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# **Ontario Department of Agriculture**

# ONTARIO AGRICULTURAL COLLEGE

**BULLE FIN 246** 

# Suggestions on Feeding Stock

BY

G. E. DAY, B.S.A.,

Professor of Animal Husbandry

Also "The Live Stock Situation from the Marketing Standpoint," by H. S. Arkell, Asst. Live Stock Commissioner for Canada



TORONTO, ONTARIO, JANUARY, 1917



**BULLETIN NO. 246**]

[JANUARY, 1917

# **Ontario Department of Agriculture**

**ONTARIO AGRICULTURAL COLLEGE** 

Suggestions on Feeding Stock

G. E. DAY, B.S.A.

## IMPORTANCE OF LIVE STOCK.

When we attempt to say anything upon the subject of stock feeding we are at once confronted by the fact that feed is searce and very high in price at the present time. It is mainly on account of the searcity of feed that this pamphlet has been prepared, but, before the subject of feeding is dealt with, le<sup>+</sup> us consider briefly the importance of conserving the live stock upon Canadian 1. 1s, under prevailing conditions.

Owing to the scarcity of fced, no doubt there are many men in this Province who are compelled to sell at least part of their stock, and to these men we have nothing to say, but there are other men who are selling their stock merely because the price of feed is high and they wish to sell their crop. Let us consider what the effects of such a course are likely to be.

(1) Stock is being sold under conditions which do not favor securing full value for young or thin stock.

(2) Hay, which is the most abundant crop this year on Ontario farms, is being sold at prices which are low in comparison with the prices of concentrates, and which are lower than could have been obtained if the hay had been fed to good stock.

(3) Much material which can be given value only by feeding it to stock is being allowed to go to waste on those farms from which the live stock has been sold.

(4) The farms are being robbed of their fertility, and are having their productiveness injured for years to come.

(5) When an abundant rop is once more secured, the men who have sold their stock will be forced to re-stock their farms at higher prices than they received for the stock they sold, because the most reliable figures we can obtain go to show that the numbers of farm animals in Canada have been growing less from year to year for some time past. If this reduction goes much further it looks as though something approaching famine prices for live stock are almost sure to prevail in the near future.

The men who sell their stocks are facing all these disadvantages, and running the risk of serious losses, in order that they may sell a few bushels of grain at a high price, but they overlook the fact that with good stock and reasonable management they could have obtained, in most cases, more money from their season's crop if they had retained their stock.

Live stock will continue to be, as it has always been in the past, the most important factor in successful farming, and it looks as though its importance is likely to be greatly increased as a result of the war. He who can conserve his live stock will surely reap a reward and, in addition, will perform a patriotic service to his country and the Empire.

# COMPOSITION OF FOODSTUFFS.

The subject of stock feeding is a very broad one, and in this brief treatment of the subject all that can be attempted is to offer a few suggestions, in the hope that they may prove helpful to the farmer when he has to make a selection from the foodstuffs offered on the market.

Very frequently requests are received at the College for tables showing the eomposition of foodstuffs, and hence there has been incorporated in this bulletin a table giving the composition of the principal foodstuffs, which are likely to be met with in the markets of this Province. The table, we hope, will meet the demand mentioned above, and will also prove useful for reference in the discussion of the relative merits of various fodders.

It will be noted that the constituents of the foodstud's are given under six different headings, and for the benefit of those to whom the subject may not be familiar, a few explanations of the headings are offered.

Water.—This term requires no explanation. All foods, no matter how dry they may appear. contain a certain proportion of water. Some foods, like roots, for example, contain a very high percentage of water, and such foods are spoken of as "succulent" foods. Generally speaking, the exact proportion of water in a food is not important, from the standpoint of animal nutrition, because animals can be supplied water directly, to make up any deficiency. While this is true, we must not overlook the fact that all animals are benefited by receiving a certain amount of succulue odd every day. Practical feeders understand the importance of foods of this nature, in keeping the animal's digestive organs in good condition.

Ash.—A reference to the table will show that the percentage of ash in most of the foods is relatively small, but the ash plays a very important part, especially in the nutrition of young, growing animals, because it represents the mineral portion of the fodder, which goes to build up the bony structure of the animal. When the ash in any food falls below two per cent. it may be said to be low, e pecially for young, growing mimals.

**Crude Protein.**—The heading, erude protein, takes in a group of substances which we need not enumerate, but which are all similar in composition. They all contain the element nitrogen, and hence erude protein is said to be the nitrogenous part of a food Protein is usually spoken of as a flesh former, because it plays a very important part in building up the muscles, or lean meat, as well us the ligaments, skin, hair, wool, etc., of animals. It is also essential for milk production. There are two classes of animals which especially require food fairly rich in protein, and these are young growing animals and those which are producing milk. This is a very important fact which should never be lost sight of by the feeder in making up rations for various animals.

**Carbolydrates.**—It will be noted, in the table, that carbolydrates are divided into two groups, namely, fibre, and nitrogen-free extract.

Fibre represents the woody portion of the fodder. It is difficult to digest, especially for hogs. Horses, cattle and sheep can digest fibre to better a ivantage than hogs, though, in any case, the actual for value of fibre is small, and its presence in large quantities in any fodder is always a serious objection. All fodders of vegetable rigin contain fibre, but a glauce down the column under this heading will she a very great variation in the amount of fibre contained in different foods.

Nitrogen-free Extract is more casily dissolved and hence is much more digestible, and of much higher value than fibre. Under this heading come such substances as starch, sugar, etc.

Carbohydrates, as a whole, are used to keep up the heat and energy of the animal body and to form fat.

Fat.—Under this heading are included many substances more or less oily in nature. A glance down the column under this heading will show that some foods contain only a trace of fat or oil, while others, such as flavseed, eontain a very high percentage. The fat in the food is used to keep up the heat and energy of the animal, and to aid in the production of fat in the animal body. It will be seen, therefore, that the fat of the food performs functions similar to those performed by carbohydrates, but fat is more effective than carbohydrates, and seems to have certain independent influences which are difficult to define. In many cases a fairly high percentage of fat seems to make foods more acceptable to animals, and also to have a marked effect upon the condition and general thrift of the animals. There are exceptions to this rule, however, such as, for example, cottouseed meal, which is higher in fat than linseed meal but which does not give as good results so far as the condition of the animal is concerned.

