the steamships, have been very satisfactory. The shipments have been nearly 3,000 packages per week lately, and the reports from England of the arrivals of the first shipments sent in the cold storage compartments are all that could be desired. Our Department accepts no responsibility in regard to the selling of the butter.

I feel confident that the cold storage service (*) which has been inaugurated will prove of enormous benefit to the producers of perishable products in Canada. I can see already how, by means of these preserving and protecting facilities, a very great expansion in the shipments of poultry, eggs, and fruit, as well as butter and cheese, can be made to Great Britain, with the certainty that our goods will reach the consumers there in excellent condition. I am, Yours very truly,

Ottawa, Aug. 5th. JAS. W. ROBERTSON.

(*) THE COLD STORAGE SERVICE.

Following are particulars of agreements made on behalf of the Government for the cold storage service :—

Railways.—The agreement with the railway companies is in substance that the Government guarantees a sum equal to two-thirds of the amount which would be earned at the carload rate from the point from which the car starts to Montreal. The shippers of butter by these cars are charged the usual less than carload rates, and the revenue so earned by the several cars is credited to the amount guaranteed by the Government. Thus the Government has agreed to pay only the difference between the earnings of each car and the two-thirds of each carload rate upon such car from the point of starting to Montreal. In some cases the earnings will equal the amount guaranteed by the Government.

In addition, the Government pays for the cost of icing the cars.

Steamships.—An agreement has been made with the steamship companies by which the Dominion Government agrees to pay from Montreal to Liverpool the sum of 15s. per 40 cubic feet (one ton by measurement) for the space occupied by the refrigerator compartments which are being put up in the several steamships.

The steamship companies agree to issue bills of ladings to those who ship creamery butter in these compartments at the ordinary current rates for that week for butter and cheese. The amount so earned is credited on the sum guaranteed by the Government as specified above. Only such butter as has been handled in compliance with the conditions announced in the circular issued specifying this service is entitled to the privileges of the cold storage service on board the steamships.

The Government puts up the compartments at its own expense, and of such a permanent character that they are expected to last for several years—practically part of the ship's equipment.

The rate agreed upon between Montreal and Bristol is 20s. per 40 cubic feet, or ton measurement. The cost of these compartments will vary from $250.00 to $350 00 per steamship, for a capacity of 1,000 packages of butter;—package of butter contains about 70 pounds.

Warehouse in Montreal.—The Montreal Cold Storage and Freezing Company offer to store butter which used the cold storage on the railways and was intended for the cold storage service on steamships, provided by the Government, at lower than usual rates, viz., 8 cents per 100 pounds of butter for the first 15 days, at a temperature not exceeding 20° Fahr., and 10½ per 100 pounds of butter for the subsequent 30 days or any part thereof. The Government offer to charge those who comply with the requirements as to shipping the butter while still fresh at the rate of 5 cents per 100 pounds for the first 15 days, and for the following 30 days, or any less period, 8 cents per 100 pounds of butter.

Feeding Standards and Rations for Dairy Cows.

[Farmers' Institute address by G. E. Day, B. S. A., Professor of Agriculture and Live Stock Lecturer, O. A. C., Guelph.]

A great deal of attention is at present being devoted to the economical use of our stock foods; and since a knowledge of the composition of food stuffs and an intelligent conception of the use of their different constituents cannot fail to be of value to the thoughtful feeder, this paper has been prepared in the hope of simplifying the subject and of attracting more attention to this very important question.

In the first place, we must understand that plants contain substances almost identical in composition to the substances which comprise the animal body. Animals eat plants, digest a portion of them, and use the digested portion in building up the different parts of their bodies, in producing milk or in producing heat and energy. Thus, some of the substances form bone; some form flesh, muscle, blood or milk; some form fat, while others are consumed in the production of heat, which is necessary to sustain animal life and energy.

The substances of which plants are composed may be grouped under five heads, as follows: (1) water; (2) ash or mineral matter; (3) protein (sometimes spoken of as "proteids" or "albuminoids"); (4) carbohydrates (also called "nitrogen free extract"); (5) fat (sometimes called "ether extract").

It is impossible to accurately estimate the value of the water which foods contain. In many cases the water seems to very materially increase the feeding value of the fodder, which fact is strikingly illustrated in the case of pasture grass and roots; and apart from their feeding value, such succulent fodders have a beneficial effect in keeping the animal system in good working order.

Ash, or mineral matter, is used in the formation of bone, and is, therefore, of importance in feeding young growing stock. The high value of oats in feeding young animals is due to the fact that oats are especially rich in mineral matter and are, therefore, good bone formers: while it is well-known that an exclusive grain ration of corn is injurious to young stock, simply because corn is deficient in ash.

Protein contains nitrogen, and is concerned in the formation of flesh, muscle, blood, milk, hair, wool, horn, etc., and to some extent fat. It will also supply heat and mechanical force, enabling the animal to do work. By work is meant any kind of muscular exertion.

