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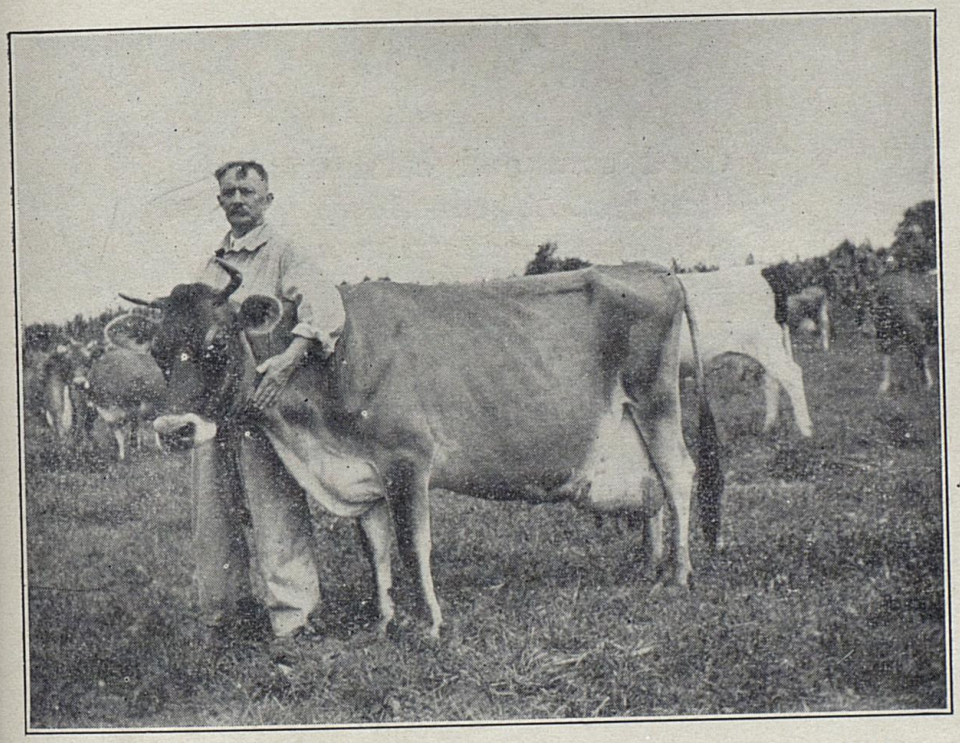
CIRCULAR NO. 227

FEEDING DAIRY COWS FOR PROFIT



A good cow in the hands of a good feeder

Lexington, Ky.

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Good care and common-sense management combined with good cows, good pastures, home-grown, high-quality legume hay and grain mixed to properly supplement the roughage and fed to each cow according to her ability to produce, enable a dairyman to produce a volume of milk and butterfat economically.

CIRCULAR NO. 227

Feeding Dairy Cows for Profit

By FORDYCE ELY

Dairy cows furnish an excellent market for Kentucky pasture and hay crops. Any seasonal change which affects the growth of these or other feed crops presents a feeding problem to the man who milks cows. For this reason the feeding problem is of vital importance to Kentucky dairy farmers thruout the year. An understanding of the fundamental principles of feeding is necessary for the dairy farmer to meet these constantly changing conditions in order that he may secure the most profits from his dairy herd. The purpose of this circular is to furnish information to the practical dairy farmer which will help him to make his herd more profitable thru proper feeding.

OVERFEEDING OR UNDERFEEDING REDUCES PROFITS

A good dairy cow is capable of producing 300 pounds or more of butterfat each year. The average cow kept for milk production in Kentucky is unprofitable because she produces less than 200 pounds of butterfat annually. Many good cows do not receive a sufficient quantity of good quality feed and for this reason never have a chance to demonstrate their ability to produce profitably. On the other hand much valuable feed is being wasted on inferior cows which are incapable of greater production.

LIBERAL FEEDING PAYS

Many dairy farmers realize that an increase in the allowance of good feed to good cows will result in greater production. Too few, however, believe that the increased production justifies the extra expenditure for feed. Liberal feeding is not wasteful feeding, but *feeding according to production.*

TABLE 1.

