BULLETIN NO. 515 FEBRUARY, 1924

New York State Agricultural Experiment Station

GENEVA, N. Y.

COMPOSITION OF OFFICIAL SAMPLES OF FEEDING-STUFFS AND MIXTURES COLLECTED IN NEW YORK FROM JANUARY TO JULY, 1923

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PUBLISHED BY THE STATION
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L. L. VAN SLYKE

INTRODUCTION

During the first six months of 1923, analyses were made of about 1,100 samples of feeding-stuffs and mixtures. These samples are classified in the following manner, the kind and number being given:

Animal products, 49; bakery waste, 2; barley feed, 2; brewers' dried grains, 6; buckwheat products, 3; buttermilk (dried), 1; compounded feed mixtures, 194; compounded feed mixtures containing molasses, 94; calf meal and pig meal and feed mixtures, 25; cocoanut meal, 2; corn bran, 3; corn gluten feed and meal, 15; corn meal and corn feed meal, 23; cottonseed meal and feed, 41; distillers' dried grains, 2; fish meal, 3; hominy feed, 21; linseed meal, 15; macaroni waste, 1; molasses for feeding, 1; poultry feed mixture, 224; red dog flour, 22; rye products, 3; wheat bran, 140; wheat bran and wheat, processed, 2; wheat bran and low-grade flour, 9; wheat bran, low-grade flour, and wheat middlings, 21; wheat middlings, 168; wheat product from shredded-wheat waste, 2; wheat and rye products, 1; yeast grains, dried, 3.

It has seemed desirable to study the results obtained by chemical analysis of the samples in these different classes of feeding materials and mixtures for the purpose of calling attention to four points: (1) The chemical composition and variation in composition in each class; (2) the number of cases in which the samples were below the guaranteed composition; (3) the number and kinds of different ingredients or materials used in each of the four classes of mixed feeds, comprising compounded feeds, with and without molasses, poultry feeds, and calf and pig meals and feeds; and (4) the prices of unmixed feeding materials.

In such a consideration of the results of analysis, it is our purpose to direct attention to a study of the composition of feeding-stuff materials and mixtures rather than to the mere observation as to whether a feed is up to its guaranteed composition.

In presenting the data, we shall consider the samples under two general divisions, first, feeding-stuffs, unmixed; and, second, mixed feeds, which include the four classes mentioned above.

A chemical analysis of a material used for feeding purposes includes the determination of protein, fat, fiber, and, in certain cases, phosphoric acid, when the object of the analysis is legal inspection or control.

1. Protein, or crude protein, includes the portion of the feeding material that is made up of organic nitrogen-containing compounds. Such compounds are required for the production of muscle and nerve tissues, of hair, feathers, etc. The amount of nitrogen in a feeding material is found by proper chemical methods and this amount multiplied by 6.25 to ascertain the corresponding amount of protein.

2. Fat, or crude fat, is obtained by treating a dried substance with pure ether. This ether extract is nearly pure fat or oil in the case of grains, seeds, nuts, and animal materials; but in the case of hay, grasses, and coarse fodder, it is more or less impure, being mixed with other substances, such as vegetable wax, gum, etc.

3. Fiber, or crude fiber, is the fibrous, woody portion of a material. It is largely indigestible but serves the useful purpose of giving proper bulk to a feed. In cereal grains and nuts, the amount of fiber, is small, but is large in stems, stalks, hays, straws, fodders, husks, hulls, cobs, etc. The presence of such materials is indicated by the amount of fiber.

In animal materials, there is no vegetable fiber, except where intestinal contents are used and then the amount is usually slight. In place of determining fiber in animal materials, the amount of phosphoric acid (P_2O_5) is found in order to ascertain whether the material should be classed as a meat material or as a bone and meat material, as explained later under the definition of animal materials.

COMPOSITION OF UNMIXED FEEDING-STUFFS

In the case of each class of these materials, we give a summary, showing the guaranteed percentages of chemical constituents. In the case of each constituent, we give, in addition, the lowest, highest, and average percentage for each class of materials.