The sable which follows has been adapted from tables which appear in that most excellent book "Fords and Feeding," by Henry and Morrison:

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# COMPOSITION OF FOODSTUFFS

				Carbohydrates		
FOODSTUFF	Water	Ash %	Crude Pro- telu %	Fibre %	Nitro- gen, free extre :t	Fat %
. CEREAL GRAINS.						
Barby and its Products.						
Barley Brewers' grains, dried Brewers' grains, wet Malt sprouts or combings	9.3 7.5 75.9 7.3	2.7 3.5 1.0 6.1	11.5 26.5 5.7 26.4	14.6 3.6 12 5	69.8 41.0 12.1 45.6	2.1 6.9 1.7 1.5
Buckwheat and its Products.						1
Buckwheat Buckwheat middlings Buckwheat bran, high grade Buckwheat bran. low grade Buckwheat hul	$\begin{array}{c} 12.1 \\ 12.0 \\ 11.2 \\ 10.1 \\ 10.3 \end{array}$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$   \begin{array}{r}     10.8 \\     28.3 \\     22.3 \\     10.7 \\     4.4   \end{array} $	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	89.9 38.5	2.5 7.4 5.8 2.7 1.0
Corn and its Products.						
Corn, dent Corn, flint Corn bran Germ oll meal Gluten feed, high grade Gluten feed, low grade Gluten meal, high grade Gluten meal, low grade	10.5 12.2 10.0 8.9 8.7 8.8 9.1 8.2		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	70.9         69.4         62.4         46.0         52.9         59.7         47.5         43.4	5.0 5.0 5.7 10.8 <b>3.8</b> 5.7 4.7 10.4
Emmer.	8.7	3.	7 11.9	9 10.1	63.7	1.9
Oats and their Products.		1				
Oats Oat bran Oat dust Oat middlings Oat huils		3. 5. 7. 5. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8. 8.	5       12.         1       12.         0       12.         2       16.         0       4.	4 10.9 2 18.3 6 18.3 3 4.0 0 29.3	59.6       52.3       7     49.9       6     61.8       2     52.3	4.4 4.7 5.2 6.8 1.7
Rye and its Products.						
Rye Rye bran Rye middlings	9. 11. 11.	4 2. 4 3. 4 3.	0 11. 5 15. 7 15.	8 1. 3 4. 7 4.	8 73.2 0 62.7 6 61.2	1.8 3.1 3.4
Wheat and its Products.						
Wheat, all analyses Flour wheat middling; Standard wheat middling; Wheat bran, all analyses Red dog flour	10. 10. 10. 10. 10. 11.	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	.9 12 .7 17 .4 17 .3 16 .5 16	.4 2. .8 4. .4 6. .0 9. .8 2.	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.1 5.0 4.9 4.4 4.1
2. LEGUMINOUS SEEDS AND THEIR PRODUCTS.						
Cull beans Field pea Pea bran Pea hulis Peanut cake, without hulls Peanut cake, hulls included	12. 9 9 7 10 5	.8 3 .2 3 .9 5 .2 3 .7 4 .6 4	.3     22       .4     22       .9     12       .6     6       .9     47       .5     28	.1       3         .9       5         .2       35         .9       43         .6       5         .4       23	.7 56.7 .6 57.8 .3 35.6 .6 37.1 .1 23.7 .4 27.0	1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1

COMPOSITION ' FOODSTUFFS-Continued

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				Carbohydrates			
_	FCODSTUFF	Water	Ash	Crude Pro- tein 'e	Fibro	Nitro- gen, free extract	Fat %
3.	OPERALING SFEDS AND THEIR PRODUCTS,						
	Geogranut meal Cotton seed meal (choice) Cotton seed meal (prime) Cotton seed meal (good) Cold pressed cotton seed cake Cottonseed feed Cottonseed feed Flax seed Linseed meal (ground oll cake) oybean meal, fat extracted Sunflower seed cake	9.6 7.5 7.8 7.9 8.3 9.7 9.2 9.1 11.8 10.0	$\begin{array}{c} 4.9\\ 6.2\\ 6.6\\ 4.2\\ 4.9\\ 2.7\\ 4.3\\ 5.4\\ 5.4\\ 4.2\\ 5.4\\ 4.2\end{array}$	$\begin{array}{c} 20.9\\ 44.1\\ 39.8\\ 87.6\\ 26.1\\ 24.5\\ 4.6\\ 22.6\\ 33.9\\ 41.4\\ 34.8 \end{array}$	$11.2 \\ 5.1 \\ 10.1 \\ 11.5 \\ 21.0 \\ 21.4 \\ 43.8 \\ 7.1 \\ 8.4 \\ 5.3 \\ 10.9 \\ 10.9 \\ 10.10 \\ 10.1$	45.3 25.0 27.4 28.4 30.1 34.6 37.3 235.7 28.7 28.7 21.8	$\begin{array}{c} 8.1 \\ 9.1 \\ 8.3 \\ 8.2 \\ 7.7 \\ 6.3 \\ 1.9 \\ 33.7 \\ 7.5 \\ 7.4 \\ 18.3 \end{array}$
4.	MILK AND ITS PRODUCTS.						
	Cow's milk Buttermilk Skim milk, separator Skim milk, gravity Whey		$\begin{array}{c} 0.7 \\ 0.7 \\ 0.7 \\ 0.7 \\ 0.7 \\ 0.7 \\ 0.7 \end{array}$	$3.5 \\ 3.6 \\ 3.8 \\ 3.3 \\ 0.8$	· · · · · · · · ·	5.0 5.0 5.2 4.7 4.8	$\begin{array}{c} 4.4 \\ 0.1 \\ 0.2 \\ 0.9 \\ 0.3 \end{array}$
5.	SLAUCHTER-HOUSE BY-PRODUCTS,						
	Dried blood Tankage, over 60% protein Tankage, 55% to 60% protein Tankage, 45% to 55% protein Tankage, below 45% protein	$9.7 \\ 7.4 \\ 7.5 \\ 7.5 \\ 6.5 \\ 1.5 $	$3.3 \\ 10.5 \\ 13.6 \\ 19.7 \\ 22.6$	$\begin{array}{c} 82.3 \\ 63.1 \\ 58.1 \\ 51.7 \\ 40.4 \end{array}$	$     \begin{array}{r}             3.6 \\             4.9 \\             3.0 \\             3.7 \\         \end{array}     $	3.8 2.5 2.9 4.2 9.9	0.9 12.9 13.0 14.0 17.0
6,	MISCELLANEOUS CONCENTRATES.			!			
	Beet pulp, wet Bøet pulp, dried Distillers' grains, dried (corn) Distillers' grains, dried (from rye) Molasses, beet Molasses, cane, or blackstrap	$   \begin{array}{r}     90.7 \\     8.2 \\     6.6 \\     7.2 \\     25.3 \\     25.8   \end{array} $	$0.4 \\ 3.5 \\ 2.6 \\ 3.9 \\ 5.2 \\ 6.4$	$\begin{array}{r} 0.9 \\ 8.9 \\ 30.7 \\ 23.1 \\ 3.5 \\ 3.1 \end{array}$	$\begin{array}{c} 2.1 \\ 18.9 \\ 11.6 \\ 10.9 \\ \\ \dots \\ \end{array}$	5.759.626.347.156.0 $64.7$	0.2 0.9 12.2 7.8
7.	DRIED FORAGE.						
	Alfalfa hay, all analyses         Clover hay (red), all analyses         Clover hay (alsikc). Rll analyses         Clover hay (white sweet)         Corn fodder (medlum in water)         Corn stover (medlum in water)         Millet hay (Hungarlan)         Oat hay         Prairie hay, western         Timothy hay, all analyses	$\begin{array}{c} 8.6\\ 12.9\\ 12.3\\ 8.6\\ 18.3\\ 19.0\\ 14.3\\ 12.0\\ 6.5\\ 11.6\end{array}$	$\begin{array}{c} 8.6 \\ 7.1 \\ 8.3 \\ 7.2 \\ 5.0 \\ 5.5 \\ 6.3 \\ 6.8 \\ 7.7 \\ 4.9 \end{array}$	$14.9 \\12.8 \\12.8 \\14.5 \\5.7 \\8.3 \\8.4 \\8.0 \\6.2$	$\begin{array}{c} 28.3\\ 25.5\\ 25.7\\ 27.4\\ 22.0\\ 27.7\\ 24.0\\ 28.3\\ 30.5\\ 29.9 \end{array}$	$\begin{array}{c} 37.3\\ 35.7\\ 38.4\\ 40.1\\ 45.8\\ 40.9\\ 44.3\\ 41.7\\ 44.7\\ 44.7\\ 45.0 \end{array}$	2.3 2.1 2.5 2.2 2.2 1.2 2.8 2.8 2.6 2.5
8.	STRAW AND CHAFF.						
	Barley straw Buekwheat straw Oat straw Oat chaff Rye straw Wheat straw Wheat chaff	$14.2 \\9.9 \\11.5 \\8.2 \\7.1 \\8.4 \\14.4$	5.7 5.5 5.4 11.5 3.2 5.2 7.2	3.5 5.2 3.6 5.9 3.0 3.1 4.2	36.0 43.0 36.5 25.7 38.9 37.4 28.0	$\begin{array}{r} 39.1 \\ 35.1 \\ 40.8 \\ 46.3 \\ 46.6 \\ 44.4 \\ 44.8 \end{array}$	1.5 1.3 2.4 2.4 1.2 1.5 1.4

