

## APPENDIX A

### Estimating a Whole Farm Nutrient Balance

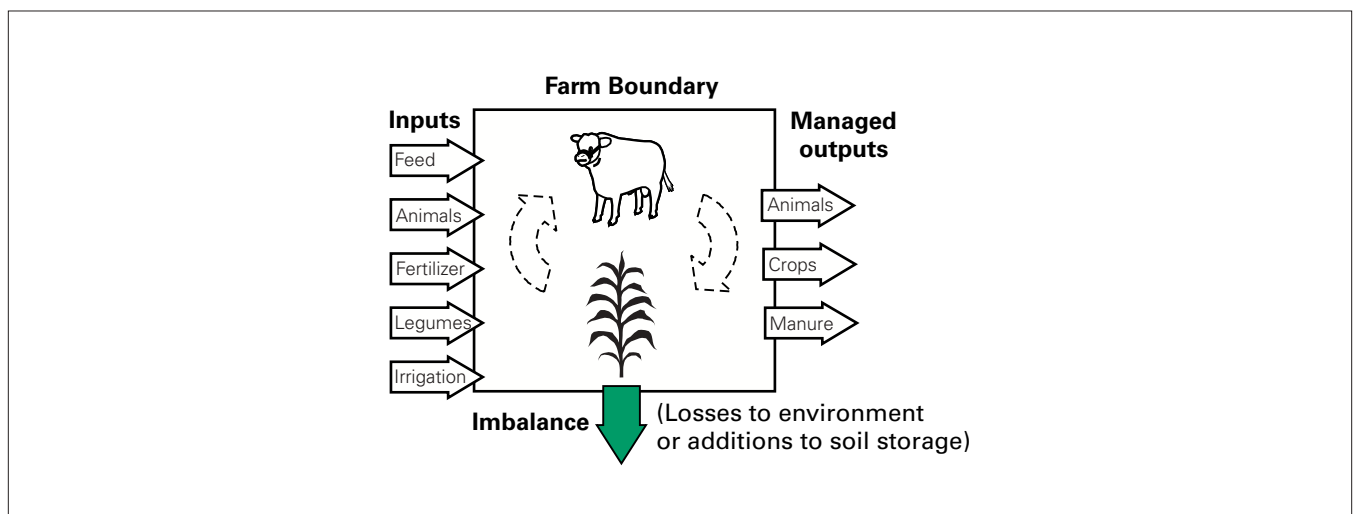
#### Concept

Nutrients arrive on the livestock farm (Inputs) in the form of purchased feed, fertilizer, and animals or as N fixed by legumes or transported with irrigation water. It is desirable that these nutrients leave the farm as marketed products (Managed Outputs) such as animals or crops. Any imbalance between Input and Managed Outputs will either (1) be added to soil reserves (adding to future environmental risks) or (2) lost directly to the environment.

Excess N will be lost to the air as ammonia gas or to surface and groundwater as nitrate or ammonium. Excess P is commonly stored in the soil, contributing to soil P levels in excess of agronomic requirements. A high soil P level increases the potential for P movement to surface waters, contributing to eutrophication issues (see Lesson 1, Principles of Environmental Stewardship).

Understanding the whole farm's nutrient balance as well as the sources of nutrient inputs is critical to identifying a nutrient management strategy for reducing an imbalance and achieving an environmentally sustainable operation.

#### Whole Farm Nutrient Balance



#### Instructions

*This balance is interested only in the nutrients that cross the border of the farm. It is not concerned with nutrients recycled within the farm.* For example, homegrown crops fed to animals raised on your farm will not be considered because they do not cross the farm's boundary. Purchased feed products will be included because this nutrient input crosses the farm's boundary.

The boundary of the farm includes all owned or rented land that you farm (do not include land that is rented to others) and all livestock production facilities. This nutrient balance is to be estimated for a one-year period.

For estimating Nutrient Inputs and Outputs, information is required on the total commodity weight and nutrient content (feeds, forages, crops, and fertilizers). If a nutrient concentration is unknown, please select a representative feed, forage, or fertilizer value from the reference tables at the end of this appendix.

To assist with these calculations, a Microsoft Excel spreadsheet is available that can be downloaded at no cost from the following website: <http://manure.unl.edu/Koelsch-nbalance.html>

### I. Livestock and Poultry

**A. Animal Inputs:** For a one-year period, enter the number of animals purchased (including custom fed animals), their average live purchase weight, and the appropriate nutrient factor (Table 2A-1, page 26) .

| Animal Group           | a. Number of Animals | b. Average Purchased Weight, lbs | Nitrogen               |                   | Phosphorus             |                   |
|------------------------|----------------------|----------------------------------|------------------------|-------------------|------------------------|-------------------|
|                        |                      |                                  | c. Table 2A-1 Fraction | Total= a x b x c  | d. Table 2A-1 Fraction | Total= a x b x d  |
| <i>Example: Calves</i> | <i>3,000</i>         | <i>600</i>                       | <i>0.027</i>           | <i>48,600 lbs</i> | <i>0.0073</i>          | <i>13,100 lbs</i> |
| 1.                     |                      |                                  |                        |                   |                        |                   |
| 2.                     |                      |                                  |                        |                   |                        |                   |
| 3.                     |                      |                                  |                        |                   |                        |                   |
| 4.                     |                      |                                  |                        |                   |                        |                   |
| <b>TOTAL</b>           |                      |                                  |                        |                   |                        |                   |

**B. Animal Outputs:** For a one-year period, enter the number of animals sold or shipped off-farm, average live sell weight (include custom fed animals, culls, and mortality shipped off-farm).