As far as practicable, there is also given a statement of the definition of each product or material, largely in accordance with the definitions recommended by the Association of Food-Control Officials of the United States.

1. Animal products reported in our work include two classes of materials, (a) meat scrap and meat meal, (b) meat and bone scrap and meat and bone meal.

(1) "Meat scrap and meat meal are the ground residues from animal tissues, exclusive of hoof and horn, and contain less than 10 per cent of phosphoric acid (P_2O_5).

(2) "Meat and bone scrap and meat and bone meal are the ground residues from animal tissues, exclusive of hoof and horn, and contain more than 10 per cent of phosphoric acid (P_2O_5).

(1) Meat scrap, beef scrap, meat meal.

	Per cent of Protein			Per cent of Fat			Per cent of Phosphoric Acid		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	40	60	**49.6**	5	14	**8.7**	8	15	**11.5**
Composition found.....	43.5	61.3	**51.6**	7.8	16.8	**12.7**	5.2	9.6	**8.4**

(2) Meat and bone scrap, meat and bone meal.

	Per cent of Protein			Per cent of Fat			Per cent of Phosphoric Acid		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	30	55	**44**	8	12	**8.6**	6	16	**13.2**
Composition found.....	30.6	56.1	**45.4**	8.5	21.5	**12.6**	10.1	17.6	**12.7**

2. Brewers' dried grains are the properly dried residues from cereals obtained in the preparation of maltose.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	20	22	**21**	5	6	**5.7**	15	19	**16**
Composition found.....	22	24.8	**24.4**	7.1	8.5	**7.9**	12	15.3	**14**

3. Buckwheat products include buckwheat middlings or shorts, which are made up of "that portion of the buckwheat grain immediately inside of the hull after separation from the flour."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	17	22	**23**	3.8	8	**5.6**	9	22	**16.3**
Composition found.....	15.5	32.3	**24.6**	4.2	7.8	**6.2**	4	18.2	**10.3**

4. Cocoanut meal, cocoanut oil meal, or copra oil meal "is the ground residue from the extraction of part of the oil from the dried meat of the cocoanut."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	20	20	**20**	6	6	**6**	12	12	**12**
Composition found.....	20.4	22.1	**21.3**	7.9	9.1	**8.5**	7.9	**8.8**	**10.3**

5. Corn bran "is the outer coating of the corn kernel."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	9	9	**9**	4	7.5	**5.5**	8.6	15	**12.9**
Composition found.....	10.3	12.5	**11.4**	6.2	10.8	**8.3**	7	12.9	**7.7**

6. Corn feed meal "is the by-product obtained in the manufacture of cracked corn, with or without aspiration products added to the siftings, and is also the by-product obtained in the manufacture of table meal from the whole grain by the non-degerminating process."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	7	9	**8.6**	4.2	4	**3.2**	1	8	**4.4**
Composition found.....	7.8	12.1	**10.4**	2.2	8.3	**3.9**	1.1	5	**2.5**

7. Corn gluten feed "is that part of commercial shelled corn that remains after the separation of the larger part of the starch and the germs by the processes employed in the manufacture of corn starch and glucose."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	20	24	**22.5**	1	5	**2.3**	7.5	8.5	**8.0**
Composition found.....	21	28.3	**25.0**	2.9	6.1	**4.5**	5.8	8	**6.5**

8. Cottonseed products are graded according to the percentage of protein under the following terms and definitions:

(a) "Cottonseed meal is a product of the cottonseed only, composed principally of the kernel with such portion of the hull as is necessary in the manufacture of oil; provided that nothing shall be recognized as cottonseed meal that does not conform to the foregoing definition and that does not contain at least 36 per cent of protein.

(b) "Choice cottonseed meal must be finely ground, not necessarily bolted, perfectly sound and sweet in odor, yellow, free from excess of lint, and must contain at least 41 per cent of protein.

(c) "Prime cottonseed meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, yellow, not brown or reddish, free from excess of lint, and must contain at least 38.6 per cent of protein.

(d) "Good cottonseed meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, and must contain at least 36 per cent of protein.