	1		1	Carbohydrates		
FOODSTUFF	Water %	Ash %	Crude Pro- tein %	Fibre %	Nitro- gen, free extract	Fat %
9. ROOTS AND TUBERS.						
Carrot Mangel Potato Sugar beet Swede turnip White turnip	. 88.3 . 90.6 . 78.8 . 83.6 . 89.1 . 90.5	$1.2 \\ 1.0 \\ 1.1 \\ 1.1 \\ 1.0 \\ 0.9$	$ \begin{array}{c} 1.2 \\ 1.4 \\ 2.2 \\ 1.6 \\ 1.2 \\ 1.4 \end{array} $	$ \begin{array}{c c} 1.1 \\ 0.8 \\ 0.4 \\ 1.0 \\ 1.4 \\ 1.1 \end{array} $	8.0 6.1 17.4 12.6 7.0 5.9	$\begin{array}{c} 0.2 \\ 0.1 \\ 0.1 \\ 0.1 \\ 0.3 \\ 0.2 \end{array}$
10. MISCELLANEOUS GREEN FORAGES.				,		
Apple Apple pomace Cabbage Pumpkin, field	. 81.8 . 76.7 . 91.1 . 91.7	0.4 1.0 0.8 0.9	0.5 1.6 2.2 1.4	$ \begin{array}{c c} 1.3 \\ 4.6 \\ 0.9 \\ 1.3 \end{array} $	$ \begin{array}{c c} 15.6 \\ 14.5 \\ 4.7 \\ 4.2 \end{array} $	0.4 1.6 0.3 0.5
11. SILAGE.		1				
Corn silage, well matured Corn silage, immature		1.7	2.1 1.9	6.3 5.8	15.4	0.8

# COMPOSITION OF FOODSTUFFS-Continued

It will be a disappointment, no doubt, to a number of people, to learn that there is apparently no method by means of which we can form an exact estimate of the relative feeding values of different fodders. It is true there is a method which is moderately accurate, but is somewhat limited in its application, and is probably too complicated for our purpose at the present time. All that will be attempted in the present discussion is the presentation of the subject of stock feeding in such a manner as to give some helpful hints to those who are really interested in the subject.

Before taking up any discussion on foodstuffs let us not forget what was said near the beginning of this article, namely, that the presence of a large proportion of crude fibre in a fodder is always a serious objection, because it tends to decrease, in a very marked degree, the food value of the fodder in question.

Another point which we must bear in mind is the fact that most of the homegrown feeds, which are produced most cheaply and in greatest abundance, are inclined to be poor in crude protein. Protein is rather more expensive to produce than carbohydrates, and it is also more expensive to purchase. Owing to the fact, however, that there is a general deficiency of protein in the bulk of our homegrown feeds, it becomes important for us to pay particular attention to the protein content of foods we wish to purchase. Any foodstuff which is high in protein and low in fibre is likely to be much more useful to us than one which is only moderate in protein and possibly high in fibre, and we must bear in mind that the foodstuff which can be bought at the lowest price per ton is not necessarily the cheapest for us to buy. Something which costs more per ton, but which gives us much more of what we really need, and less of what we do not need, may be very much better value than some low priced feed.

#### CEREAL GRAINS.

A glance at the table will show that the cereal grains and their by-products have been grouped together. It will also show us that the cereal grains, as a whole, are characterized by only a moderate percentage of crude protein. For example, barley has 11.5 per cent., buckwheat 10.8 per cent., corn 10.1 per cent., emmer 11.9 per cent., oats 12.4 per cent., rye 11.8 per cent. and wheat 12.4 per cent. of crude protein. If we compare these percentages with the percentage of protein in many of the by-products of these same grains, we can easily see that the grains themselves are rather low in crude protein. As to fibre: wheat, rye and corn are very low in fibre. Barley has only a moderate amount of fibre, but buckwheat, emmer and oats run somewhat higher, owing to the heavy fibrous coating which encloses the grain.

**Barley and its Products.**—Barley, as a rule, has not been regarded with any very great favor by feeders, but of late, since prices for all kinds of feed have gone very high, barley is being much more largely used, and the price has gone up accordingly. For hogs, beef cattle, and even dairy cows, barley is worth more per ton than buckwheat, emmer, or oats, and approaches in value very closely to corn, wheat or rye as a food for stock, especially for hogs. When fed alone it is not particularly palatable, and best results are obtained by feeding it in combination with other feeds. For hogs, the addition of wheat middlings to the harley adds very much to its palatability and its value. For cattle, bran combines well with barley.

Dried brewers' grains constitute a very important by-product from barley, and it will be noticed that the brewers' grains contain a high percentage of protein. It is true that they are also high in fibre, but the large percentage of protein which they contain more than compensates for this defect and makes brewers' grains worth more per ton than wheat bran.

Malt sprouts or malt combings arc also high in protein and constitute a valuable food when properly used. They are extremely dry, as a rule, and are not very palatable. In using malt sprouts only a small quantity should be fed, and it is better to soak the sprouts in water before feeding. Brewers' grains and malt sprouts are probably best suited for dairy cattle though they may be fed to almost any class of stock, including horses, providing judgment is exercised in mixing other kinds of feed with these products. They are probably least suitable for hogs.

