

# BALANCING RATIONS FOR DAIRY COWS

Table I.—Digestible Nutrients in one pound of different feeds.

| CONCENTRATES          | Protein | Carbo-<br>hydrates | Fat  |
|-----------------------|---------|--------------------|------|
| Corn                  | .078    | .668               | .043 |
| Corn and Cob meal     | .044    | .600               | .029 |
| Gluten meal           | .297    | .425               | .061 |
| Gluten feed           | .213    | .528               | .029 |
| Hominy                | .068    | .605               | .074 |
| Wheat                 | .088    | .675               | .015 |
| Wheat bran            | .119    | .420               | .025 |
| Wheat middlings       | .169    | .536               | .041 |
| Wheat shorts          | .130    | .457               | .045 |
| Rye                   | .095    | .694               | .012 |
| Rye bran              | .112    | .468               | .018 |
| Barley                | .084    | .653               | .016 |
| Oats                  | .107    | .503               | .038 |
| Oat hulls             | .013    | .385               | .006 |
| Buckwheat             | .081    | .482               | .024 |
| Buckwheat bran        | .059    | .340               | .020 |
| Buckwheat middlings   | .227    | .375               | .061 |
| Emmer (speltz)        | .100    | .703               | .020 |
| Canada peas           | .197    | .493               | .004 |
| Kafir corn            | .052    | .443               | .014 |
| Milo maize            | .049    | .448               | .013 |
| Sorghum seed          | .045    | .611               | .028 |
| Flax seed             | .206    | .171               | .290 |
| Linseed meal O. P.    | .302    | .320               | .069 |
| Cottonseed meal       | .376    | .214               | .096 |
| Dry brewers grains    | .200    | .322               | .060 |
| Dry distillers grains | .228    | .397               | .116 |
| Wet beet pulp         | .005    | .077               | .000 |
| Dry beet pulp         | .041    | .649               | .000 |
| Molasses beet pulp    | .061    | .687               | .000 |
| ROUGHAGE              |         |                    |      |
| Corn fodder           | .025    | .346               | .012 |
| Corn stover           | .014    | .312               | .007 |
| Mixed hay             | .042    | .420               | .013 |
| Timothy hay           | .028    | .424               | .013 |
| Orchard-grass hay     | .049    | .424               | .014 |
| Cheat hay             | .034    | .358               | .006 |
| Hungarian grass       | .050    | .469               | .011 |
| Red clover            | .071    | .378               | .018 |
| Crimson clover        | .105    | .349               | .012 |
| Sweet clover          | .119    | .367               | .005 |
| Alfalfa               | .111    | .391               | .006 |
| Alsike clover         | .084    | .397               | .011 |
| Common vetch          | .127    | .378               | .026 |
| Oat hay               | .047    | .367               | .017 |
| Oats and vetch        | .083    | .358               | .013 |
| SILAGE                |         |                    |      |
| Corn                  | .012    | .142               | .007 |
| Sorghum               | .001    | .135               | .002 |
| Red clover            | .015    | .092               | .005 |
| Alfalfa               | .030    | .080               | .019 |
| Kale*                 | .019    | .046               | .003 |
| ROOTS                 |         |                    |      |
| Carrot                | .008    | .077               | .003 |
| Sugar beet            | .013    | .098               | .001 |
| Mangel                | .010    | .055               | .002 |
| Turnip                | .009    | .064               | .001 |
| Artichoke             | .013    | .147               | .002 |
| Potato                | .011    | .157               | .001 |
| Pumpkin               | .010    | .058               | .002 |

\*To be fed fresh from the field.

## FOOD OF MAINTENANCE.

Table II.—Nutrients required by cows of different weights for body maintenance.\*

| Weight<br>lbs. | Protein<br>lbs. | Carbo-<br>hydrate<br>lbs. | Fat<br>lbs. |
|----------------|-----------------|---------------------------|-------------|
| 800            | .56             | 5.60                      | .08         |
| 900            | .63             | 6.30                      | .09         |
| 1000           | .7              | 7.00                      | .10         |
| 1100           | .77             | 7.70                      | .11         |
| 1200           | .84             | 8.40                      | .12         |

Table III.—Nutrients required for the production of one pound of milk containing a given percentage of butter fat.\*

| Fat<br>Per cent | Protein<br>lbs. | Carbo-<br>hydrate<br>lbs. | Fat<br>lbs. |
|-----------------|-----------------|---------------------------|-------------|
| 3.0             | .047            | .20                       | .017        |
| 3.5             | .049            | .22                       | .019        |
| 4.0             | .054            | .24                       | .021        |
| 4.5             | .057            | .26                       | .023        |
| 5.0             | .060            | .28                       | .024        |
| 5.5             | .064            | .30                       | .026        |
| 6.0             | .067            | .32                       | .028        |

\*From Bulletin 130 by T. L. Haecker, Minn. Exp. Sta.