(e) "Cottonseed feed is a mixture of cottonseed meal and cottonseed hulls, containing less than 36 per cent of protein."

Samples were obtained for analysis of only the two grades, "choice" and "good."

(1) Cottonseed meal, average of samples of all grades.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	36	43	**39**	5	7	**5.5**	10	15	**12.4**
Composition found.....	35.1	44.5	**40.0**	5.4	8.8	**6.9**	6	14.8	**9.7**

(2) Choice cottonseed meal.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	41	43	**42.4**	5	7	**6**	10	12	**10.4**
Composition found.....	41.3	44.3	**42.9**	6.1	8.8	**7.2**	6	8.7	**7.3**

(3) Good cottonseed meal.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	36	36	**36**	5	6	**5**	14	15	**14.5**
Composition found.....	35.1	41.3	**37.4**	5.4	7.8	**6.6**	9.4	14.8	**11.8**

9. Distillers' dried grains "are the dried residue from cereals obtained in the manufacture of alcohol and distilled liquors."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	28	30	**29**	8	10	**9**	13	14.5	**13.8**
Composition found.....	31.4	31.9	**31.6**	11.7	12.7	**12.2**	11.3	11.3	**11.3**

10. Fish meal "is the dried ground waste material obtained in the fishing industry."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	55	55	**55**	4	8	**5.3**	—	—	—
Composition found.....	57.9	60.8	**59.4**	6.6	10.7	**8.2**	0	0	**0**

11. Hominy feed, hominy meal, or hominy chop "is the kiln-dried mixture of the mill-run bran coating, the mill-run germ, with or without a partial extraction of the oil and a part of the starchy portion of the white corn kernel obtained in the manufacture of hominy, hominy grits and corn meal by the degerminating process." The same kind of by-product obtained in the use of yellow corn is known as "yellow hominy feed," etc. The distinction is purely commercial and is not based on any appreciable difference in the composition of the material.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	8.5	10	**9.7**	4	8.5	**5.5**	4.8	7	**5.6**
Composition found.....	9.4	12.0	**11.2**	3.6	7.9	**6.3**	2.3	4.9	**3.7**

12. Linseed meal "is the ground product obtained after extraction of part of the oil from flaxseed screened and cleaned of weed seeds and other foreign materials by the most improved commercial processes, provided that the final product shall not contain over 6 per cent of weed seeds and other foreign materials and provided further that no portion of the stated 6 per cent of weed seeds and other foreign materials shall be deliberately added."

Most of the samples examined by us come under the term "old process oil meal," by which is meant linseed meal made by the old process of extraction by hydraulic pressure in contradistinction to the new process of extraction by treatment with solvents.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	30	35	**32.7**	4	6	**5.2**	8	10	**9.5**
Composition found.....	31.5	37	**34.6**	5.9	8	**6.8**	6	9	**7.3**

13. Rye middlings or rye feed "consists of the products other than the flour obtained in the manufacture of the ordinary '100

per cent' rye flour from the rye grain which has been cleaned and scoured."

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	11.3	13.3	**12.6**	2	3.7	**2.9**	3.5	10.7	**8.4**
Composition found.....	13.6	15.3	**14.4**	3.5	4.6	**3.7**	2.4	3.6	**3.1**

14. The different **wheat products** examined by us include (a) wheat bran, (b) wheat middlings, (c) red dog flour, and various mixtures of these.

(1) "Wheat bran is the coarse outer coating of the wheat kernel as separated from cleaned and scoured wheat in the usual process of commercial milling.

(2) "Standard middlings consist mostly of the fine particles of bran, germ and very little of the fibrous offal obtained from the 'tail of the mill.' This product must be obtained in the usual commercial process of milling.

(3) "Red dog flour consists of a mixture of low-grade flour, fine particles of bran and the fibrous offal from the 'tail of the mill.'

(4) "Wheat bran and standard middlings consist of the two commodities as defined above mixed in the proportions obtained in the usual process of commercial milling."