Oats and Their Products.—For a cereal grain oats stand up fairly well in regard to protein, but the great objection is they are high in fibre. For a cereal they contain a high per cent. of fat, and almost all classes of stock relish oats. Oats also contain a fairly high per cent. of ash, and consequently they make a most excellent grain to feed young growing animals. They are bulky in character and hence it is seldom that any injury is caused to animals through feeding oats. They are not particularly valuable for fattening except to include in mixtures to give bulk and palatability to other concentrates. Oats are regarded as the main concentrate for horses, though, with the use of judgment, other grains may be substituted for oats, even for horses. In the United States corn takes the place of oats almost entirely in many districts and seems to give very good satisfaction. No doubt a mixture of corn and oats would be better than corn alone. In other parts we find barley successfully taking the place of oats for horse feeding, and in some cases dried brewers' grains have been successfully substituted for a considerable portion of the oats in the rations of working horses. As a matter of fact, oats are not absolutely essential in successful horse feeding, if the feeder will bear in mind the fact that he should take weight instead of bulk into consideration when making up rations for his horses. Oats do not weigh so much per bushel or per gallon as corn or barley, and this fact must be remembered when heavier grains are substituted for lighter ones, and the bulk of the ration must be reduced accordingly. While this is true, oats will always continue to be popular with the farmer for reasons already stated, but when the price of oats reaches two cents per pound it is doubtful whether we can get as good value from this grain as we could from some others, and it is time to cast about to see whether there is not something else which could take the place of at least part of the oats in the rations fed. Corn at two cents per pound furnishes much more feed than oats at two cents, and it has already been noted that barley, at the same price per pound, is cheaper than oats. Rye also furnishes more nutrients per hundred pounds and a great deal less fibre, and, frequently, damaged wheat can be obtained at very little more per ton than oats, in which case it makes a much cheaper ration.

Of the by-products from oats notice first oat hulls, which are very low in protein and very high in fibre. As a matter of fact, oat hulls are not as good feed as good oat chaff. On the other hand, oat middlings are fairly high in protein and low in fibre, and if they can be procured of a composition similar to that given in our table, oat middlings would be worth a high price per ton; but the trouble is that those who sell oat middlings are inclined to mix a good many of the comparatively worthless hulls with the middlings, reducing its value very materially. The other by-products, oat the and oat dust, contain a moderate amount of protein and a high percentage of fibre, indicating the presence of considerable quantities of oat hulls. Oat by-products should not be purchased except from reliable dealers and under guarantee as to percentage of protein and fibre. If care is not exercised it is possible to buy too much worthless material in these products.

Wheat and its Products.—Wheat, of course, is altogether too high in price to be considered as a feed for stock at present. Its actual feeding value is similar to that of corn, and usually a little higher than that of barley. Sometimes frozen wheat can be obtained which is just as valuable for feeding purposes as first class wheat, providing, of course, that the frost has not caught the wheat at too early a stage in its growth and that the grains have reached a fair degree of maturity.

Wheat bran, though widely known, is frequently underestimated as a feed for stock. It will be noticed that bran contains more protein than wheat or even any of the cereal grains. The main objection is its rather high percentage of fibre, which reduces its value materially. It is seldom that bran makes a satisfactory ration alone, giving best results when used in combination with other concentrates. When oats arc two cents a pound and bran is not more than two cents a pound, it will usually be found profitable to use bran in place of part of the oats in the ration of a horse, and when bran is less per ton than oats it may well replace oats altogether in the ration of other farm animals. Bran shows to good advantage in the ration of the dairy cow, but it may be used in the ration of fattening animals, especially along with corn or barley, and it will usually be found that the combination will give better results than when bran is not used. Bran is not satisfactory for hogs unless it may be matured breeding stock, and even for this purpose middlings (shorts) are preferable.

It will be noticed that wheat middlings are higher in protein and lower in fibre than bran. As a rule middlings command from \$2 to \$3 per ton more than bran, a difference which is quite justifiable on the basis of their composition. A great deal depends, however, upon the use to which the feed is to be put. As already intimated, bran is not very satisfactory for pigs, and the younger the pigs the less satisfactory it is. On the other hand, wheat middlings make one of the most satisfactory rations we can obtain for young pigs, and for such a purpose as this there would be a very wide difference indeed between the value of bran and middlings. On the other hand, if we were feeding cows, we would probably be willing to pay very little more for middlings than we would for bran, because the bran will give nearly as good results as could be obtained from middlings and the difference in value would probably not amount to more than \$1 or \$2 per ton. Wheat middlings, like bran, may be used in mixtures for almost any class of stock.

Red dog flour, which is a low grade flour, has quite a high feeding value as is indicated by its fairly high percentage of protein and low percentage of fibre. Red dog flour should be worth as much per ton as any of the cereal grains themselves. Care must be exercised, however, in feeding this flour. It should always be mixed quite largely with some more bulky feed, because its heavy floury nature will cause it to form into a pasty mass in the animal's stomach interfering with digestion if it is fed alone.

Buckwheat and its Products.—The table shows buckwheat to have a lower percentage of protein than oats and nearly as much fibre. In nitrogen-free extract, however, buckwheat excels oats, so that for fattening purposes possibly buckwheat may be worth quite as much if not slightly more than oats. For milk production, however, buckwheat would not be so satisfactory as oats. Buckwheat may be fed in mixtures to hogs, but of course it is not worth as much per ton as barley.

The by-products of buckwheat are not well known in this country. Note that buckwheat hulls have very little value for feed, whereas buckwheat middlings, if at all true to name, have a very high value, and would be especially valuable for the purpose of increasing the amount of protein in the ration of dairy cows. High grade buckwheat bran also has a high value and, if true to name, is worth considerably more than wheat bran, but, as in the case of the by-products from oats these by-products should only be obtained from reliable firms and under guarantee as to composition, because they are liable to be loaded up with a great deal of nearly worthless hulls.

Rye and its Products.—Rye has a feeding value similar to that of wheat and possibly slightly higher than barley. It is not high in protein, but is very low in fibre and is high in nitrogen-free extract. At the same price per ton it would be better value, probably. than any of the other cereals, except possibly wheat and corn, and it should be worth quite as much as corn.

The by-products of rye are practically unknown in this country as yct. It will be noted that they are somewhat similar to wheat bran though they are lower in fibre and higher in nitrogen-free extract.

Emmer.—Emmer is not very well known in this country though some recommend it quite highly as a crop. Compared with barley, it does not measure up very well, being very little higher in protein, lower in nitrogen-free extract, and decidedly higher in fibre. For feeding purposes barley is worth more per ton than emmer.

Corn and its Products.—It will be noticed that there is very little difference in composition between dent and flint corn, and practical tests indicate that there is little or no difference in their feeding value. Corn is low in protein and in

ash. These two facts render it unsuitable to use as a sole ration for young growing animals. Pigs fed exclusively upon corn do not make satisfactory growth and sometimes become deformed owing to deficient development of bone and muscle. On the other hand corn is low in fibre, high in nitrogen-free extracts, and, for a cereal, it is high in fat. In addition to this it is relished by almost all kinds of animals. As a ration for fattening stock, fcd in suitable combinations, it cannot be beaten, but it is always advisable to combine with corn some kind of food rich in protein, and, in the case of young, growing animals, rich in ash also. For dairy cows it is not particularly suitable, though it may be fed in moderate quantities, provided foods rich in protein are fed with it. For hogs it can be improved very much by adding about ten per cent. of a food such as tankage or linsecd meal. Even the addition of wheat middlings will be found to make a marked improvement in its value. Its value for horses has already been mentioned and it can be quite successfully substituted for oats, or at any rate for the greater part of the oat ration for horses. Sheep are also fond of it and it makes a good fattening ration for this class of stock, especially when fed with clover or alfalfa hay, which help to correct its deficiencies in protein and ash. It has been stated by some authorities that corn is the best and the worst feed for animals. That is to say, when corn is properly combined with other feeds it makes one of the very best feeds for animals, but when it is not understood it makes one of the worst.