## BALANCING A RATION.

In order to be able properly to balance a ration, one must be willing to spend some time in studying the subject and becoming familiar with the composition of the various feed stuffs.

The dairy cow uses feed to maintain her body and for the manufacture of milk. If she is carrying a calf, provision must be made in the food for its growth and development.

The problem of the feeder is to provide the cow with the materials necessary to enable her to accomplish her work. These materials are the digestible protein, carbohydrates, and fats contained in the food, and are grouped under the general term of nutrients. These nutrients are used by the animal body as follows:

The proteids provide material for the upkeep of the body and are the source of the casein and albumen in the milk. The carbohydrates supply the body with heat and energy and are the source of the sugar and fat in the milk. The fats in the food accomplish the same work as do the carbohydrates, but are listed separately because of their greater value, one pound of fat being equal to about two and one-fourth pounds of

carbohydrates. When the above-named nutrients in a ration are in such proportion as best to meet the needs of the animal, the ration is known as a balanced ration.

The first step in providing such a ration is to ascertain the needs of the animal. As an illustration to show how to adjust a ration, let us assume that we have a cow weighing approximately 1000 pounds and giving 30 pounds of four-per-cent milk daily. By referring to Tables II and III, we find the requirements of such an animal. (See Table IV.)

**Table IV.—Requirements of a 1000-pound cow, giving 30 pounds of four-per-cent milk a day.**

|   | Protein<br>lbs. | Carbo-<br>hydrates<br>lbs. | Fat<br>lbs. |
|---|-----------------|----------------------------|-------------|
| For maintenance .....                   | .7              | 7.0                        | .1          |
| To produce 30 lbs. 4 per cent milk..... | 1.62            | 7.3                        | .62         |
| Nutrients required .....                | 2.32            | 14.3                       | .72         |

The next step is to make a selection of feed stuffs that will meet these requirements. The ration should contain a considerable amount of roughage; first, because the cow requires a bulky ration, and second, nutrients can usually be grown cheaper in this form than any other. For these reasons it is the common practice to give the cow all the hay or other coarse fodder she will clean up. It is also very desirable that she be given some succulent food, such as roots, kale, or silage.

By referring to Table I, we may make such selections of hay, succulent foods, and grains as follows:

**Table V.—Balanced rations for a 1000-pound cow, giving 30 pounds of four-per-cent milk a day.**

| A                               |                 |                            |             |
|---------------------------------|-----------------|----------------------------|-------------|
|                                 | Protein<br>lbs. | Carbo-<br>hydrates<br>lbs. | Fat<br>lbs. |
| 15 lbs. oat and vetch hay ..... | 1.25            | 5.37                       | .20         |
| 30 lbs. corn silage .....       | .37             | 4.30                       | .21         |
| 5 lbs. barley .....             | .42             | 3.26                       | .08         |
| 2 lbs. oats .....               | .21             | 1.01                       | .08         |
| 1 lb. gluten feed .....         | .21             | .53                        | .03         |
|                                 | 2.46            | 14.47                      | .60         |
| B                               |                 |                            |             |
| 15 lbs. clover hay .....        | 1.07            | 5.67                       | .27         |
| 40 lbs mangels .....            | .40             | 2.20                       | .08         |
| 4 lbs. bran .....               | .48             | 1.68                       | .10         |
| 5 lbs. beet pulp .....          | .21             | 3.24                       | .00         |
| 3 lbs. corn meal .....          | .24             | 2.01                       | .13         |
|                                 | 2.40            | 14.80                      | .58         |
| C                               |                 |                            |             |
| 15 lbs. oat hay .....           | .71             | 5.50                       | .26         |
| 50 lbs. kale .....              | .95             | 2.35                       | .15         |
| 5 lbs. barley .....             | .42             | 3.26                       | .08         |
| 4 lbs. beet pulp .....          | .16             | 2.60                       | .00         |
| 1 lb. middlings .....           | .17             | .54                        | .04         |
|                                 | 2.41            | 14.25                      | .53         |

These rations are given to illustrate the method used in building up a ration rather than to present one that is ideal. Many others equally good can be formulated, and, possibly, cheaper foods substituted for some of those used.

It will be noticed that a surplus of protein is provided, and that a slight variation in other nutrients occurs. Foods vary considerably in composition, and all feeding standards can only be close approximations.

The amount of milk a cow can give is limited to the protein content of the ration, and as a surplus of this nutrient can be used for other purposes in the animal body, it is the practice of most feeders to provide this nutrient somewhat in excess of actual requirements. This practice is generally recommended, where the excess protein is secured at a cost not exceeding that of a corresponding amount of carbohydrates.

In making a grain mixture for a herd, it is well to compute the requirements of a cow giving an average amount of milk. This same mixture can then be fed to cows giving greater or lesser amounts, in the proportion of one pound of grain to about four pounds of milk.

**Oregon Agricultural College**

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BY

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