| Animal Group                  | a. Number of Animals | b. Average Sell Weight, lbs | Nitrogen               |                   | Phosphorus             |                   |
|-------------------------------|----------------------|-----------------------------|------------------------|-------------------|------------------------|-------------------|
|                               |                      |                             | c. Table 2A-1 Fraction | Total= a x b x c  | d. Table 2A-1 Fraction | Total= a x b x d  |
| <i>Example: Finish Cattle</i> | <i>2,800</i>         | <i>1,250</i>                | <i>0.024</i>           | <i>84,600 lbs</i> | <i>0.0065</i>          | <i>22,800 lbs</i> |
| 1.                            |                      |                             |                        |                   |                        |                   |
| 2.                            |                      |                             |                        |                   |                        |                   |
| 3.                            |                      |                             |                        |                   |                        |                   |
| 4.                            |                      |                             |                        |                   |                        |                   |
| <b>TOTAL</b>                  |                      |                             |                        |                   |                        |                   |

**C. Animal Products Outputs:** For a one-year period, enter the quantity of animals sold and nutrient concentration if you have an analysis for your own animal products.

| Animal products | a. Pounds of Animal Products Sold | Nitrogen            |         | Phosphorus  |         |
|-----------------|-----------------------------------|---------------------|---------|-------------|---------|
|                 |                                   | b. N Factor         | = a x b | c. P Factor | = a x c |
| Milk            |                                   | 0.0050 <sup>1</sup> |         | 0.001       |         |
| Eggs            |                                   | 0.0167              |         | 0.002       |         |
| Wool            |                                   | 0.0012              |         | 0.0001      |         |
| <b>TOTAL</b>    |                                   |                     |         |             |         |

<sup>1</sup>Assumes 3.2% protein in milk. The nitrogen factor can be estimated as follows: Nitrogen Factor = % Crude Protein/638

**D. Change in Animal Inventory:** (beginning vs. end of year). For those livestock groups that have changed in numbers fed from the beginning to the end of the year, indicate that change in inventory below.

|                | January 1            |                        | December 31          |                        | Nitrogen               |                                 | Phosphorus             |                                 |
|----------------|----------------------|------------------------|----------------------|------------------------|------------------------|---------------------------------|------------------------|---------------------------------|
|                | a. Number of Animals | b. Average Weight, lbs | c. Number of Animals | d. Average weight, lbs | e. Table 2A-1 Fraction | Total= (c x d x e)- (a x b x e) | f. Table 2A-1 Fraction | Total= (c x d x f)- (a x b x f) |
| <i>Example</i> | <i>1,500</i>         | <i>925</i>             | <i>1,700</i>         | <i>925</i>             | <i>0.027</i>           | <i>5,000 lbs</i>                | <i>0.0065</i>          | <i>1,200</i>                    |
| 1.             |                      |                        |                      |                        |                        |                                 |                        |                                 |
| 2.             |                      |                        |                      |                        |                        |                                 |                        |                                 |
| <b>TOTAL</b>   |                      |                        |                      |                        |                        |                                 |                        |                                 |

## II. Feeds, Forages, Grains, and Other Crops

**E. Inputs:** (include grain, supplement, forages, bedding, and minerals purchased). For a one-year period, list all feed purchases, quantity purchased, fraction dry matter, nutrient concentrations if known (use Table 2A-3 if unknown).

| List Feed           | All Purchased Feeds        |  | Nitrogen                  |                          | Phosphorus              |                     |
|---------------------|----------------------------|--|---------------------------|--------------------------|-------------------------|---------------------|
|                     | a. Pounds Sold, Wet Weight | b. Fraction DM (% DM/100) <sup>1</sup> | c. Fraction CP (% CP/100) | Total=<br>a x b x c/6.25 | d. Fraction P (% P/100) | Total=<br>a x b x d |
| <i>Example: Hay</i> | <i>200,000</i>             | <i>1</i>                               | <i>0.19</i>               | <i>6,100 lbs</i>         | <i>0.0025</i>           | <i>500 lbs</i>      |
| 1.                  |                            |  |                           |                          |                         |                     |
| 2.                  |                            |  |                           |                          |                         |                     |
| 3.                  |                            |  |                           |                          |                         |                     |
| 4.                  |                            |  |                           |                          |                         |                     |
| 5.                  |                            |  |                           |                          |                         |                     |
| <b>TOTAL</b>        |                            |  |                           |                          |                         |                     |

Example: CP and P concentrations were reported on a wet weight or as-fed basis. "Fraction DM" is entered as 1 (see footnote) for calculation purposes.

**F. Outputs:** (include grain, forages, and straw sold). Follow same directions as Inputs.

| List Feed                | Crops and Feeds Sold       |  | Nitrogen                  |                          | Phosphorus              |                     |
|--------------------------|----------------------------|--|---------------------------|--------------------------|-------------------------|---------------------|
|                          | a. Pounds Sold, Wet Weight | b. Fraction DM (% DM/100) <sup>1</sup> | c. Fraction CP (% CP/100) | Total=<br>a x b x c/6.25 | d. Fraction P (% P/100) | Total=<br>a x b x d |
| <i>Example: Soybeans</i> | <i>240,000</i>             | <i>0.90</i>                            | <i>0.403</i>              | <i>13,900 lbs</i>        | <i>0.0065</i>           | <i>1,400 lbs</i>    |
| 1.                       |                            |  |                           |                          |                         |                     |
| 2.                       |                            |  |                           |                          |                         |                     |
| 3.                       |                            |  |                           |                          |                         |                     |
| 4.                       |                            |  |                           |                          |                         |                     |
| 5.                       |                            |  |                           |                          |                         |                     |
| <b>TOTAL</b>             |                            |  |                           |                          |                         |                     |

Example: CP and P concentration were reported on a dry weight basis. Actual "Fraction DM" is entered (0.90) for calculation purposes.