(1) Wheat bran.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	6	16.7	**13.8**	1	5	**3.6**	3.5	14	**11.1**
Composition found.....	12.7	19.1	**15.8**	4.1	6.9	**5.3**	5	11.6	**8.6**

(2) Wheat middlings.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	6	18	**14.6**	1.0	7	**4.2**	1.9	13.	**7.5**
Composition found.....	11.2	18.8	**16.7**	2.4	7.3	**5.3**	2.1	9.4	**5.3**

(3) Red dog flour.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	13	17	**15.7**	2	4.5	**3.8**	2.5	6	**4**
Composition found.....	13.7	18.9	**16.5**	2.1	5.9	**4**	0.3	3.9	**2.1**

(4) Wheat bran and wheat middlings.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	12	16	**14.6**	2.5	5	**3.8**	7.5	12	**9.7**
Composition found.....	15	18	**16.6**	4.3	6.4	**5.3**	5.2	10.5	**7.5**

(5) Wheat bran and red dog flour.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	14	17	**15.2**	3.5	4	**3.9**	8	10	**8.6**
Composition found.....	15.4	17.2	**16.4**	4.8	6.1	**5.3**	4.4	7.5	**5.6**

(6) Wheat bran, wheat middlings, and red dog flour.

	Per cent of Protein			Per cent of Fat			Per cent of Fiber		
	Low	High	Average	Low	High	Average	Low	High	Average
Composition guaranteed.	13	15.8	**14.9**	3	4.6	**4.2**	8.3	11.3	**9.7**
Composition found.....	14.5	17.7	**16.3**	4.0	6.9	**5.8**	4.9	9.3	**5.8**

In Table 1, we give in summarized form a statement of the average composition found in the materials which have been con-

TABLE 1.—SHOWING VARIATION AND AVERAGE OF COMPOSITION OF FEEDING-STUFFS.

FEEDING-STUFFS	PERCENTAGE PROTEIN			PERCENTAGE FAT			PERCENTAGE FIBER		
	Low	*High*	*Average*	*Low*	*High*	*Average*	*Low*	*High*	*Average*
Animal products:									
(1) Meat scrap and meal.....	43.5	61.3	**51.6**	7.8	16.8	**12.7**	5.2*	9.6*	**8.4***
(2) Meat and bone scrap and meal	30.6	56.1	**5.4**	8.5	21.5	**12.6**	10.1*	17.6*	**12.7***
Brewers' dried grains..	22	24.8	**24.4**	7.1	8.5	**7.9**	12	15.3	**14**
Buckwheat products...	15.5	32.3	**24.6**	4.2	7.8	**6.2**	4	18.2	**10.3**
Cocoanut meal.....	20.4	22.1	**21.3**	7.9	9.1	**8.5**	7.9	8.8	**10.3**
Corn bran.....	10.3	12.5	**11.4**	6.2	10.8	**8.3**	7	12.9	**7.7**
Corn feed meal.....	7.8	12.1	**10.4**	2.2	8.3	**3.9**	1.1	5	**2.5**
Corn gluten feed.....	21	28.3	**25**	2.9	6.1	**4.5**	5.8	8	**6.5**
Cottonseed products:									
(1) Choice cottonseed meal.....	41.3	44.3	**42.9**	6.1	8.8	**7.2**	6	8.7	**7.3**
(3) Good cottonseed meal.....	35.1	41.3	**37.4**	5.4	7.8	**6.6**	9.4	14.8	**11.8**
Distillers' dried grains.	31.4	31.9	**31.6**	11.7	12.7	**12.2**	11.3	11.3	**11.3**
Fish meal.....	57.9	60.8	**59.4**	6.6	10.7	**8.2**	0	0	**0**
Hominy feed.....	9.0	12.1	**10.9**	4.1	9.5	**7.0**	1.9	8.0	**4.0**
Linseed meal.....	30.1	36.6	**32.0**	5.4	9.6	**7.0**	7.4	9.5	**8.1**
Rye products.....	13.6	15.3	**14.4**	3.5	4.6	**3.7**	2.4	3.6	**3.1**
Wheat products:									
(1) Bran.....	12.7	19.1	**15.8**	4.1	6.9	**5.3**	5.1	11.6	**8.6**
(2) Middlings.....	11.2	18.8	**16.7**	2.9	7.3	**5.3**	2.1	9.4	**5.3**
(3) Red dog flour ...	13.7	18.9	**16.5**	2.1	5.9	**4**	0.3	3.9	**2.1**
(4) Bran and middlings.....	15	18	**16.6**	4.3	6.4	**5.3**	5.2	10.5	**7.5**
(5) Bran and red dog flour.....	5.4	17.2	**16.4**	4.8	6.1	**5.3**	4.4	7.5	**5.6**
(6) Bran, middlings and red dog flour	14.5	17.7	**16.3**	4.0	6.9	**5.8**	4.9	9.3	**5.8**
(7) Middlings and red dog flour.	16.3	18.3	**17.0**	4.0	6.1	**4.6**	3.8	7.1	**5.1**

