

## BEEF CATTLE NUTRITION

Beef cattle are ruminants – members of a group of hooved mammals (as deer and camels) that chew the cud. They have a unique ability to convert high fibrous feedstuffs to utilizable sources of nutrients for animal maintenance, production (growth, fattening, lactation) and reproduction.

### Nutrient Requirements of Beef Cattle

Nutrients are substances, usually obtained from feeds, which can be used by an animal when made available in a suitable form to its cells, organs and tissues. Types of nutrients include (1) energy nutrients [TDN (total digestible nutrients)], (2) proteins, (3) mineral, (4) vitamins and (5) water.

Excluding water, about 83 percent of the nutrients consumed by beef cattle are to meet their energy (TDN) needs. About 15 percent are fed to meet protein requirements and only about 2 percent of the nutrients are needed to meet mineral and vitamin requirements. It is vitally important that cattle rations be properly balanced with feed ingredients to meet all of the nutrient needs.

The nutrient requirements of beef cattle are published by the National Research Council (NRC). The NRC requirement table should be used to formulate rations or plan feeding programs for beef cattle.

### Composition of Feed Ingredients

To properly plan a feeding program, the composition of commercial feeds, forages and roughages is needed. For commercial feeds, request the nutrient content for the feed supplier. If forages are to be fed, have them analyzed by a feed analysis laboratory. A “book value” for nutrient composition of feeds as shown in Table 1 is usually sufficient.

**Table 1. Feed Ingredient Analysis (Percent Composition, “as-Fed” Basis)**

| <i>Ingredient Category</i>           | <i>Ingredient</i>   | <i>Ingredient Number</i> | <i>Dry Matter</i> | <i>Crude Protein</i> | <i>TDN</i> | <i>Calcium</i> | <i>Phosphorus</i> | <i>Fat</i> | <i>ADF</i> |
|--------------------------------------|---------------------|--------------------------|-------------------|----------------------|------------|----------------|-------------------|------------|------------|
| I. Energy Feeds                      | Corn                | 1                        | 88.0              | 8.9                  | 80.0       | 0.2            | 0.31              | 3.6        | 3.0        |
|                                      | Milo                | 2                        | 88.0              | 9.7                  | 75.0       | 0.03           | 0.28              | 2.8        | 5.0        |
|                                      | Molasses-Liq. Cane  | 3                        | 75.0              | 4.4                  | 54.0       | 0.75           | 0.08              | 0.0        | .0         |
|                                      | Molasses-Dried Cane | 4                        | 94.0              | 9.7                  | 66.0       | 1.03           | 0.14              | 0.6        | .0         |
|                                      | Oats                | 5                        | 89.0              | 11.8                 | 68.5       | 0.06           | 0.34              | 4.2        | 15.0       |
|                                      | Rice-Rough          | 6                        | 89.0              | 7.9                  | 70.0       | 0.06           | 0.28              | 1.8        | 16.0       |
|                                      | Rice Bran           | 7                        | 91.0              | 12.8                 | 67.0       | 0.07           | 1.55              | 13.8       | 18.0       |
|                                      | Wheat               | 8                        | 89.0              | 11.6                 | 78.0       | 0.04           | 0.37              | 1.9        | 4.0        |
| II. Protein Feeds                    | Cottonseed          | 9                        | 92.0              | 22.0                 | 88.3       | 0.15           | 0.69              | 21.2       | 26.0       |
|                                      | CSM-41%             | 10                       | 91.0              | 41.1                 | 69.0       | 0.16           | 1.10              | 2.0        | 20.0       |
|                                      | SBM-44%             | 11                       | 91.0              | 44.0                 | 74.0       | 0.25           | 0.60              | 1.2        | 9.1        |
|                                      | Urea                | 13                       | 99.0              | 281.3                | .0         | .00            | .00               | .0         | .0         |
| III. Forages and Roughages           | Alfalfa Pellets-17% | 14                       | 92.0              | 17.4                 | 55.0       | 1.32           | 0.24              | 2.8        | 32.0       |
|                                      | Cottonseed Hulls    | 15                       | 91.0              | 3.7                  | 43.0       | 0.09           | 0.06              | 1.5        | 65.0       |
|                                      | Rice Millfeed       | 16                       | 91.0              | 6.2                  | 33.0       | 0.36           | 0.55              | 5.8        | 46.0       |
| IV. Minerals, Vitamins and Additives | Dical 22-18.5       | 17                       | 97.0              | .0                   | .0         | 22.21          | 18.70             | .0         | .0         |
|                                      | Limestone           | 18                       | 100.0             | .0                   | .0         | 39.40          | .00               | .0         | .0         |
|                                      | Salt                | 19                       | 100.0             | .0                   | .0         | .00            | .00               | .0         | .0         |
|                                      | TM Salt             | 20                       | 100.0             | .0                   | .0         | .00            | .00               | .0         | .0         |
|                                      | TM Premix           | 21                       | 100.0             | .0                   | .0         | .00            | .00               | .0         | .0         |
|                                      | Vit Premix          | 22                       | 100.0             | .0                   | .0         | .00            | .00               | .0         | .0         |
|                                      | Others              | 23                       |                   |                      |            |                |                   |            |            |