The best known by-product of corn in this country is gluten feed, which is a by-product from the manufacture of starch from corn. It contains all that is left of the corn after the starch is removed, except the germ. It will be noted in the table that there are two grades of gluten feed. High grade gluten feed is a very valuable product, containing a high percentage of protein and only a moderate amount of fibre. The low grade gluten feed is not worth so much by a good deal, and buyers should be on the watch in this connection and should see to it that a satisfactory guarantee as to composition accompanies the feed. Gluten feed is especially valuable for dairy cows for the purpose of increasing the protein content in their ration, and for this purpose it ranks with such feed as linseed meal, though not quite equal to linseed meal in value. It is not counted a satisfactory feed for pigs or sheep and may be regarded as especially suitable for dairy cattle.

Gluten meal is also of two grades, the highest grade being particularly valuable for dairy cattle. As a matter of fact gluten meal is seldom sold in this country although sometimes the term is applied to gluten feed. Gluten meal proper consists exclusively of the gluten of corn which is the residue in the manufacture of starch.

Germ oil meal is the residue from corn germs after the oil has been extracted. It will be noticed that it still contains a high percentage of fat, and a fair' high percentage of protein, and would be a very useful feed in dairy rations colly. Its value would be similar to that of gluten feed.

Corn bran, which consists mainly of the outer hull of the corn kernel, has not a high feeding value and is seldom sold alone.

# LEGUMINOUS SEEDS AND THEIR PRODUCTS.

Beans.—Beans are out of the question at the present time as a feed for stock except it may be cull b .ns. The table shows beans to have a very high percentage of protein and a fairly low percentage of fibre, with only a moderate amount of nitrogen-free extract. Cull beans have a high feeding value, but the trouble is they are not very palatable to most animals. Sheep will eat them freely, but for pigs the beans must be cooked. Cattle will eat them under protest if mixed with other kinds of meal.

Field Pea. —The field pca is also out of the question as a feed for stock in this country at present. It will be noted that peas are similar in composition to beans and have about the same value as a feed, with the difference that most classes of stock are found of peas whereas beans are generally disliked.

There are two by-products of peas from the mills which manufacture split peas for soup, namely, pea bran and pea hulls. It will be noted that both these byproducts are low in protein and extremely high in fibre as compared with wheat bran. A strange fact is that pea bran is selling on some markets at the same price per ton as wheat bran, whereas wheat bran is worth considerably more, as the composition plainly indicates.

**Peanut Cake.**—It is quite possible that peanut cake will never become promir ent on our markets, but, owing to the extremely high price for all kinds of feeds at present, it is hard to say just what may appear on Canadian markets, and hence this by-product has been included in the list. It will be noted that peanut cake, made from hulled nuts, is extremely rich in protein and fairly low in fibre. It is also high in fat. In other words, it is an extremely rich concentrated food, and ranks with the highest grade eottonseed meal in value. It will also be noted that peanut cake made from seeds from which the hulls had not been removed is very much lower in protein and very much higher in fibre. Cake of this nature ranks in value with the lower grades of cottonseed meal.

# OIL BEARING SEEDS AND THEIR PRODUCTS.

**Cocoanut Meal.**—This product is very little known in Canada, but it is being introduced in some parts and hence is worthy of cons<sup>-d</sup>oration. Compared with wheat bran it has considerably more protein, but it is also somewhat higher in fibre. In fat it is considerably higher than wheat bran. On the whole, therefore, eocoanut meal should be worth several dollars a ton more than wheat bran, especially as a feed for dairy cows.

Cottonseed Meal.—Regarding cottonseed meal it must be remembered that it is valuable for a specific purpose, and that is for increasing the protein content of a ration. Cottonseed meal is not suitable for all classer of stock and for any class of stock it should be used in moderation. Dairy cows or fattening cattle will take two pounds per day, per head, without any injury, and horses will take one pound a day without danger. It is true these quantities are the second with exceeded, but when a person is feeding three pounds or more of cottonseed meal to a cow per day he is venturing upon dangerous ground. For calves and pigs cottonseed meal had better not be used at all. It is true these animals may be fed very small amounts of cottonsecd meal in their ration, but in this country we do not need to use it, and hence it is not worth while running risks.

The table shows that eottonseed meal is not, by any means, a constant term. That is to say, there are numerous grades of eottonseed meal on the market. It will be noticed that the percentage of fibre increases in the lower grades. In cold pressed eottonseed cake and in cottonseed feed the per eent of fibre is nearly as high as the percentage of protein. A good brand of eottonsed meal, containing forty per eent. or more of protein, is worth nearly twice as much per ton as cold pressed cottonseed cake or eottonseed feed. In fact, the two last mentioned grades of feed are not worth a great deal more per ton than wheat bran. It is true they contain much more protein and fat, but their percentage of fibre is so high that it cuts down their value very materially. Those who are buying cottonseed meal should pay careful attention to the percentage of protein and of fibre, and not be misled into thinking that because the feed in question has a fairly high percentage of protein it is necessarily a valuable feed. It may have so much fibre that its feeding value is seriously reduced.

The composition of cottonseed hulls is given merely to indicate where the high percentage of fibre comes from in the lower grades of cottonseed meal.

Flaxseed. —Flaxseed, at present, is so sigh in price that it is not used to any extent for feeding purposes. In some eases where it is grown at home small amounts are used. It will be noted that flaxseed is extremely high in fat as well as fairly high in protein. The fat is extracted giving us linseed oil, and the residue is known as linseed meal or oil eakc.

Linseed Meal.—This by-product of flaxseed contains a high percentage of protein and a fair amount of iat. It does not contain so much protein as high grade cottonseed meal, but it does not possess any of the dangerous properties of cottonseed meal, and when fcd to stock it tends to bring about a general thrifty condition in the animal. Owing to this fact most feeders prefer linseed meal to cottonseed meal though it is lower in protein. As a source of protein for dairy cows cottonseed meal is more economical, and it is only on the ground that linseed meal can be fed to any elass of animals, and tends to promote thrift, that we ean justify paying quite as much per ton for this product as for high class cottonseed meal. It is useful for increasing the protein in the ration of young pigs, calves, colts, fattening cattle, dairy cows, sheep, lambs, and of practically every class of stock.

Soy Bean Meal.—This product is not widely known in Car la, though an effort has been made to establish a market for it in this country. belongs to the same class of fodders as high grade cotton seed meal. It does not possess the poisonous properties of cottonseed meal and hence can be more widely used. It is not likely, however, that the price will ever become sufficiently reasonable to promote its use in this country.

# MILK AND ITS PRODUCTS.

Cow's milk can scarcely be called a feed for stock except for very young calves. It constitutes a perfectly balanced ration for the young growing calf and it is difficult to get a substitute. It will be noted that there is no fibre in any of this group of substances.

Skim Milk.—Skim milk is similar to whole milk except that the fat has been removed. When fed to ealves something must be given with the skim milk to take

the place of the fat which has been removed. It is usually best to feed the young ealf whole milk until it ean be taught to eat a little grain, such as oats, corn, or a mixture of these with bran. As soon as the calf learns to eat, skim milk may be gradually substituted for whole milk.