*Phosphoric acid (P_2O_5).

sidered in detail in the preceding pages. This will be found convenient for comparison of the composition of the different materials and for ready reference when information is desired regarding the average composition of any of the materials.

COMPOSITION OF COMPOUNDED FEEDS

Under the general term compounded feeds are included four classes of mixtures, which consist of various individual feeding-stuffs and other materials, mixed in a great variety of ways as to kinds and proportions. These mixtures, for convenience, are classified under the four heads, compounded feeds, compounded feeds with molasses, poultry feeds, and calf and pig meals. Little useful information can be gained by studying the composition of these mixtures from a purely chemical standpoint, except in a general way. Their outstanding feature is that they vary arbitrarily and widely in chemical composition. However, it is possible to bring out some interesting and important facts by studying their range of composition in a comparative way. For the purpose of such a study Table 2 has been prepared. In this table, we have indicated, in the case of each of the four classes of mixed feeds, the percentage of samples in which each constituent (protein, fat, and

TABLE 2.—SHOWING RANGE OF COMPOSITION OF MIXED FEEDS.

FOOD CONSTITUENTS	COMPOUNDED FEEDS	COMPOUNDED FEEDS WITH MOLASSES	POULTRY FEEDS	CALF AND PIG MEALS	PIG FEEDS AND MEALS
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Protein:					
Below 10 per cent	13.8	27.0	0	0	0
Above 10 and below 15 per cent	24.3	35.1	8.6	0	0
Above 15 and below 20 per cent	8.3	12.6	46.2	27.8	42.8
Above 20 and below 25 per cent	42.5	21.7	42.9	33.3	42.8
Above 25 and below 30 per cent	11.1	3.6	2.3	38.9	14.4
Fat:					
Below 5 per cent	39.2	69.4	21.5	33.3	42.8
Above 5 and below 8 per cent	60.8	29.	78.5	55.6	57.2
Above 8 per cent	0	1.0	0	11.1	0
Fiber:					
Below 5 per cent	9.4	10.0	49.3	72.2	42.8
Above 5 and below 10 per cent	76.8	69.4	50.7	27.8	57.2
Above 10 and below 15 per cent	13.8	20.6	0	0	0
Above 15 per cent	0	0	0	0	0

fiber) occurs within certain limits. For example, in the case of compounded feeds, 11.5 per cent of the samples contain less than 10 per cent of protein; 33 per cent of the samples contain between 10 and 15 per cent of protein, etc.

An examination of this table points to certain facts of interest, among which are the following: (1) In compounded feeds, with and without molasses, the amount of protein varies from below 10 to 30 per cent; in poultry feeds, from 10 to 30 per cent; and in calf and pig meals, from 15 to 30 per cent. The fat varies from below 5 to nearly 8 per cent, except that in calf and pig meals the percentage is above 8 in a few cases. The amount of fiber in the first two classes varies from below 5 to 15 per cent; while in the others, the fiber is below 10 per cent. (2) In compounded feeds, nearly 40 per cent of the samples contain less than 15 per cent of protein, 50 per cent of them containing from 15 to 25 per cent of protein. In compounded feeds with molasses, over 60 per cent of the samples contain less than 15 per cent of protein. In the case of poultry feeds, about 90 per cent of the samples contain from 15 to 25 per cent of protein. In the other classes, the protein averages higher.

