 100                    | 3.1                           | 3,636                              | 3,490                                 |
| Choice white grease | 100                 | 100                    | 11.6                          | 3,768                              | 3,616                                 |
| Corn oil            | 100                 | 100                    | 59                            | 3,980                              | 3,820                                 |
| Soybean oil         | 100                 | 100                    | 51                            | 3,977                              | 3,818                                 |
| Corn starch         | 99                  | 0.22                   | 0                             | 1,818                              | 1,811                                 |
| Sucrose             | 99                  | 0                      | 0                             | 1,725                              | 1,652                                 |

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