**G. Change in Inventory:** (beginning vs. end of year). If the inventory of any previously mentioned crop or animal feed stored on farm has changed from the beginning to the end of the year, indicate that change in inventory below.

| List Crop/Feed       | Crops and Feeds Stored on Farm         |   |  | Nitrogen                  |                                | Phosphorus              |                           |
|----------------------|--|---|--|---------------------------|--------------------------------|-------------------------|---------------------------|
|                      | a. Inventory on Jan. 1, lbs Wet Weight | b. Inventory on Dec. 31, lbs Wet Weight | c. Fraction DM (% DM/100) <sup>1</sup> | d. Fraction CP (% CP/100) | Total=<br>(b - a) x c x d/6.25 | e. Fraction P (% P/100) | Total=<br>(b - a) x c x e |
| <i>Example: Corn</i> | <i>560,000</i>                         | <i>300,000</i>                          | <i>0.87</i>                            | <i>0.09 lbs.</i>          | <i>3,300 lbs</i>               | <i>0.0031</i>           | <i>720 lbs</i>            |
| 1.                   |  |   |  |                           |                                |                         |                           |
| 2.                   |  |   |  |                           |                                |                         |                           |
| 3.                   |  |   |  |                           |                                |                         |                           |
| <b>TOTAL</b>         |  |   |  |                           |                                |                         |                           |

<sup>1</sup>If Fraction CP and Fraction P are reported on a dry matter basis, enter fraction DM. If Fraction CP and Fraction P are reported on a wet basis (as fed basis), enter "1" for fraction DM. DM ... Dry Matter CP ... Crude Protein P ... Phosphorus

### III. Fertilizer, Manure, and Miscellaneous Products

**H. Fertilizer Inputs:** (Dry, liquid, anhydrous, compost, etc.). For a one-year period, enter all fertilizer purchases from off-farm suppliers, quantity purchased, and nitrogen and phosphorus content. If nutrient contents are unknown, refer to Table 2A-2. Phosphorus should be entered as elemental P, not P<sub>2</sub>O<sub>5</sub>. Convert to elemental P by dividing P<sub>2</sub>O<sub>5</sub> by 2.29.

| Fertilizer Inputs                     | a. Amount Purchased, pounds | Nitrogen      |              | Phosphorus    |                  |
|---------------------------------------|-----------------------------|---------------|--------------|---------------|------------------|
|                                       |                             | b. N Fraction | Total= a x b | c. P Fraction | Total= a x c     |
| <i>Example: Conc. Super-phosphate</i> | <i>48,000</i>               | <i>0</i>      | <i>0 lbs</i> | <i>0.2</i>    | <i>9,600 lbs</i> |
| 1.                                    |                             |               |              |               |                  |
| 2.                                    |                             |               |              |               |                  |
| 3.                                    |                             |               |              |               |                  |
| 4.                                    |                             |               |              |               |                  |
| 5.                                    |                             |               |              |               |                  |
| <b>TOTAL</b>                          |                             |               |              |               |                  |

<sup>1</sup>Assumes 3.2% protein in milk. The nitrogen factor can be estimated as follows: Nitrogen Factor = % Crude Protein/638

**I. Outputs:** (Manure, compost etc.). For a one-year period, list all fertilizers, manures, or other miscellaneous products sold, traded or given away and your best estimate of quantity involved. If nutrient content is known, enter those concentrations. Manure quantity and nutrient concentrations should be reported on a wet weight basis. Phosphorus should be entered as elemental P, not P<sub>2</sub>O<sub>5</sub>. Convert to elemental P by dividing P<sub>2</sub>O<sub>5</sub> by 2.29.

| Fertilizer, manure, and compost outputs | a. Amount Purchased, pounds | Nitrogen      |                  | Phosphorus    |                |
|---|-----------------------------|---------------|------------------|---------------|----------------|
|   |                             | b. N Fraction | Total= a x b     | c. P Fraction | Total= a x c   |
| <i>Example: Compost</i>                 | <i>100,000</i>              | <i>0.012</i>  | <i>1,200 lbs</i> | <i>0.008</i>  | <i>800 lbs</i> |
| 1.                                      |                             |               |                  |               |                |
| 2.                                      |                             |               |                  |               |                |
| 3.                                      |                             |               |                  |               |                |
| 4.                                      |                             |               |                  |               |                |
| 5.                                      |                             |               |                  |               |                |
| <b>TOTAL</b>                            |                             |               |                  |               |                |

**J. Change in Inventory:** (beginning vs. end of year). If the inventory of any previously mentioned product has changed from the beginning to the end of the year, indicate that change in inventory below.

| Fertilizer, manure, and compost | Inventory on |                | Nitrogen      |                            | Phosphorus    |                    |
|---------------------------------|--------------|----------------|---------------|----------------------------|---------------|--------------------|
|                                 | a. January 1 | b. December 31 | c. N Fraction | Total= (b - a) x (b-a) x c | d. P Fraction | Total= (b - a) x d |
| 1.                              |              |                |               |                            |               |                    |
| 2.                              |              |                |               |                            |               |                    |
| 3.                              |              |                |               |                            |               |                    |
| 4.                              |              |                |               |                            |               |                    |
| 5.                              |              |                |               |                            |               |                    |
| <b>TOTAL</b>                    |              |                |               |                            |               |                    |

### IV. Miscellaneous Nitrogen Sources

**K. Inputs as Legume Fixed Nitrogen:** For all legumes *not manured within the past two years*, indicate acres grown, yield, and crude protein (CP) content (as fed or wet basis).

| Crop   | a. Acres not Manured | b. Yield        | c. CP Fraction (as fed) | Total=                               | Assumptions   |                 |
|--|----------------------|-----------------|-------------------------|--------------------------------------|---------------|-----------------|
|  |                      |                 |                         |                                      | Legume Factor | Fixation Factor |
| <i>Example: Older legume hay crop</i>                              | <i>100</i>           | <i>5 ton/ac</i> | <i>0.18</i>             | <i>a x b x c x 192= 17,300 lbs N</i> | <i>1</i>      | <i>0.6</i>      |
| 1. 1st year hay crop (≥90% legume)                                 |                      | tons/ac         |                         | a x b x c x 96=                      | 1             | 0.3             |
| 2. 2nd year or older hay crop (≥90% legume)                        |                      | tons/ac         |                         | a x b x c x 192=                     | 1             | 0.6             |
| 3. 1st year hay crop (grass & legume mix: 25%-90% legume)          |                      | tons/ac         |                         | a x b x c x 58=                      | 0.6           | 0.3             |
| 4. 2nd year or older hay crop (grass & legume mix: 25%-90% legume) | tons/ac              |                 | a x b x c x 115=        | 0.6                                  | 0.6           |                 |
| 5. Soybeans  |                      | bu/ac           |                         | a x b x c x 3.8=                     | 1             | 0.4             |
| 6. Dry edible beans  |                      | bu/ac           |                         | a x b x c x 3.8=                     | 1             | 0.4             |
| 7. Other   |                      |                 |                         |                                      |               |                 |
| <b>TOTAL</b>   |                      |                 |                         |                                      |               |                 |

Legume Factor: Portion of harvested crop crude protein from legumes. Fixation Factor: Portion of fixed nitrogen that originates from atmosphere.