In respect to fat, poultry feeds stand highest; calf and pig meals and feeds, second; compounded feeds come third; with the molasses feeds lowest.

In respect to fiber, calf and pig meals contain least; while poultry feeds contain more, followed, in order, by pig feeds and meals, compounded feeds, and molasses feeds.

DEFICIENCIES IN COMPOSITION

Manufacturers of feeding-stuffs and mixers of feeds are required by law in New York to state the minimum percentage of protein and of fat and the maximum percentage of fiber contained in each brand of material offered for sale. One of the chief purposes of the work of inspection of these materials is to ascertain whether a smaller percentage of protein or of fat, or a larger percentage of fiber, is present in the samples than the percentage stated by the manufacturer.

In Table 3, we indicate the number of cases in which the deficiency of protein exceeds 1 per cent, that of fat exceeds 0.5 per cent, and that of fiber exceeds 1 per cent. Data are given for each feeding-stuff and each class of mixed feeds.

TABLE 3.—SHOWING NUMBER OF CASES OF DEFICIENCY OF PROTEIN AND FAT AND EXCESS OF FIBER IN FEEDING-STUFFS AND MIXED FEEDS.

MATERIALS	TOTAL NUMBER OF SAMPLES	NUMBER OF SAMPLES		
		Deficient in		With excess of fiber
		Protein	Fat	
I. Unmixed feeds:				
Animal products:				
(1) Meat and scrap meal	31	1	1	—
(2) Meat and bone scrap and meal	18	2	0	—
Brewers' dried grains	6	0	0	0
Buckwheat products	3	1	0	0
Cocoanut oil meal	2	0	0	0
Corn bran	3	0	0	0
Corn feed meal	23	0	2	1
Corn gluten feed	15	0	0	0
Cottonseed products:				
(1) Choice cottonseed meal	19	0	0	0
(2) Good cottonseed meal	22	0	0	0
Distillers' dried grains	2	0	0	0
Fish meal	3	0	0	—
Hominy feed	21	1	4	0
Linseed meal	15	0	0	0
Miscellaneous	10	0	0	0
Rye products	3	0	0	0
Wheat products:				
(1) Bran	140	0	0	0
(2) Middlings	168	3	6	0
(3) Red dog flour	22	1	2	0
(4) Bran and middlings	30	0	0	0
(5) Bran and red dog flour	9	0	0	0
(6) Bran, middlings and red dog flour	21	0	0	0
Yeast grains	3	0	0	1
II. Mixed feeds:				
Compounded feeds	194	5	0	0
Compounded feeds with molasses	94	14	3	2
Poultry feeds	224	9	0	0
Calf and pig meals and feeds	25	0	0	0

1. In the 23 different classes of unmixed feeding-stuffs, representing nearly 600 samples, there were 14 in which no deficiency of protein greater than 1 per cent, or fat greater than 0.5 per cent, or excess of fiber or phosphoric acid greater than 1 per cent occurred; 4 in which there was only one constituent involved in respect to such deficiency or excess; and 5 involving two constituents. The number of the individual samples in which there was a deficiency or an excess included in Table 3 was 26, 9 of protein, 15 of fat, and 2 of fiber.

2. In the four classes of mixed feeds, representing 537 samples, there were 28 cases of deficiency of protein, 3 of fat, and 2 of excess of fiber, a total of 33 samples.

3. Summarizing the results obtained with the entire 1,100 samples, there were 37 samples in which protein was deficient more than 1 per cent, 18 deficient more than 0.5 per cent of fat, and 4 with excess fiber, or a total of 59 samples.

MATERIALS USED IN MIXED FEEDS

An examination of the samples of mixed feeds, numbering 537, shows that 120 different materials or ingredients were used in these mixtures. We indicate in Table 4 the different materials present in each of the four classes of mixed feeds. It is also shown in how many of the samples of each class of mixed feeds each ingredient was present.

Of the 120 materials, 62 different ones were used in compounded feeds, 54 in compounded molasses feeds, 91 in poultry feeds, and 49 in calf and pig meals and feeds.