## Planning a Feeding Program

It is usually advisable for those who plan to feed only a few animals for cattle shows, to plan a feeding program which involves primarily commercially produced feeds. Feeds should be purchased from a reputable dealer that will supply more information than is on the feed tag (especially the estimated TDN content). Farm-raised or purchased forages or roughages may be used along with medium to high energy purchased commercial feeds to help balance rations and supply adequate crude fiber to prevent “founder” or other digestive disturbances.

The key to a good feeding program for beef cattle is to have the animals gaining weights at the proper rate to reach target weight and condition (or finish) at show time. Cattle with a fast growth rate can be easily overconditioned (overfinished). A proper feeding program involves starter and grower rations and also a finishing ration for market animals.

Design the starter program to build health and resistance to disease. Newly weaned calves usually need to become familiar with eating from feed bunks, drinking from waterers, etc., during this period which usually lasts four to six weeks.

The growing program should be designed for adequate growth rate to achieve target weights. The length of time a calf should be on a growing program will depend on (1) the length of time from purchase of the calf to show time, (2) the type of calf purchased and (3) its potential growth rate. Rations should be designed for animals to reach target weights. Target weights for steers are shown in the following table.

**Target Weights – Market Steers**

| <u>Frame Score</u> | <u>Hip Height 7 months</u> | <u>Hip Height 9 months</u> | <u>Target Weight</u> |
|--------------------|----------------------------|----------------------------|----------------------|
| 3                  | 40                         | 42                         | 950-1050             |
| 4*                 | 42                         | 44                         | 1051-1150            |
| 5*                 | 44                         | 46                         | 1151-1250            |
| 6*                 | 46                         | 48                         | 1251-1350            |

\*Preferred frame score

There is a great deal of variability among animals, so a feeding program should be custom designed for each calf. Remember, “The Eye of the Master” is vitally important in properly feeding and care of beef animals. Seek advice from fiends, Extension Agents and others who have experience in feeding show animals.

Cattle that are to be finished are generally fed a high concentrate (grain) ration for 210 to 150 days before the show. This is a very critical phase of feeding to achieve proper finish. Feed intake and rate of gain usually drops during the hot, humid summer months so achieving target weights and degrees of finish is often difficult.

The nutrient requirements of beef cattle depend on animal weight, frame size, sex, expected rate of gain and the environment. Use NRC nutrient requirement guidelines to help select he proper feeds to achieve adequate rate of gain from the time an animal is purchased until the project is completed.

Most 4-H beef cattle projects involve the use of a high-energy base feed, such as “Beef Ration” or perhaps even horse feeds. The high-energy feed is limit-fed and other feeds like corn, oats, soybean meal, etc., are added to obtain the desired levels of protein, TDN, fiber, etc., for optimum performance.

## Feed Labels

To properly evaluate a feeding program for cattle it is usually necessary to be able to interpret information on a feed tag. Following is a feed label and explanation of the terms used.