**L. Inputs as Nitrogen in Irrigation Water:** List all irrigation wells, quantity of fresh water pumped, and nitrate-N concentration, if known. Do not include effluent from lagoon or feedlot runoff control pond.

| Well                      | a. PPM Nitrate-N | b/ Acre-inches pumped | Total = a x b x 0.2265 |
|---------------------------|------------------|-----------------------|------------------------|
| <i>Example: Home well</i> | <i>15</i>        | <i>1,700</i>          | <i>5,800 lbs N</i>     |
| 1.                        |                  |                       |                        |
| 2.                        |                  |                       |                        |
| 3.                        |                  |                       |                        |
| 4.                        |                  |                       |                        |
| 5.                        |                  |                       |                        |
| <b>TOTAL</b>              |                  |                       |                        |

### Calculation of Balance

Instructions: To complete Nitrogen Balance and Phosphorus Balance, enter input and output values from previous four pages. For example, "A" refers to Animal Inputs total from page 21.

#### Nitrogen Balance

|   | Inputs | -  | Input Inventory Correction<br>(if inventory increases) | - | Managed<br>Outputs                    | - | Output Inventory Correction<br>(if inventory decreases) |
|---|--------|----|--|---|---------------------------------------|---|---|
| <b>Animals</b>  | A      |    | D  |   | B + C                                 |   | D   |
| <b>Feed</b>   | E      |    | G  |   | F                                     |   | G   |
| <b>Fertilizer</b>   | G      |    | J  |   | H                                     |   | J   |
| <b>Legumes</b>  | K      |    |  |   |                                       |   |   |
| <b>Irrigation</b>   | L      |    |  |   |                                       |   |   |
| TOTALS: _____ lbs   |        | to | _____ lbs  |   |                                       |   |   |
| Total Inputs  |        |    | Total Managed Outputs                                  |   |                                       |   |   |
| Or RATIO of _____   |        | to | _____  |   | 1                                     |   |   |
| Inputs/ Outputs   |        |    |  |   |                                       |   |   |
| <b>Imbalance</b> (environmental losses and additions to soil storage) |        |    |  |   | _____ lbs<br>Inputs - Managed Outputs |   |   |

#### Phosphorus Balance

|   | Inputs | -  | Input Inventory Correction<br>(if inventory increases) | - | Managed<br>Outputs                    | - | Output Inventory Correction<br>(if inventory decreases) |
|---|--------|----|--|---|---------------------------------------|---|---|
| <b>Animals</b>  | A      |    | D  |   | B + C                                 |   | D   |
| <b>Feed</b>   | E      |    | G  |   | F                                     |   | G   |
| <b>Fertilizer</b>   | G      |    | J  |   | H                                     |   | J   |
| TOTALS: _____ lbs   |        | to | _____ lbs  |   |                                       |   |   |
| Total Inputs  |        |    | Total Managed Outputs                                  |   |                                       |   |   |
| Or RATIO of _____   |        | to | _____  |   | 1                                     |   |   |
| Inputs/ Outputs   |        |    |  |   |                                       |   |   |
| <b>Imbalance</b> (environmental losses and additions to soil storage) |        |    |  |   | _____ lbs<br>Inputs - Managed Outputs |   |   |

**Table 2A-1. Nutrient concentration in meat animals.**

| Species                         | Nitrogen Fraction | Phosphorus Fraction |
|---------------------------------|-------------------|---------------------|
| Beef cattle < 1,000 lbs         | 0.027             | 0.0073              |
| Beef cattle > 1,000 lbs         | 0.024             | 0.0065              |
| Dairy cattle (replacement herd) | 0.029             | 0.0083              |
| Dairy cattle (milking herd)     | 0.025             | 0.0072              |
| Swine < 100 lbs                 | 0.025             | 0.0056              |
| Swine 100 to 300 lbs            | 0.024             | 0.0047              |
| Swine > 300 lbs                 | 0.023             | 0.0047              |
| Poultry                         | 0.028             | 0.0058              |
| Goat                            | 0.024             | 0.0060              |
| Sheep                           | 0.025             | 0.0060              |

Nitrogen and phosphorus fractions represent the fraction (elemental N or P) of live weight divided by 100.

**Table 2A-2. Fertilizer nutrient concentration.**

| Product                       | Nitrogen Fraction | Phosphorus Fraction |
|-------------------------------|-------------------|---------------------|
| Anhydrous ammonia             | 0.82              |                     |
| Aqua ammonia                  | 0.20              |                     |
| Ammonium nitrate              | 0.34              |                     |
| Ammonium sulfate              | 0.21              |                     |
| Ammonium nitrate-sulfate      | 0.30              |                     |
| Urea                          | 0.46              |                     |
| Urea-ammonium nitrate (UAN)   | 0.28              |                     |
| Phosphoric acid               |                   | 0.24                |
| Superphosphoric acid          |                   | 0.35                |
| Ordinary superphosphate       |                   | 0.087               |
| Concentrated superphosphate   |                   | 0.20                |
| Ammonium phosphate-sulfate    | 0.16              | 0.087               |
| Ammonium phosphate-nitrate    | 0.27              | 0.052               |
| Monoammonium phosphate        | 0.11              | 0.23                |
| Diammonium phosphate          | 0.18              | 0.20                |
| Ammonium polyphosphate-liquid | 0.10              | 0.15                |
| Ammonium polyphosphate-dry    | 0.11              | 0.25                |

Nitrogen and phosphorus fractions represent the fraction (elemental N or P) of total commodity weight divided by 100. To convert from  $P_2O_5$  to P, divide  $P_2O_5$  by 2.29.