Skim milk is highly valued for young pigs. It is easily digested and very palatable, two important considerations. Danish authorities estimate six pounds skim milk equal to one pound mixed meal, while American authorities usually give skim milk a somewhat higher rating. When everything is considered, however, a person would be safer in using the Danish standard than he would if he allowed a higher value for skim milk. It is true that sometimes as low us four pounds of skim milk will prove equal to one pound meal, but this is exceptional and it would not be safe to purchase skim milk on this basis. For pigs, sour milk seems to give just as good results as sweet milk, and, in fact, better results in most cases.

Buttermilk.—May be counted equal to skim milk, and whey about one-half the value of skim milk. This is probably a rather low valuation of whey, but it is better to keep on the safe side.

# SLAUGHTER HOUSE BY-PRODUCTS.

Dried Blood.—This is an extremely concentrated feed as the analysis shows. It contains no fibre and over eighty per cent. protein. Of course a feed such as this can only be used in very small proportions, possibly less than ten per cent. of the total ration. It would be very easy to lose a good deal of the value of such a product unless it could be handled with extreme care.

Tankage .-- Tankage is a prepared by-product from the large abattoirs and is coming rapidly into prominence, especially as.a feed for hogs. It shows to best advantage when fed with other feeds which are poor in protein, such as corn, and it also plays an important part in supplying young pigs with a liberal amount of protein, especially when skim milk is not available. As a substitute for skim milk for young pigs it has given pretty satisfactory results, and possibly comes nearer to taking the place of skim milk than any other product on the market. Owing to the high percentage of protein in tankage, it is necessary to feed it with eare or there will be waste of protein. When feeding tankage to young pigs it is seldom advisable to feed more than one pound tankage to nine pounds meal. T+ will be noticed that tankage varies in its percentage of protein and " e varies accordingly. When older pigs are fed on mixed grain, tankage .ay not prove profitable, but it will show up to best advantage with young pigs or with pirs of any kind which are being fed on corn. In certain tests at this College tankage at \$50.00 per ton proved more economical for pigs than skim milk at 10e. per cwt.

#### MISCELLANEOUS CONCENTRATES.

Beet Pulp.—Wet beet pulp belongs to the same class of foods as roots though it is scarcely equal in value to either mangels or turnips. It approaches these feeds very closely, however, in value and is well worth consideration when available. Dried beet pulp, however, is more similar to some of our cereal grains in composition, though it is somewhat lower in protein and higher in fibre. Its value is probably about two thirds of the value of wheat bran.

Distillers' Grains, Dried.—It will be noted that distillers' grains vary with the kind of grain which has been used, those derived from eorn showing a higher percentage of protein than those derived from rye. Distillers' grains, on the whole, arc similar to brewers' grains though perhaps slightly higher in value.

Beet Molasses.--Beet molasses may be used in mixtures as a feed for stock, but this product is not palatable and can be used only in small quantities. From its composition we would conclude that it is equal to cane molasses in feeding value, but it seems to possess certain injurious properties making it a dangerous food for some animals, especially calves or pigs, and enat'ing the feeder to use it in only small proportions.

**Cane** Molasses.—The actual feeding value of cane molasses, according to experiments, is similar, pound for pound, to that of eorn. It will be seen, therefore, that it is easily possible to pay too much for molasses, and especially for compounds containing molasses for which great things are often claimed by manufacturers. There is one feature of cane molasses which gives it a peculiar value and that is its palatability, and the fact that it seems to promote thrift to a remarkable extent in the animals to which it is fed. Consequently, molasses can often be used to good advantage in making other feeds palatable and hence in stimulating the appetite of animals. General's speaking, it is better to buy molasses by the barrel than to buy it in so called "molasses feeds."

# DRIED FORAGE.

Alfalfa Hay.-If compared with the hay from grasses such as timothy hay, prairie hay, etc., it will be noticed that alfalfa hay has a very much higher percentage of protein. As a result when alfalfa hay is fed to stock, it is not so necessary to feed concentrates rich in protein as it is when timothy hay or hay similar in character is fcd. It will be noted that the percentage of protein in alfalfa hay is similar to, and, in fact, higher than the percentage of protein in many concentrated feeds such as cercal grains and many of their by-products. Against this, however, we must take into consideration the fact that alfalfa hay, like all other bulky fodders, contains a high percentage of fibre and hence its value is reduced as compared with the concentrated feeds which contain a much lower percentage of fibre. It is a fact, however, that when first class altalfa hay is fed to dairy cows it will not be found necessary to feed concentrates to any considerable extent, except in the case of cows which are fairly large producers of milk. It is the fact that alfalfa hay is capable of saving concentrates to a large extent that renders it such a valuable bulky fodder on the farm. Alfalfa hay may be fed to any kind of stock, but is especially valuable for cattle and sheep. Even hogs relish a little fine, leafy alfalfa hay and matured sows will eat considerable quantities.

Clover Hay.—Clover hay, both red and alsike, are very similar in composition and approach within measurable distance of alfalfa hay in feeding value. Stockmen, however, prefer red elover hay to alsike hay, and either one of these kinds is capable of reducing the amount of concentrates necessary to produce a given result in feeding stock though not quite to the same extent as alfalfa. According to the analysis white sweet clover is very similar to alfalfa in composition, and, when stock have become accustomed to eating it, will probably give nearly as good results if well cured and not too coarse.

**Corn Fodder and Stover.**—Corn fodder of good quality eut and eured with the ears remaining on the stalks makes a fodder approaching very closely in value to timothy hay. If not well handled there is danger that the fodder may contain a very high percentage of water and have its value reduced considerably. Both eorn fodder and stover are very variable in composition, depending upon conditions under which they are kept.

Corn stover is simply corn stalks after the ears have been removed, and it will be noted that its value is considerably less than that of corn fodder.

Timothy Hay.—C. apared with elover and alfalfa, timothy hay is low in protein and fairly high in fibre. It is true it is somewhat higher in nitrogen-free extract, but its low protein content is the serious disadvantage. Most farmers prefer timothy hay for horses, and it is probably safer than most other kinds of hay for this purpose. It is usually more free from dust than most other hay and if horses are allowed very liberal rations of hay it does not seem so liable to cause injury. For cattle it is not so satisfactory, and when fed to cattle a more liberal meal ration must be given, and meal containing a larger percentage of protein than when alfalfa or elover hay is fed. For sheep it is entirely unsatisfactory and should not be used for this purpose, either elover or alfalfa being exceptionally well suited for sheep feeding.

The other kinds of hay mentioned in the table are all similar in composition though they are slightly higher in protein than timothy hay.

#### STRAW AND CHAFF.

The noticeable feature of the composition of straw is the extremely high percentage of fibre. As a result, when we feed animals largely upon straw they have to handle a very large amount of what may be called inert or comparatively useless material. While this is true, it is also true that straw may be used as part of the bulky ration to good advantage when other bulky fodders are scarce or very high in price. Idle horses may be carried through the winter upon straw as their bulky fodder with a light allowance of grain, and cattle or sheep may be made to utilize a considerable amount of straw. It must be remembered that if straw is used in the ration of dairy cows or fattening cattle, it will be necessary to feed a good deal more meal than when hay is fed, so that sometimes what we may gain in saving hay may be more than lost through the extra amount of concentrates used. For store cattle or dry cows straw can be used to much better advantage than for cows which are milking or cattle which are being fattened.