TABLE 4.—SHOWING NUMBER OF SAMPLES OF MIXED FEEDS CONTAINING EACH OF THE DIFFERENT MATERIALS USED.

KIND OF MATERIAL	COMPOUNDED FEEDS	COMPOUNDED FEEDS WITH MOLASSES	POULTRY FEEDS	CALF AND PIG MEALS
Albumen, milk	....	....	7	2
Alfalfa meal	7	35	95	1
Anise	....	....	2	7
Barley, cracked or crushed	....	3	1	....
Barley feed (middlings and hulls)	2	1	....	....
Barley flour	....	1	4	1
Barley, ground	42	29	39	2
Barley malt, ground	....	....	....	1
Barley meal	3	1	3	1
Beans, ground	....	....	2	1
Bean meal	2	1	4	1
Beef scrap	....	....	2	1
Beet pulp, dried	17	17	2	....
Blood flour or meal	....	....	6	14
Bone, ground	....	....	1	....
Bone meal	4	2	70	6
Brewers' dried grains	27	7	....	....
Buckwheat	....	....	1	....
Buckwheat feed	2	....	1	....
Buckwheat, ground	0	....	7	....
Buckwheat hulls	0	1	1	....
Buckwheat middlings	4	....	2	....
Buttermilk, dried	1	....	100	3
Calcium carbonate	15	6	30	7
Calcium phosphate	11	....	15	3
Capsicum	....	....	1	....

TABLE 4.—SHOWING NUMBER OF SAMPLES OF MIXED FEEDS CONTAINING EACH OF THE DIFFERENT MATERIALS USED.—*Continued.*

KIND OF MATERIAL	COMPOUNDED FEEDS	COMPOUNDED FEEDS WITH MOLASSES	POULTRY FEEDS	CALF AND PIG MEALS
Charcoal	1	2	25	2
Cocoanut oil meal	28	6	4	6
Cocoa-bean shell meal	0	16	3	4
Corn bran	4	1	4	....
Corn, cracked	3	28	7	....
Corn flour	4	3	4	2
Corn germ meal	6	3	6	....
Corn gluten feed	102	32	76	....
Corn gluten meal	11	1	11	....
Corn, ground	41	14	23	....
Corn meal and feed meal	98	17	147	5
Corn oil meal	6	4	2	....
Corn starch	....	....	....	2
Corn starch by-product	1	....	....	....
Cottonseed meal	111	40	16	4
Distillers' dried grains from corn	15	7	....	....
Epsom salt	....	....	1	....
Fenugreek	....	....	2	6
Fish meal	1	....	43	....
Fish scrap	....	....	10	....
Flax plant by-product	....	1	....	....
Flaxseed meal	....	....	....	2
Flaxseed, unpressed	....	....	10	1
Gentian	....	....	1	....
Ginger	....	....	....	1
Grains from barley malt and corn dried	1	....	....	....
Grain screenings	12	14	5	....
Hominy feed or meal or chop	101	15	48	2
Hominy feed, yellow	8	6	5	2
Iron oxide	....	....	....	3
Kaffir corn, cracked	....	....	6	....
Kaffir corn, ground	2	....	13	....
Lentils	....	....	....	1
Linseed oil meal	113	36	97	13
Locust-bean meal	....	....	1	4
Malt flour	1	....	....	4
Malt sprouts	9	1	6	....
Meat and bone meal	....	1	22	....
Meat and bone scrap	....	....	26	....
Meat meal	2	1	27	....
Meat scrap	1	....	79	....
Milk, dried	....	....	8	1
Milk, powdered	....	....	1	3
Millet seed, whole	....	....	2	....
Millet seed, cracked	....	....	5	....
Milo maize	1	1	5	....
Molasses	....	107	4	1
Oats, clipped by-product	1	10	....	....
Oats, crimped	....	6	....	....