Table 2A-3. NRC Feed Code Listing.

| NCR Feed | Common Name                   | Fraction <sup>1</sup> Dry Matter | Fraction <sup>1</sup> Crude Protein | Fraction <sup>2</sup> Phosphorus |
|----------|-------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| 101      | Bahiagrass 30% Dry Matter     | 0.30                             | 0.089                               | 0.0022                           |
| 102      | Bahiagrass Hay                | 0.90                             | 0.082                               | 0.0022                           |
| 103      | Bermudagrass Late Vegetative  | 0.91                             | 0.078                               | 0.0018                           |
| 104      | Brome Hay Pre-bloom           | 0.88                             | 0.160                               | 0.0037                           |
| 105      | Brome Hay Mid Bloom           | 0.88                             | 0.144                               | 0.0028                           |
| 106      | Brome Hay late Bloom          | 0.91                             | 0.100                               | 0.0000                           |
| 107      | Brome Hay Mature              | 0.92                             | 0.060                               | 0.0022                           |
| 108      | Fescue Meadow Hay             | 0.88                             | 0.091                               | 0.0029                           |
| 109      | Fescue Alta Hay               | 0.89                             | 0.102                               | 0.0024                           |
| 110      | Fescue K31 Hay                | 0.91                             | 0.150                               | 0.0037                           |
| 111      | Fescue K31 Hay Full Bloom     | 0.91                             | 0.129                               | 0.0032                           |
| 112      | Fescue K31 Mature             | 0.91                             | 0.108                               | 0.0030                           |
| 113      | Napiergrass Fresh 30 day DM   | 0.20                             | 0.087                               | 0.0041                           |
| 114      | Napiergrass Fresh 60 day DM   | 0.23                             | 0.078                               | 0.0041                           |
| 115      | Orchardgrass Hay, Early Bloom | 0.89                             | 0.128                               | 0.0034                           |
| 116      | Orchardgrass Hay, Late Bloom  | 0.91                             | 0.084                               | 0.0030                           |
| 117      | Pangoliagrass Fresh           | 0.21                             | 0.091                               | 0.0022                           |
| 118      | Red Top Fresh                 | 0.29                             | 0.116                               | 0.0037                           |
| 119      | Reed Canarygrass Hay          | 0.89                             | 0.103                               | 0.0024                           |
| 120      | Ryegrass Hay                  | 0.88                             | 0.086                               | 0.0000                           |
| 121      | Sorghum Sudan Hay             | 0.91                             | 0.113                               | 0.0031                           |
| 122      | Sorghum-Sudan Pasture         | 0.18                             | 0.168                               | 0.0044                           |
| 123      | Sorghum-Sudan Silage          | 0.28                             | 0.108                               | 0.0021                           |
| 124      | Timothy Hay Late Vegetative   | 0.89                             | 0.140                               | 0.0040                           |
| 125      | Timothy Hay Early Bloom       | 0.89                             | 0.108                               | 0.0029                           |
| 126      | Timothy Hay Mid Bloom         | 0.89                             | 0.097                               | 0.0023                           |
| 127      | Timothy Hay Full Bloom        | 0.89                             | 0.081                               | 0.0020                           |
| 128      | Timothy Hay Seed Stage        | 0.89                             | 0.060                               | 0.0000                           |
| 129      | Wheatgrass Crest., Hay        | 0.92                             | 0.090                               | 0.0015                           |
| 135      | Grass Pasture Spring          | 0.23                             | 0.213                               | 0.0045                           |
| 136      | Grass Pasture Summer          | 0.25                             | 0.150                               | 0.0000                           |
| 137      | Grass Pasture Fall            | 0.24                             | 0.220                               | 0.0000                           |
| 138      | Mix Pasture Spring            | 0.21                             | 0.260                               | 0.0000                           |
| 139      | Mix Pasture Summer            | 0.22                             | 0.195                               | 0.0000                           |
| 140      | Range June Diet               | 0.20                             | 0.110                               | 0.0015                           |
| 141      | Range July Diet               | 0.20                             | 0.105                               | 0.0015                           |
| 142      | Range August Diet             | 0.20                             | 0.097                               | 0.0015                           |
| 143      | Range September Diet          | 0.20                             | 0.069                               | 0.0015                           |
| 144      | Range Winter                  | 0.80                             | 0.047                               | 0.0015                           |
| 145      | Meadow Spring                 | 0.15                             | 0.203                               | 0.0015                           |
| 146      | Meadow Fall                   | 0.20                             | 0.134                               | 0.0015                           |
| 147      | Meadow Hay                    | 0.90                             | 0.134                               | 0.0015                           |
| 148      | Prairie Hay                   | 0.91                             | 0.053                               | 0.0014                           |
| 201      | Alfalfa Hay Early Vegetative  | 0.91                             | 0.300                               | 0.0033                           |
| 202      | Alfalfa Hay Early Vegetative  | 0.91                             | 0.234                               | 0.0033                           |
| 203      | Alfalfa Hay Late Vegetative   | 0.91                             | 0.270                               | 0.0033                           |
| 204      | Alfalfa Hay Late Vegetative   | 0.91                             | 0.217                               | 0.0033                           |
| 205      | Alfalfa Hay Early Bloom       | 0.91                             | 0.250                               | 0.0022                           |
| 206      | Alfalfa Hay Early Bloom       | 0.91                             | 0.199                               | 0.0022                           |
| 207      | Alfalfa Hay Mid Bloom         | 0.91                             | 0.220                               | 0.0022                           |
| 208      | Alfalfa Hay Mid Bloom         | 0.91                             | 0.170                               | 0.0024                           |
| 209      | Alfalfa Hay Full Bloom        | 0.91                             | 0.170                               | 0.0024                           |
| 210      | Alfalfa Hay Full Bloom        | 0.91                             | 0.130                               | 0.0024                           |
| 211      | Alfalfa Hay Late Bloom        | 0.91                             | 0.170                               | 0.0024                           |

<sup>1</sup> Fraction Dry Matter is the percentage dry matter of total commodity weight divided by 100.