Of the different kinds of straw mentioned in the table it will be noticed that backwheat supplies the most protein, but it is so extrem ly high in fibre that it is seldom regarded as a satisfactory feed for stock except in extreme cases. Everything considered, out straw is the most satisfactory for all classes of stock.

The table shows barley straw to be practically equal to out straw so far as composition is concerned, but barley straw is not so palatable as oat straw and the awns or beards of the barley render it objectionable. Wheat straw and rye straw are both rather low in feeding value and should not be used for feed if oat straw is available.

Notice the relatively high value of chaff as compared with straw, both in the case of oat chaff and wheat chaff. The plan of separating the chaff from the straw at the time of threshing, which used to be more common than it is at present, has a good deal to commend it.

### ROOTS AND TUBERS.

These foods belong to what are known as succulent foods; that is to say, all the members of the group contain a very high percentage of water. The high percentage of water reduces the value of one hundred pounds of any of these foods, but the solid material which they furnish is usually very digestible and very palatable. In addition, these succulent foods tend to keep the digestive organs of the animal in better condition and consequently they have a value outside of their actual feeding value. All practical feeders recognize the importance of succulent foods as a means of keeping animals in healthy, thrifty condition.

Of the roots mentioned in the table, sugar beets have the highest feeding value, i nig especially high in nitrogen-free extract as compared with the other kinds of roots. Mangels and swede turnips are similar in value, the advantage, if any, being in favor of the turnip. White turnips or fall turnips drop a little below swede turnips, and carrots have a slightly higher feeding value than swede turnips.

Roots are valuable for all classes of stock including horses. Most feeders prefer carrots for horses though almost any kind of roots may be fed if judgment is exercised. Care should be taken not to feed many roots to a horse not accustomed to them and in all cases the roots should be sound. Decaying or mouldy vegetable matter is extremely dangerous to horses.

Mangels are usually preferred for dairy cattle as they are not so likely to taint the milk as are turnips. Many feeders prefer turnips to mangels for fattening cattle though experiments indicate very little, if any, difference in value. For sheep, turnips are undoubtedly safer than mangels and consequently are to be preferred.

The potato, which is a tuber and not a root, has a higher feeding value than the roots mentioned. Potatoes, however, eannot be grown profitably for stock feeding and it is only cull potatoes which are used for this purpose. For pigs, potatoes must be boiled before they are acceptable.

Danish experiments indicate that it requires about seven and a half pounds mangels or four pounds of sugar beets to be equivalent to one pound of mixed meal in hog feeding. No doubt the same comparison would hold true in the ease of fattening cattle, but in the case of dairy cattle, where the proportion of protein is very important, very little difference in value will be found between sugar beets and mangels. Some other experiments have shown a much higher value for roots that that shown in Danish experiments, and in some cases less than five pounds of mangels have proved equal to one pound of meal. On the average, however, pos ib'y the Danish estimate is not very far astray.

Potatoes may be said to have approximately the same feeding value as sugar bects, but in the case of pigs the experimentary provide the potatoes would have to be taken into consideration. In the British Isles very heavy rations of roots are fed, but in this country from thirty to fifty pounds a day is usually considered a fair allowance for a cow, and four pounds a day a fair allowance for a sheep. In the case of pigs the roots are best pulped and mixed with meal, in which case about equal weights of roots and meal will prove satisfactory.

# MISCELLANEOUS GREEN FORAGE.

The apple is not usually considered a feed for stock, but if its composition is compared with that of roots, or even of potatoes, it will be seen that the apple has considerable value and unmarketable apples should not be wasted. They must be used for almost any class of stock, though, as a rule, it is scarcely safe to feed quite so many apples to cattle as one would feed of roots.

The by-product of the sider mill, known as apple pomace, also has considerable value and is worth considerable when available.

Cr.bbages and pump mangels and there is not song to t<sup>a</sup> me class of fodders as turnips and wide difference in their feeding value.

Silage.—Corn silar plays a very important properties of the proper

Corn silage may be fed to aim at all class of stock, though, owing to the fact that there may be some mould will be composed by the some mould will be composed by the probably be just as well not to feed it to have set. Some these feeders speak highly of silage for sheep and others very much arefer vorts. Probably turnips are rather more satisfactory for sheep than corn silage though pigs will eat a cert allow and it can scarcely be called a tisfactor feeders with they waste a great deal and it can scatcely be called a tisfactor feeders with they waste a great deal and it can pigs Silage gives best results when fed to cattle and it is suitable for any lass of cattle. For matured cattle about forty pounds of silage per day may deal as a fairly liberal allowance.

## HXED FFEDS.

There are on the market a good many ready prepared mixtures of feed for which extravagant elaims are sometimes make. Many of these feeds are intended merely to provide a market for such substances as oat hulls, cottonseed hulls and similar materials, which, as has been shown, have a very low feeding value in the selves. Some of these mixtures are worth the money asked for them, but others are not, and the farmer must by wide awake to avoid being caught. The agent who sells the feed will probably emphasize the percentage of protein contained in it, but the farmer must remember that this is not the only consideration, and that the fibre content is a pretty sure indication as to whether 'he mixture is a high grade or low grade product As already pointed out, a high centage of fibre means a low grade product, and no farmer should purchase feeds with which he is not familiar without a guarantee as to both the percentage of protein and fibre.

Sometimes weed seeds are included in these mixtures, and some weed seeds such as worm-seed mustard and other mustards, are decidedly injurious to stock. It is well, therefore, to exercise caution in purchasing these feeds and to insist upon guarantees as previously stated.

### CONCLUSION.

As was stated in another place it is not possible to give exact comparisons of the relative feeding value of the various foodstuffs for all the ourposes for which they may be required. All that has been attempted in this is etim is to give, in a somewhat crude but practical form, a few hints and suggestions regarding a number of feeds with which our farmers may come in contact, in the hope that such a presentation of the subject may be helpful in enabling the farmer to spend his money on feeds to better advantage.

# THE LIVE STOCK SITUATION FROM THE MARKETING STANDPOINT

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The live stock industry has contributed to the industrial revenue of Canada an aggregate of exports, for the fiscal year ending March 31st, 1916, to the volue of \$105,919,190. This averages a return of over two million dollars per week. For the fiscal years ending March 31st, 1913, 1914 and 1915, the animal produce exports have totalled respectively \$45,773,227, \$54,612,072 and \$76,956,002. Thus, within the period of the war, the exports of animals and animal products have doubled, while for the four-year period they have increased practically one hundred and fifty per cent.