| <b>FEED LABEL</b>   |   |
|---|---|
| 50 Lbs. Net Weight  | ← Net weight must appear on the tag.  |
| CHEWIE BEEF RECEIVING RATION<br>(For Ruminants Only)  | ← Name of Feed<br>Statement must appear where NPN products such as urea, biurette or ammonical compounds are used.  |
| MEDICATED   | ← Where drugs are present, the word medicated must follow the brand of product name.  |
| Feed for 28 days.<br>As an aid in the maintenance of weight gains in the presence of respiratory diseases such as shipping fever. | ← A claim giving the purpose of the drug must appear.   |
| WARNING: Feed only as directed on this label. Discontinue use 7 days prior to slaughter.  | ← Directions for use and precautionary statements must appear. Directions may appear elsewhere on the tag.  |
| ACTIVE DRUG INGREDIENT<br>Chlortetracycline...70 grams/ton  | ← The amount of an active drug ingredient must be given.  |
| GUARANTEED ANALYSIS   | ← Guaranteed Analysis   |
| Crude Protein, not less than ...12%   | ← Minimum crude protein content   |
| (This includes not more than 1% equivalent crude protein from non-protein nitrogen.)  | ← The percentage units of equivalent crude protein being <u>supplied by NPN products</u> . If the equivalent crude protein exceeds 8.75% or 1/3 of the total crude protein a WARNING or CAUTION statement must appear on the tag. |
| Crude Fat, not less than...1.0%   | ← Minimum crude fat content   |
| Crude Fiber, not more than...22%  | ← Maximum crude fiber content   |
| INGREDIENTS   | ← All ingredients must be listed unless collective terms are use.   |
| Ground corn, ground grain sorghum, dehydrated alfalfa meal, cottonseed hulls (37%), cottonseed meal, salt and limestone.          |   |
| FEEDING DIRECTIONS  | ← Feeding instructions are usually provided and <u>must</u> appear if drugs or NPN are present.   |
| Feed at the rate of 10 pounds per head per day.   |   |
| MANUFACTURED BY   | ← The name and principal mailing address of the manufacturer or person responsible for distributing the feed must appear on the tag.  |
| The Cow Feed Company<br>Little Rock, Arkansas   |   |

If roughage products constitute more than 5 percent of ingredients, the percent must be stated.

## Collective Terms for Feeds (Abbreviated List)

Collective terms recognize a general classification of ingredient origin, which perform a similar function, but do not imply equivalent nutritional values. When a collective term is used, individual ingredients within that group cannot be listed on the label.

| ANIMAL PROTEIN PRODUCTS        |  |
|--------------------------------|--|
| Animal By-Products Meal        | Meat and Bone Meal   |
| Fish By-Products               | Poultry by-Products  |
| Fish Meal                      | Whey, Dried  |
| Hydrolyzed Poultry Feathers    |  |
| FORAGE PRODUCTS                |  |
| Alfalfa Leaf meal              | Corn Plant, Dehydrated   |
| Alfalfa Hay, Ground            | Ground Grass   |
| Coastal Bermuda Grass Hay      | Soybean Hay, ground  |
| GRAIN PRODUCTS                 |  |
| Barley                         | Rice – Ground, Brown, Ground Paddy,<br>Ground Rough, Broken or Chipped |
| Corn                           |  |
| Grain Sorghums                 | Rye  |
| Oats                           |  |
| Wheat                          |  |
| PLANT PROTEIN PRODUCTS         |  |
| Coconut Meal                   | Peanut Meal  |
| Cottonseed Meal                | Soybean Meal   |
| Cottonseed, Whole Pressed      | Sunflower Meal   |
| Guar Meal                      | Yeast, Dried   |
| Linseed Meal                   |  |
| PROCESSED GRAIN BY-PRODUCTS    |  |
| Brewers Dried Grain            | Oat Groats – Oat meal, Feeding   |
| Condensed Distillers, Solubles | Rice Bran  |
| Corn Gluten Feed               | Wheat Bran   |
| Grain Sorghum Mill Feed        | Wheat Shorts   |
| Malt Sprouts                   | Wheat Germ Meal  |
| ROUGHAGE PRODUCTS*             |  |
| Beet Pulp, Dried               | Peanut Hulls   |
| Citrus Pulp, Dried             | Rice Hulls   |
| Cottonseed Hulls               | Rice Mill By-Product   |
| Husks                          | Straw, Ground  |
| Oat Hulls                      |  |
| MOLASSESS PRODUCTS             |  |
| Beet Molasses                  | Starch Molasses  |
| Cane Molasses                  | Molasses Distillers, Condensed Solubles                                |
| Citrus Molasses                |  |

\*If roughage products constitute more than 5 percent of ingredients, the percent must be stated.

Mineral-vitamin supplements are sometimes fed free-choice to cattle on moderate to high levels of forages. The label should show the amount of minerals and vitamins contained in the supplement as shown below.