Fraction Crude Protein and Fraction Phosphorus is indicated on a dry weight basis.

<sup>2</sup> Fraction Phosphorus is indicated as elemental phosphorus.

Source: National Research Council Nutrient Requirements for Beef Cattle 1996.



**Table 2A-3. NRC Feed Code Listing (continued)**

| <b>NCR Feed</b> | <b>Fraction<sup>1</sup> Common Name</b> | <b>Fraction<sup>1</sup> Dry Matter</b> | <b>Crude Protein</b> | <b>Fraction<sup>2</sup> Phosphorus</b> |
|-----------------|---|--|----------------------|--|
| 212             | Alfalfa Hay Late Bloom                  | 0.91                                   | 0.120                | 0.0024                                 |
| 213             | Alfalfa Hay Mature                      | 0.91                                   | 0.140                | 0.0021                                 |
| 214             | Alfalfa Hay Seeded                      | 0.91                                   | 0.120                | 0.0021                                 |
| 215             | Alfalfa Hay Weathered                   | 0.89                                   | 0.100                | 0.0023                                 |
| 216             | Alfalfa Meal Dehydrated 15%CP           | 0.90                                   | 0.173                | 0.0025                                 |
| 217             | Alfalfa Silage Early Bloom              | 0.35                                   | 0.195                | 0.0031                                 |
| 218             | Alfalfa Silage Mid Bloom                | 0.38                                   | 0.170                | 0.0027                                 |
| 219             | Alfalfa Silage Full Bloom               | 0.40                                   | 0.160                | 0.0027                                 |
| 220             | Birdsfoot Trefoil, Hay                  | 0.91                                   | 0.159                | 0.0023                                 |
| 221             | Clover Ladino Hay                       | 0.89                                   | 0.224                | 0.0033                                 |
| 222             | Clover Red Hay                          | 0.88                                   | 0.150                | 0.0024                                 |
| 223             | Vetch Hay                               | 0.89                                   | 0.208                | 0.0034                                 |
| 230             | Leg Pasture Spring                      | 0.20                                   | 0.280                | 0.0030                                 |
| 231             | Leg Pasture Summer                      | 0.23                                   | 0.222                | 0.0030                                 |
| 301             | Barley Silage                           | 0.39                                   | 0.119                | 0.0029                                 |
| 302             | Barley Straw                            | 0.91                                   | 0.044                | 0.0007                                 |
| 303             | Corn Cobs Ground                        | 0.90                                   | 0.028                | 0.0004                                 |
| 304             | Corn Silage 25% Grain                   | 0.29                                   | 0.083                | 0.0027                                 |
| 305             | Corn Silage 25% Grain                   | 0.29                                   | 0.083                | 0.0027                                 |
| 306             | Corn Silage 35% Grain                   | 0.33                                   | 0.086                | 0.0027                                 |
| 307             | Corn Silage 40% Grain                   | 0.33                                   | 0.092                | 0.0027                                 |
| 308             | Corn Silage 40% GR + NPN                | 0.33                                   | 0.132                | 0.0027                                 |
| 309             | Corn Silage 40% GR + NPN + Ca           | 0.33                                   | 0.130                | 0.0027                                 |
| 310             | Corn Silage 45% Grain                   | 0.34                                   | 0.087                | 0.0022                                 |
| 311             | Corn Silage 45% GR + NPN                | 0.33                                   | 0.130                | 0.0027                                 |
| 312             | Corn Silage 45% GR + NPN + Ca           | 0.33                                   | 0.130                | 0.0027                                 |
| 313             | Corn Silage 50% Grain                   | 0.35                                   | 0.080                | 0.0027                                 |
| 314             | Corn Silage 50 + NPN + CA               | 0.35                                   | 0.130                | 0.0027                                 |
| 315             | Corn Silage Immature (no ears)          | 0.25                                   | 0.090                | 0.0031                                 |
| 316             | Corn Silage Stalklage                   | 0.30                                   | 0.063                | 0.0000                                 |
| 317             | Corn Stalks Grazing                     | 0.50                                   | 0.065                | 0.0009                                 |
| 318             | Oat Silage Dough                        | 0.36                                   | 0.127                | 0.0031                                 |
| 319             | Oat Straw                               | 0.92                                   | 0.044                | 0.0006                                 |
| 320             | Oat Hay                                 | 0.91                                   | 0.095                | 0.0025                                 |
| 321             | Sorghum Silage                          | 0.30                                   | 0.094                | 0.0022                                 |
| 322             | Wheat Silage Dough                      | 0.35                                   | 0.125                | 0.0029                                 |
| 323             | Wheat Straw                             | 0.89                                   | 0.035                | 0.0005                                 |
| 401             | Barley Malt Sprouts w/hulls             | 0.93                                   | 0.281                | 0.0068                                 |
| 402             | Barley Grain Heavy                      | 0.88                                   | 0.132                | 0.0035                                 |
| 403             | Barley Grain Light                      | 0.88                                   | 0.140                | 0.0039                                 |
| 404             | Corn Hominy                             | 0.90                                   | 0.115                | 0.0057                                 |
| 405             | Corn Grain Cracked                      | 0.88                                   | 0.098                | 0.0032                                 |
| 406             | Corn Dry Ear 45 lb/bu                   | 0.86                                   | 0.090                | 0.0027                                 |
| 407             | Corn Dry Ear 56 lb/bu                   | 0.87                                   | 0.090                | 0.0027                                 |
| 408             | Corn Dry Grain 45 lb/bu                 | 0.88                                   | 0.098                | 0.0030                                 |
| 409             | Corn Ground Grain 56 lb/bu              | 0.88                                   | 0.098                | 0.0031                                 |
| 410             | Corn Dry Grain 56 lb/bu                 | 0.88                                   | 0.098                | 0.0031                                 |
| 411             | Corn Grain Flaked                       | 0.86                                   | 0.098                | 0.0031                                 |
| 412             | Corn HM Ear 56 lb/bu                    | 0.72                                   | 0.090                | 0.0027                                 |
| 413             | Corn HM Grain 45 lb/bu                  | 0.72                                   | 0.098                | 0.0030                                 |
| 414             | Corn HM Grain 56 lb/bu                  | 0.72                                   | 0.098                | 0.0031                                 |
| 415             | Cottonseed Black Whole                  | 0.92                                   | 0.230                | 0.0062                                 |
| 416             | Cottonseed High Lint                    | 0.92                                   | 0.244                | 0.0062                                 |
| 417             | Cottonseed Meal - Mech..                | 0.92                                   | 0.440                | 0.0076                                 |