Fat undergoes combustion in the body, producing heat which is necessary to create mechanical force. It is also stored up in the body as fat, to be used when required. Thus fat animals can live a long time without food, the fat that has been stored up supplying heat.

Carbohydrates are concerned chiefly in the production of heat, and are not stored up in the body. They form the largest part of vegetable foods.

If an animal is fed upon protein alone, it cannot live long, but becomes sickly and dies in a comparatively short time. Protein is also more expensive than carbohydrates, and therefore it is a wasteful practice to feed more protein than is necessary. At the same time, in order to obtain the best results, a certain amount of protein is necessary, as is also a certain amount of fat; and the object of the feeder is to compound a ration which contains these three substances (protein, carbohydrates and fat) in the most suitable proportions. Such a ration is called a "balanced ration."

The relation which the digestible protein bears to the digestible carbohydrates and fat is called the "nutritive ratio" of a fodder. Thus, if we say that the nutritive ratio of a fodder is 1:7, we mean that there is one part of digestible protein to seven parts of digestible fat and carbohydrates.

The value of a fodder depends upon its composition and its digestibility. No fodders are entirely digestible, though roots and milk are very nearly so. We cannot, therefore, determine the nutritive ratio of a fodder from its composition only, but we must know what portions of the different constituents are digestible.

Digestion experiments are very difficult to conduct, but the following table shows the latest conclusions of experts as to the amount of digestible nutrients in the several food stuffs named, and may be regarded as approximately correct. The column under "Total organic matter" contains the total amount of digestible and indigestible protein, carbohydrates and fat in the different fodders.

Pounds of nutrients in 100 pounds of fodder :—

Fodder.	Digestible Protein.	Digestible Carbohydrates.	Digestible Fat.	Total Organic Matter.
Pasture grass	2.6	10.6	.5	18
Green fodder corn	1.3	11.8	.7	19.5
Green clover	2.9	14.1	.4	27.1
Green rye	2.1	14.1	.4	21.6
Green oats	2.7	22.7	1.0	35.3
Corn silage	1.3	14.0	.7	24.2
Fodder corn, dry	3.7	40.4	1.2	66.8
Red clover hay	6.5	34.9	1.6	78.5
Alfalfa hay	7.6	37.8	1.3	84.2
Timothy hay	3.0	43.9	1.2	82.4
Oat straw	1.6	41.4	.7	85.7
Pea straw	4.3	32.3	.8	79.8
Potatoes	1.4	16.1	.1	20.1
Sugar beets	1.1	9.3	.1	12.6
Mangels	1.1	4.8	.2	8.0
Turnips	.6	5.5	.2	8.7
Carrots	1.0	7.1	.3	10.4
Corn	7.1	62.7	4.2	87.6
Corn and cob meal	6.5	56.3	2.9	83.4
Oats	9.1	44.7	4.1	86.0
Barley	9.5	66.1	1.2	86.7
Wheat	9.2	64.9	1.4	87.7
Wheat bran (roller)	12.6	44.1	2.9	82.4
Wheat bran (stone)	10.1	47.5	2.6	83.1
Wheat shorts	11.6	45.4	3.2	83.6
Wheat middlings	12.2	47.2	2.9	84.5
Rye	8.3	65.5	1.2	86.5
Buckwheat	7.7	49.2	1.8	85.4
Pea meal	18.0	56.0	.9	86.9
Malt sprouts	19.8	36.2	1.7	84.5
Brewers' grains	3.9	9.5	1.3	23.3
Brewers' grains, dried	16.2	35.5	5.3	88.7
Gluten meal	25.0	49.4	5.6	89.7
Starch fed wet	5.5	21.7	2.3	34.3
Cottonseed meal	36.9	18.1	12.3	84.6
Linseed meal, old process	28.3	32 8	7.1	85.1
Linseed meal, new process	27.2	32.9	2.7	84.1
Skimmed milk	3.1	4.7	.8	8.9
Buttermilk	3.9	4.0	1.1	9.2
Whey	.8	4.7	.3	5.9
Whole milk	3.5	4.8	3.7	12.0

N. B.—Linseed meal is the American name for oilcake.

In the production of heat, fat has about 2.2 times the value of carbohydrates, and as the production of heat is closely associated with the nutritive value, it is customary to count fat 2.2 times as valuable as carbohydrates for fodder. Therefore, if we multiply any given amount of fat by 2.2, the product will represent the amount of carbohydrates that the given amount of fat is equal to.

If we wish to find the nutritive ratio of a fodder, we must first find the digestible nutrients which it contains. Then the amount of fat is multiplied by 2.2 to express the amount of carbohydrates that it is equal to. The product thus obtained is then added to the amount of carbohydrates, which gives the total amount of carbohydrates which the fat and carbohydrates are together equal to. Then this number is divided by the amount of protein.