### **Custom Mixes**

For those who prefer to mix their rations or have them mixed at a feed mill, the formulations in Table 2 should be considered. The expected rate of gain for steers and heifers fed the various supplements and rations is shown in the footnotes below the table. Choose the supplement/ration needed to reach the target weight. (For other example rations for steers refer to 4-H Market Steer Project, U-201)

**Table 2. Supplements and Rations for Steers and Heifers**

| <b>Feed Ingredient</b>                          | <b><u>Starter/Grower(1)</u></b> |                  | <b><u>Grower/Finisher(2)</u></b> |                  | <b><u>Finisher3</u></b> |
|---|---------------------------------|------------------|----------------------------------|------------------|-------------------------|
|   | <b>Supplement (4)</b>           | <b>Ration(5)</b> | <b>Supplement(6)</b>             | <b>Ration(5)</b> | <b>Ration(5)</b>        |
| Corn  | 1150                            | 425              | 1350                             | 845              | 1160                    |
| Oats  | 400                             | 200              | 250                              | 200              | 200                     |
| SBM – 44%                                       | 300                             | 320              | 250                              | 265              | 220                     |
| Cottonseed Hulls                                | --                              | 920              | --                               | 560              | 290                     |
| Molasses  | 100                             | 100              | 100                              | 100              | 100                     |
| Limestone                                       | 20                              | 20               | 30                               | 20               | 20                      |
| TM Salt   | 20                              | 10               | 20                               | 10               | 10                      |
| Dicalcium phosphate                             | 10                              | 5                | --                               | --               | --                      |
| ADE (4 mil IU A/lb)                             | 1.5                             | 0.50             | 1                                | 0.50             | 0.50                    |
| Aureomycin (50 g/lb)                            | 0.60                            | 0.20             | 0.35                             | 0.20             | 0.15                    |
| <b><u>Composition(Percent-As-Fed-Basis)</u></b> |                                 |                  |                                  |                  |                         |
| Dry Matter                                      | 88.3                            | 89.5             | 88.2                             | 88.9             | 88.4                    |
| Crude Protein                                   | 14.3                            | 12.1             | 13.2                             | 12.0             | 11.9                    |
| TDN   | 73.9                            | 58.2             | 75.1                             | 65.5             | 70.8                    |
| Calcium   | 0.60                            | 0.58             | 0.68                             | 0.50             | 0.49                    |
| Phosphorus                                      | 0.43                            | 0.28             | 0.33                             | 0.27             | 0.29                    |
| Fat   | 3.1                             | 2.0              | 3.1                              | 2.5              | 2.9                     |
| Crude Fiber                                     | 4.2                             | 22.5             | 3.4                              | 14.9             | 9.2                     |

- (1) For steers over 500 lbs. expect 1.75 to 2.25 lbs. daily gain. For heifers over 500 lbs. expect 1.25 to 1.75 lbs. daily gain.
- (2) For steers expect 2.5 to 3 lbs. daily gain. For heifers expect 1.75 to 2.25 lbs. daily gain.
- (3) For steers expect 2.75 to 3.5 lbs. daily gain. Gains during hot, humid summer months may be less than 2.75 lbs. daily. Excellent feeding management is needed with this ration.
- (4) Feed at 1 percent of body weight with good quality hay or pasture at about 1.5 percent of body weight.
- (5) Feed twice daily all cattle will consume in 30 to 45 minutes. Withdraw hay as cattle adapt to the ration (refer to the section on Feeding Market Cattle).
- (6) Feed at 1.5 percent of body weight with good quality hay at about 1 percent of body weight.

## Target Weights

A feeding program should be planned so that the steers and heifers will reach target weights (see page 2). Commercial feeds, custom mixes (Table 2) or individual feeds may be used to reach target weights. An example of how a steer calf must gain is shown in Table 3.

| <b>Weight of Calf</b> | <b>Days to Show</b> | <b>Growing</b> |                      |                 | <b>Finishing</b> |                      |                 |
|-----------------------|---------------------|----------------|----------------------|-----------------|------------------|----------------------|-----------------|
|                       |                     | <b>Days</b>    | <b>Target Weight</b> | <b>Gain/Day</b> | <b>Days</b>      | <b>Target Weight</b> | <b>Gain/Day</b> |
| 500                   | 270                 | 130            | 734                  | 1.80            | 140              | 1100                 | 2.61            |
| 600                   | 270                 | 130            | 860                  | 2.00            | 140              | 1250                 | 2.79            |
| 700                   | 210                 | 70             | 805                  | 1.50            | 140              | 1150                 | 2.46            |
| 800                   | 150                 | --             | --                   | --              | 150              | 1200                 | 2.67            |

## Feeding Market Cattle

Adjusting cattle to the finishing ration and keeping them on feed is more difficult than adapting cattle to growing rations. Often, cattle are expected to adapt to high-energy rations too rapidly. Rumen microflora should be slowly adapted to greater levels of concentrate feeds so that proper digestion and utilization can occur. To prevent disturbances, finishing rations should be carefully formulated and changes made very gradually. Rations that are coarsely ground and have considerable bulk are easier to feed without difficulty than finely ground grains and roughages.