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Fraction Crude Protein and Fraction Phosphorus is indicated on a dry weight basis.

<sup>2</sup> Fraction Phosphorus is indicated as elemental phosphorus.

Source: National Research Council Nutrient Requirements for Beef Cattle 1996.

Table 2A-3. NRC Feed Code Listing (continued)

| NCR Feed | Fraction <sup>1</sup> Common Name      | Fraction <sup>1</sup> Dry Matter | Crude Protein | Fraction <sup>2</sup> Phosphorus |
|----------|--|----------------------------------|---------------|----------------------------------|
| 418      | Cottonseed Meal - Sol - 41% CP         | 0.92                             | 0.461         | 0.0116                           |
| 419      | Cottonseed Meal - Sol - 43% CP         | 0.92                             | 0.489         | 0.0076                           |
| 420      | Molasses Beet                          | 0.78                             | 0.085         | 0.0003                           |
| 421      | Molasses Cane                          | 0.74                             | 0.058         | 0.0010                           |
| 422      | Oats 32 lb/bu                          | 0.91                             | 0.136         | 0.0030                           |
| 423      | Oats 38 lb/bu                          | 0.89                             | 0.136         | 0.0041                           |
| 424      | Rice Bran                              | 0.90                             | 0.144         | 0.0173                           |
| 425      | Rice Grain Ground                      | 0.89                             | 0.089         | 0.0036                           |
| 426      | Rice Grain Polished                    | 0.89                             | 0.086         | 0.0013                           |
| 427      | Rye Grain                              | 0.88                             | 0.138         | 0.0036                           |
| 428      | Sorghum, Dry Grain                     | 0.89                             | 0.116         | 0.0034                           |
| 429      | Sorghum, Rolled Grain                  | 0.90                             | 0.126         | 0.0034                           |
| 430      | Sorghum, Steam Flaked                  | 0.70                             | 0.120         | 0.0034                           |
| 431      | Tapioca                                | 0.89                             | 0.031         | 0.0000                           |
| 432      | Wheat Ground                           | 0.89                             | 0.142         | 0.0044                           |
| 433      | Wheat Middlings                        | 0.89                             | 0.184         | 0.0100                           |
| 434      | Wheat Grain Hard Red Spring            | 0.88                             | 0.142         | 0.0042                           |
| 435      | Wheat Grain Soft White                 | 0.90                             | 0.113         | 0.0033                           |
| 501      | Brewers Grain 21% Dry Matter           | 0.21                             | 0.260         | 0.0070                           |
| 502      | Brewers Grain Dehydrated               | 0.92                             | 0.292         | 0.0070                           |
| 503      | Canola Meal                            | 0.92                             | 0.409         | 0.0120                           |
| 504      | Coconut Meal                           | 0.92                             | 0.215         | 0.0021                           |
| 505      | Corn Gluten Feed                       | 0.90                             | 0.238         | 0.0095                           |
| 506      | Corn Gluten Meal                       | 0.91                             | 0.468         | 0.0051                           |
| 507      | Corn Gluten Meal 60% CP                | 0.91                             | 0.663         | 0.0061                           |
| 508      | Distillers Grain + Solubles            | 0.25                             | 0.295         | 0.0083                           |
| 509      | Distillers Grain Dehydrated - Light    | 0.91                             | 0.304         | 0.0140                           |
| 510      | Distillers Grain Dehydrated - Interm.  | 0.91                             | 0.304         | 0.0083                           |
| 511      | Distillers Grain Dehydrated - Dark     | 0.91                             | 0.304         | 0.0140                           |
| 512      | Distillers Grain Dehydrated - Very Dk. | 0.91                             | 0.304         | 0.0140                           |
| 513      | Distillers Grain Solubles Dehydrated   | 0.91                             | 0.000         | 0.0140                           |
| 514      | Distillers Grain Wet                   | 0.25                             | 0.297         | 0.0140                           |
| 515      | Lupins                                 | 0.90                             | 0.260         | 0.0044                           |
| 516      | Peanut Meal                            | 0.92                             | 0.342         | 0.0066                           |
| 517      | Soybean Meal - 44                      | 0.89                             | 0.499         | 0.0071                           |
| 518      | Soybean Meal - 49                      | 0.90                             | 0.521         | 0.0071                           |
| 519      | Soybean Whole                          | 0.90                             | 0.540         | 0.0065                           |
| 520      | Soybean Whole Roasted                  | 0.90                             | 0.403         | 0.0065                           |
| 521      | Sunflower Seed Meal                    | 0.90                             | 0.428         | 0.0102                           |
| 522      | Urea                                   | 0.99                             | 2.910         | 0.0000                           |
| 601      | Apple Pomace                           | 0.22                             | 0.000         | 0.0011                           |
| 602      | Bakery Waste                           | 0.92                             | 0.054         | 0.0024                           |
| 603      | Beet Pulp + Steffen's filt             | 0.91                             | 0.090         | 0.0010                           |
| 604      | Beet Pulp Dehydrated                   | 0.91                             | 1.000         | 0.0010                           |
| 605      | Citrus Pulp Dehydrated                 | 0.91                             | 0.098         | 0.0013                           |
| 606      | Grape Pomace                           | 0.90                             | 0.067         | 0.0017                           |
| 607      | Soybean Hulls                          | 0.91                             | 0.000         | 0.0018                           |
| 701      | Bloodmeal                              | 0.90                             | 0.938         | 0.0032                           |
| 702      | Feather Meal                           | 0.90                             | 0.858         | 0.0068                           |
| 703      | Fishmeal                               | 0.90                             | 0.679         | 0.0314                           |
| 704      | Meat Meal                              | 0.95                             | 0.582         | 0.0434                           |
| 705      | Tallow                                 | 0.99                             | 0.000         | 0.0006                           |
| 706      | Whey Acid                              | 0.07                             | 0.142         | 0.0071                           |
| 707      | Whey Delact                            | 0.93                             | 0.179         | 0.0118                           |