For example, we will determine the nutritive ratio of barley. According to the table, it contains digestible nutrients in 100 pounds as follows: Protein, 9.5; carbohydrates, 66.1; fat, 1.2. Then multiplying the fat by 2.2, we get $1.2 \times 2.2 = 2.64$. Adding this product to the carbohydrates, we get: $66.1 + 2.64 = 68.74$. Therefore, nutritive ratio = 9.5; 68.74. But it is customary to express the digestible protein as 1, therefore we must divide by the amount of protein, which gives nutritive ratio, 1: 7.23.

(TO BE CONTINUED.)

The Australian Minister of Agriculture has instructed the Government dairy expert to visit New Zealand to enquire into the manufacture of cheese on the Canadian principle. Since New Zealand has adopted the Canadian method of manufacturing cheese, she has obtained a considerable foothold upon the London market. Australia sees this and is anxious to also learn from the wise and prudent.

Best Methods of Reducing the Cost of a Pound of Butter.

(BY F. J. S.)

II. FEEDING.

Quantity.—Many cows do not get at all times sufficient to eat. To any thinking person this is a penny-wise and pound-foolish practice, and one that materially increases the cost of butter production. At time of writing (July) the vast majority of Ontario cows are in this position. It is well to remember that it is only from the feed that is eaten over and above that required to maintain the system that any profit can be reaped. Cows should be fed liberally always,—this will of a certainty reduce the cost of the product in more ways than one.

Let us illustrate. Shortage of feed at this season means increased cost per lb.: (1) In immediate reduction of product. (2) In continued reduction of product throughout the season. Cows that early in the season fail in flow of milk cannot be induced, even by full feeding later, to return to their former flow. (3) In a shortened milking season. (4) A lengthened period of feeding while dry, and, therefore, an increased cost of winter maintenance. (5) An impaired progeny.

The general practice of putting dependence upon grass for summer feeding is one that brings a train of disastrous results that together combine to increase the cost of our butter product. And this is common at other seasons, notably when the cow is dry, which is usually in winter. Were our cows more liberally fed when dry they would certainly give a greater quantity of butter in the season, and at less cost per lb. Insufficient feeding while dry is a sure method of developing unprofitable dairy herds.

Quality.—This is often neglected, to our injury. It is quite possible to feed a cow liberally as regards quantity, but very illiberally as regards quality. It is usually better to feed two kinds (or more) of grain rather than one, and the same may be said of coarse fodders. To feed largely of coarse fodders and little or no grain is not advisable. A ration made up almost solely of carbohydrate fodder is always a wasteful one. Carefully-conducted experiments upon a combined scientific and practical basis have proved that one-sided rations do not digest as fully as well-balanced rations, and that increased waste of nutriment results. Corn stover, straw, and wheat, or shorts, could not, for instance, be considered a very profitable ration. The same principles apply to rations exclusively albuminoid in character.

Palatability.—That digestibility and palatability are more or less closely linked we believe it would not be wise to deny. That roots and silage owe much of their feeding excellence to this we think is equally true. Under customary practice the cost of butter might be considerably decreased by attention to this matter, especially during late winter and late fall.

Regularity.—Irregularity in feeding—(we mean in quantity and quality rather than in time)—especially in early life—causes the wreck of many an otherwise good cow. A calf that is stinted in feed for a more or less lengthened period—due to shortage of feed or a busy season—is doomed to give disappointment when a member of the herd. Such an animal will not in later life respond to good feeding, as not only the digestive but the assimilative powers have been destroyed. Liberal feeding from calfhood up is absolutely necessary if the cost of butter would be reduced.

MANAGEMENT.

The Calf.—Generally speaking, we believe the fall calf outstrips its spring relation, and makes a cow more likely to produce cheap butter. The spring calf that is exposed to the heat and flies of summer is not usually a record-breaker.

The Heifer.—Were the heifers with their first calf milked at least ten to twelve months, instead of being allowed to go dry in six or seven, the cost of butter production would be very largely decreased. Careful training will accomplish wonders in this direction. Six or eight months cows are *very* common, and as long as this practice is persisted in the cost of butter will be correspondingly high. We should not forget that, milking or not, the cow is to be fed twelve months each year, and as she is very largely a creature of habit, the length of her first milking period will largely control all subsequent ones.

The Cow.—One point only here—the question of stabling in summer time during the day, while heat is intense and flies continue troublesome. All farmers who have faithfully tried this practice speak highly of results, and others need not hope to successfully deny it. No financial outlay is needed, and the labor connected with it is amply repaid by increased product. We believe that no other one practice—extra feed not excepted—will so cheapen butter production in the summer season. A cool and darkened stable is a positive paradise for cows, and they will not forget to respond. There is right here a possible saving of at least two cents per pound of product.

The By-Products. Many people lose as much butter-fat in the skim-milk and buttermilk as would, if regained, reduce the cost of the whole butter produced from one to five cents per pound. An astonishing statement! Perhaps so; but none the less true, being based upon actual facts. From five to ten times as much butter-fat is frequently lost in these by-products as good work would warrant. The reduction of the cost of a pound of butter is truly a wide and important subject to the dairy farmer.