Several methods to get cattle on feed and keep them eating regularly have been used successfully. When good quality hay is available, market steers may be slowly adapted to the supplements shown in Table 2. Steers adapted to roughage may be started on a supplement by feeding 0.5 pound of supplement per 100 pounds of body weight (3 pounds for a 600 pound steer). Hay or other roughage should be gradually reduced as the supplement level is increased. Cattle should be adapted to these supplements in two to three weeks.

Cattle may be adapted to the rations shown in Table 2 in about two to four weeks by using a method similar to that used for supplements (as explained in the preceding paragraph). An example plan for adapting steers to the various rations is as follows.

| Ration* |                                    |                                     |                              |
|---------|------------------------------------|-------------------------------------|------------------------------|
| Day     | Starter/Grower<br>(500 lbs. steer) | Grower/Finisher<br>(700 lbs. steer) | Finisher<br>(800 lbs. steer) |
| 1       | 7.5 (1.5% of BW)                   | 7.0 (1.0% of BW)                    | 8.0 (1.0% of BW)             |
| 2       | 8.0                                | 7.5                                 | 8.5                          |
| 3       | 8.5                                | 8.0                                 | 9.0                          |
| 4       | 9.0                                | 8.5                                 | 9.5                          |
| 5       | 9.5                                | 9.0                                 | 10.0                         |
| 6       | 10.0                               | 9.5                                 | 10.5                         |
| 7       | 10.5                               | 10.0                                | 11.0                         |
| 8       | 11.0                               | 10.5                                | 11.5                         |
| 9       | 11.5                               | 11.0                                | 12.0                         |
| 10      | 12.0                               | 11.5                                | 12.5                         |
| 11      | 12.5                               | 12.0                                | 13.0                         |
| 12      | 13.0                               | 12.5                                | 13.5                         |
| 13      | 13.5                               | 13.0                                | 14.0                         |
| 14      | 14.0                               | 13.5                                | 14.5                         |
| 15      | 14.5                               | 14.0                                | 15.0                         |
| 16      | 15.0                               | 14.5                                | 15.5                         |
| 17      |                                    | 15.0                                | 16.0                         |
| 18      |                                    | 15.5                                | 16.5                         |
| 19      |                                    | 16.0                                | 17.0                         |
| 20      |                                    | 16.5                                | 17.5                         |
| 21      |                                    | 17.0                                | 18.0                         |
| 22      |                                    | 17.5                                | 18.5                         |
| 23      |                                    | 18.0                                | 19.0                         |
| 24      |                                    | 18.5                                | 19.5                         |
| 25      |                                    | 19.0                                | 20.0                         |
| 26      |                                    |                                     | 20.5                         |
| 27      |                                    |                                     | 21.0                         |
| 28      |                                    |                                     | 21.5                         |

\*Withdraw hay gradually as steers adapt to the ration. BW = body weight

## Feeding Management Guidelines

1. Feed your calf at the same time daily.
2. Feed a balanced ration based on goals for target weight and condition or finish.
3. Keep the feed box clean. Feed no more than the calf will clean up in 30 minutes.
4. Try to have a companion calf.
5. Increase your feeding gradually. Make any change of feed slowly.
6. Use a variety of feed.
7. Avoid finely ground feed. A crimped or coarse grind is better.
8. If your calf goes off feed or scours, reduce the amount of grain and feed more hay immediately. Return to normal feed gradually.
9. Keep clean, fresh water before calf at all times.
10. Keep the stall clean and dry, and as free from flies as possible.
11. Turn calf out daily for exercise – nights in summer; days in winter.

## Estimating Beef Cattle Weights

$$\text{Estimated weight (lbs.) of animal} = \frac{C \times C \times AB}{300}$$

C = Heart Girth [measure the circumference behind the shoulder blade]  
 AB = Length [measure length from point of shoulder (A) to point of rump (B)]

**Example:** Heart Girth = 75 inches and Body Length = 65 inches

$$\text{Animal weight} = \frac{75 \times 75 \times 65}{300} = 1,219 \text{ pounds}$$