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Fraction Crude Protein and Fraction Phosphorus is indicated on a dry weight basis.

<sup>2</sup> Fraction Phosphorus is indicated as elemental phosphorus.

Source: National Research Council Nutrient Requirements for Beef Cattle 1996.

**Table 2A-3. NRC Feed Code Listing (continued)**

| <b>NCR Feed</b> | <b>Fraction<sup>1</sup> Common Name</b> | <b>Fraction<sup>1</sup> Dry Matter</b> | <b>Crude Protein</b> | <b>Fraction<sup>2</sup> Phosphorus</b> |
|-----------------|---|--|----------------------|--|
| 801             | Ammonium Phos (Mono)                    | 0.97                                   | 0.709                | 0.2474                                 |
| 802             | Ammonium Phos (Dibasic)                 | 0.97                                   | 1.159                | 0.2060                                 |
| 803             | Ammonium Sulfate                        | 1.00                                   | 1.341                | 0.0000                                 |
| 804             | Bone Meal                               | 0.97                                   | 0.132                | 0.1286                                 |
| 805             | Calcium Carbonate                       | 1.00                                   | 0                    | 0.0004                                 |
| 806             | Calcium Sulfate                         | 0.97                                   | 0                    | 0.0000                                 |
| 807             | Cobalt Carbonate                        | 0.99                                   | 0                    | 0.0000                                 |
| 808             | Copper Sulfate                          | 1.00                                   | 0                    | 0.0000                                 |
| 809             | Dicalcium Phosphate                     | 0.97                                   | 0                    | 0.1930                                 |
| 810             | EDTA                                    | 0.98                                   | 0                    | 0.0000                                 |
| 811             | Iron Sulfate                            | 0.98                                   | 0                    | 0.0000                                 |
| 812             | Limestone                               | 1.00                                   | 0                    | 0.0002                                 |
| 813             | Limestone Magnesium                     | 0.99                                   | 0                    | 0.0004                                 |
| 814             | Magnesium Carbonate                     | 0.98                                   | 0                    | 0.0000                                 |
| 815             | Magnesium Oxide                         | 0.98                                   | 0                    | 0.0000                                 |
| 816             | Manganese Oxide                         | 0.99                                   | 0                    | 0.0000                                 |
| 817             | Manganese Carbonate                     | 0.97                                   | 0                    | 0.0000                                 |
| 818             | Mono-Sodium Phosphate                   | 0.97                                   | 0                    | 0.2250                                 |
| 819             | Oystershell Ground                      | 0.99                                   | 0                    | 0.0007                                 |
| 820             | Phosphate Deflourinated                 | 1.00                                   | 0                    | 0.1800                                 |
| 821             | Phosphate Rock                          | 1.00                                   | 0                    | 0.1300                                 |
| 822             | Phosphate Rock - Low FI                 | 1.00                                   | 0                    | 0.1400                                 |
| 823             | Phosphate Rock - Soft                   | 1.00                                   | 0                    | 0.0900                                 |
| 824             | Phosphate Mono-Mono                     | 0.97                                   | 0                    | 0.2250                                 |
| 825             | Phosphoric Acid                         | 0.75                                   | 0                    | 0.3160                                 |
| 826             | Potassium Bicarbonate                   | 0.99                                   | 0                    | 0.0000                                 |
| 827             | Potassium Iodide                        | 1.00                                   | 0                    | 0.0000                                 |
| 828             | Potassium Sulfate                       | 0.98                                   | 0                    | 0.0000                                 |
| 829             | Salt                                    | 1.00                                   | 0                    | 0.0000                                 |
| 830             | Sodium Bicarbonate                      | 1.00                                   | 0                    | 0.0000                                 |
| 831             | Sodium Selenite                         | 0.98                                   | 0                    | 0.0000                                 |
| 832             | Sodium Sulfate                          | 0.97                                   | 0                    | 0.0000                                 |
| 833             | Zinc Oxide                              | 1.00                                   | 0                    | 0.0000                                 |
| 834             | Zinc Sulfate                            | 0.99                                   | 0                    | 0.0000                                 |
| 835             | Potassium Chloride                      | 1.00                                   | 0                    | 0.0000                                 |
| 836             | Calcium Phosphate (Mono)                | 0.97                                   | 0                    | 0.2160                                 |
| 837             | Sodium TriPoly Phosphate                | 0.96                                   | 0                    | 0.2500                                 |
| 999             | Minerals                                | 0.99                                   | 0                    | 0.0000                                 |
|                 | L-lysine.HCl                            |  | 0.958                | 0.0000                                 |
|                 | DL-methionine                           |  | 0.958                | 0.0000                                 |

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<sup>2</sup> Fraction Phosphorus is indicated as elemental phosphorus.

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