TABLE 4.—SHOWING NUMBER OF SAMPLES OF MIXED FEEDS CONTAINING EACH OF THE DIFFERENT MATERIALS USED.—*Concluded.*

KIND OF MATERIAL	COMPOUNDED FEEDS	COMPOUNDED FEEDS WITH MOLASSES	POULTRY FEEDS	CALF AND PIG MEALS
Oats, crushed	3	20	2	....
Oats, flour	....	....	7	3
Oats, ground	87	15	94	....
Oats, hulled	....	....	3	....
Oat hulls	54	20	....	....
Oat meal	....	....	37	4
Oat middlings	14	17	12	....
Oats, rolled	....	....	7	....
Oat shorts	48	18	....	....
Oats, steel-cut	....	....	1	....
Oats, whole	....	....	2	....
Pea meal	2	....	1	....
Peas, cracked	....	....	3	....
Peas, ground	....	....	6	....
Peanut oil meal	2	5	1	....
Peanut shells	....	2	....	....
Rape seed	....	....	2	....
Red dog flour	6	1	10	5
Rice bran	4	1	....	....
Rice hulls, ground	2	1	....	....
Rice polish	....	....	2	3
Rye bran	2	....	....	....
Rye flour	....	....	....	1
Rye middlings	5	....	....	....
Salt	155	62	100	15
Sesame meal	1	....	....	2
Sodium bicarbonate	....	....	1	1
Soy bean meal	....	2	....	....
Sugar	....	....	1	2
Sulfur	....	....	1	....
Sunflower seed	1	....	2	....
Tankage, digester	2	....	1	....
Wheat bran	121	34	15	2
Wheat, cracked	....	....	7	....
Wheat feed	2	....	1	....
Wheat feed, toasted	5	....	....	....
Wheat flour	....	....	8	5
Wheat, ground	....	....	16	....
Wheat middlings	114	23	176	6
Wheat product, cooked	....	....	1	....
Wheat, puffed, ground	....	....	2	1
Wheat screenings, ground	1	5	6	....
Wheat, shredded, ground	....	....	2	....
Yeast grains, dried	4	1	....	....

PRICES OF UNMIXED FEEDING-STUFFS

In the case of unmixed feeding-stuffs, in each class of which the composition does not vary widely, it is of interest to observe to what extent the retail price per ton varied. The ton price is given in Table 5, showing average, lowest, and highest figures in each class.

TABLE 5.—SHOWING RETAIL PRICES PER TON OF UNMIXED FEEDING-STUFFS.

MATERIAL	AVERAGE	LOWEST	HIGHEST
	Dollars	*Dollars*	*Dollars*
Animal products:			
(1) Meat meal	**95.70**	49	110
(2) Meat and bone meal	**91.50**	70	102
Barley by-products	**39.00**	38	40
Brewers' dried grains	**46.30**	20	70
Buckwheat middlings	**38.00**	38	38
Buckwheat middlings, hulls and screenings	**25.00**	25	25
Cocoanut oil meal	**44.00**	40	48
Corn bran	**38.30**	35	40
Corn feed meal	**40.10**	34	44
Corn gluten feed and meal	**51.80**	45	57
Cottonseed meal:			
(1) Choice	**60.90**	56	75
(2) Good	**57.60**	50	65
Hominy feed	**39.50**	37	45
Linseed oil meal	**57.20**	48	64
Rye products	**34.70**	32	38
Wheat products:			
Bran	**39.40**	34	46
Middlings	**41.50**	32	50
Red dog flour	**46.10**	38	52
Wheat feed	**41.10**	30	46

The data in Table 5 show a very wide variation in retail price in some classes. Excepting three classes, the variation in ton price in the other 16 classes ranges from $5 to $61, and in 12 of these classes the difference is $10 or more between the lowest and highest retail price. The question suggests itself as to whether a difference in selling price in any class of materials, varying little or none in composition, should be greater than $5 a ton. Should not all differences in prices, due to such conditions as normal differences in freight and other handling, in credit, etc., be covered in extreme cases by

$5 a ton? Is there any reasonable explanation why, for example, one consumer pays $34 a ton for wheat bran and another, $46; or why there should be a difference of retail price per ton, amounting to $18 in case of wheat middlings, or $19 in case of cottonseed meal?