The High Place of Agriculture. - Considering the value of the exports of animal produce with that of the exports of agricultural produce, the aggregate for the fiscal year ending March 31st, 1916, amounted to \$372,394,380, as compared with a total export value for the same period, of manufactures, including munitions, of \$250,052,223. In other words, the total export value of agricultural produce is practically one and one-half times as great as the value of the exports of manufacture, including munitions of war. Pressing the comparison still further, the aggregate of exports from all sources, including mining, fishing, lumbering, manufactures and agriculture, for the fiscal year 1915-16, amounted to \$779,300,070. Of this the total export value of animal and agricultural products amounted to 48 per cent. For the fiscal years 1911-12, 1912-13, 1913-14 and 1914-15, the export value of animal and agricultural products amounted respectively to 53 per cent., 51 per cent., 57 per cent. and 54 per cent. In other words, during the last five fiscal years the exports of agriculture vielded an industrial revenue to the country of more then half, to be exact 52.6 per cent., of the total return from all sources combined. Again, the aggregate export trade for the first five months. April, May, June, July and August, of the current fiscal year, amounted to \$443,-254,333, of which \$222,176,467 represents the proportionate value of agricultural products, or slightly over 50 per cent. of the total exports. Bearing in mind the fact that the great increase in the export value of manufactured products may be attributed almost entirely to the manufacture of war munitions, the financial return vielded to the country by agriculture is all the more creditable. It will be observed that the latter industry has increased its exports in the same enormous proportion as compared with the other industries of Canada and continues, therefore, to hold a similar ratio from the standpoint of aggregate values in foreign trade, as it held prior to the commencement of the war.

The Possibility of Permanence.— The most significant feature of this increase as relating to the live stock industry lies in the fact that it reveals the possibility or, at least, suggests the opportunity, of the continuance of a permanent trade, following the deelaration of peace. Apart from the export of such products as tinned meat, pork and beans, etc., which may be required only temporarily for war purposes, the export trade in live stock products centres round the sale of such staple food commodities as cheese, eggs, bacon and fresh beef. The following table will serve to indicate the greatly increasing value of the export trade in these products, as well as the substantial return to the country which each of them now yield's. Exports of cheese, eggs, bacon and fresh beef from Canada:

1913         1914         1915         1916	Oheese.	Eggs.	Bacon.	Fresh Beef.
	\$20,697,144	\$58,176	\$5,351,225	\$160,877
	18,948,511	92,322	3,763,330	1,165,295
	19,247,603	1,206,518	11,812,186	2,060,430
	27,495,607	2,705,416	25,759,266	6,154,632
April to Augus <sup>+</sup> . inc 1916	lusive, 15,000,653	293,053	13,568,242	1,155,195

Canadian cheese is standard for all countries competing for position in the United Kingdom and a permanent outlet for this product on the British market is fully assured.

Eggs for Export. — The export trade in eggs is new. Canada, for many years has had no surplus to sell. At the beginning of the war, however, Great Britain found her normal sources of supply unavailable and was obliged to turn to the United States and to Canada, which, in 1914, had a few surplus eggs to dispose of. From that date, production increased to such an extent in the Dominion that we were able to greatly extend our exports and, at the same time, by the joint efforts of the Government and of the produce trade, to so protect their quality that the reputation they have gained has resulted in a demand which has drained the country of practically all of its present available stock. Canada has been able to sell steadily as against American competition and at eonsiderably better prices. There is reasonable ground for the belief that Canadian eggs have established a permanent place for themselves in the United Kingdom.

The Bacon Business. - The export bacon business represents perhaps the safest and most satisfactory trade in which we may engage at the present moment. That Canada is in a position to produce high-class Wiltshire sides has enabled her to take the place of Denmark, to compete with Ireland, and, in the matter of price, to outclass the United States in the war demand for this product. The significance of this statement will bear consideration. It means simply that Canada is in a position, if she can produce the necessary volume of hogs, to secure a grip on the British bacon market which should represent to her an annual revenue of millions of dollars in the years to come. Unquestionably, the Dominion will be faced with very serious competition after the war, but, if she makes good her hold at the present moment, she need have nothing to fear as her organization for this trade develops and improves. It is the view of those who have most carefully studied the situation that hog production in Canada is a safe business undertaking and should be developed into an industry out of which, by organization and systematization, may be developed, as in the case of Denmark, a great export trade.

**Every Hoof Required.** — The sale of fresh beef relates itself not only to the existing war demand, both civil and military, but, as well, to the need for replenishing, after the war, the depleted herds of Belgium and the decreasing stocks of France. The situation here suggested requires no elaboration. The need for all the country can produce, for every available last hoof, is more than evident. Further, the relationship between Canada and the United Kingdom is now such as to suggest the establishment of more favorable trade connections than have hitherto existed, out of which may very probably develop our ability to profitably sell onr eattle or our meat to the United Kingdom. The world shortage in all meat products, particularly in cattle, practically insures an opportunity to this country to secure a market for its animal products to the extent of its limit of production.

Exports Exceed Imports. - There has been a growing uneasiness on the part of the Canadian people, possibly due to the very high prices for food commodifies, as to the existing status of our live stock industry. The suspicion has arisen that we are falling very far behind in production. The statements which have been given, however, in reference to our export trade, should assist very materially in explaining the conditions which now obtain. Moreover, it may be pointed out that in 1913 the combined imports of eggs, poultry, bacon, beef, ham, mutton, pork, live stock, wool and lard, amounted to \$2,366,303 more than the value of the exports in these commodities. On the other hand, in 1916, the exports exceeded the imports by \$36,544,418. Making due allowance for a lower home consumption in 1916 as compared with 1913, it would, at least, appear that the live stock industry is reasonably holding its own. The turn of this whole argument, however, suggests that, in the interests of Canada, the live stock industry should do much more than simply hold its own. Normal production has made possible, under existing circumstances, a very satisfactory trade expansion. Normal production, however, will not answer the urgent demand of the Empire for meats and all food products during the period of the war. The urgency of the food question in Europe and even in the United Kingdom is daily becoming more and more apparent. We have continually imposed upon us the obligation of Empire necessity.

From another point of view, involving the commercial and economic status of the country, we shall do well to bear in mind the returns which agriculture can contribute. That the industry is rendering an efficient service, is already sufficiently confirmed. It must be borne in mind, however, that the exports of war munitions represents only temporary prosperity. Preparedness for the future suggests the essentially provident course of strengthening the position of agriculture in all our industrial propaganda, thus enabling this industry to yield its fullest possible quota through the utilization of the enormous natural resources of the Dominion.

Stability Depends on Live Stock Production. - Upon the development of the live stock industry depends the continuous stability of agriculture in Canada. We may therefore well do what we can in the days to come to coerce existing circumstances into a national movement have g for its object a steady increase in live stock production and a corresponding expansion of our live stock trade. This will involve improved facilities of marketing. It will necessitate standardization of product for export purposes. We must take steps to secure a volume of supply which, while fully necting the requirements of the country for home consumption, will assure a dependable and continuous surplus, without which permanent trade relationships can never be established. Our ability to organize production and to organize selling, whether from the farm or on the foreign market, will measure the extent of our success. Other agricultural countries have only prospered as they have been able to commercially systematize the development of their rural industries and disorganized agriculture in Canada will never be able to compete against the aggresive policy of other countries, the Argentine, Australia, the United States, or even newly awakened Russia, in the concentrated struggle for position on the European market after the war. The live stock industry, then, in taking stock of itself, is seized of the opportunity now presented to it, is measuring its forces to meet the call of Canada and of the Empire, and is asking the cooperation of the great commercial institutions of the country in a comprehensive movement to discharge its full responsibility in promoting the industrial advancement of the Dominion.