Summary of the records of 223 cows in a Kentucky dairy herd improvement association which completed its testing year January 31, 1929.

	Yearly Production of Butterfat	Value of Product Per Cow	Cost of Feed Per Cow	Return Above Cost of Feed	Return for $1 Spent for Feed	Percent of Income Spent for Feed
	Lbs.					
Poor cows	Up to 150	$86.20	$65.18	$21.02	$1.32	76
Fair cows	151 to 250	139.84	85.99	53.85	1.62	61
Good cows	251 to 350	196.53	93.95	102.58	2.09	48
Excellent cows	351 to 450	257.73	106.77	150.96	2.41	41

Note 1.—Members in this association sold milk wholesale.
2.—Do not confuse "return above cost of feed' with "profits."

Table 1 shows that it pays to feed good cows liberally. Altho it cost about one and one-half times as much to feed good cows as it cost to feed poor cows the income above cost of feed was $21.02 per cow for the poor cows and $102.58, or nearly five times as much, from the good cows. The cost of feed is the largest single item in the cost of producing milk and butterfat and the realtive efficiency of dairy cows can well be measured by the income above the cost of feed. Many owners of small herds of relatively poor dairy cows believe that only the dairyman with high-producing cows is faced with a feeding problem. The above table shows that this is not true. The owner of poor cows spent 76 percent of the income from his cows for feed as compared with the owner of good cows who spent only 48 percent of the income from his cows for feed. The lower the average production of the cows in the herd the more difficult is the feeding problem.

THE TRUE VALUE OF FEED

Feeds are not of value to a cow merely because they satisfy her appetite. Feeds contain certain groups of chemical compounds which aid in supporting animal life. These are referred to as nutrients.

Protein. Lean meat or muscle tissue and the vital organs of the body are made up largely of protein. Protein in the feed builds new tissues and repairs worn out tissues. Milk is about 3.3 percent protein and a dairy cow must have sufficient protein in her feed to keep her body in repair and also enough in addition with which to produce milk. Feeds containing more than 20 percent of protein are referred to as protein concentrates and are usually high in price. See Table 2. Farm-grown grains are usually low in protein and for this reason protein is most likely to be deficient in the dairy cow's ration.

Carbohydrates and Fats. These two nutrients furnish heat and energy for the animal body. A reserve of heat and energy is stored in the form of body fat. 100 pounds of milk contains about 5 pounds of carbohydrates (sugar) and 4 pounds of fat (butterfat). A hard-worked dairy cow needs a generous allowance of carbohydrates and fats in her feed to provide for these nutrients in her milk and to furnish her with the energy to do her work and warm her body. Farm-grown feeds are usually rich in heat and energy producing nutrients.

Water. All feeds contain some water. Early pastures contain as high as 80 to 90 percent of water. Pasture and silage are referred to as succulent feeds because of their high water content. Milk is 87 percent water and the cow's body is nearly one-half water. Succulent feeds are valuable for their cooling, laxative effect which is due largely to the water they contain. Warm weather and high production increase the need for water. A cow in milk requires about 12 gallons daily. Cows prefer cool, clean water, but if it is too cold some of the heat and energy furnished by the feed must be used to heat it to body temperature. Warm, stagnant water is often distasteful, and due to the fact that cows are less inclined to drink it, this may severely limit milk production. The richness of the milk is not affected materially by the amount of water consumed.

Ash. This is the mineral part of the feed. Bones are made up largely of lime and phosphorus. High-producing cows and cows which are heavy in calf require feeds which are relatively rich in these minerals. See Table 2. Milk also contains these

same minerals and this fact accounts to some extent for the food value of milk to young growing animals.

A GOOD DAIRY RATION

It should be economical. This is unquestionably the most important requirement of a ration. Plenty of good pasture and home-grown legume hay contribute to the economy of a ration for dairy cows. As much corn and other feed grains as possible should be raised on the farm and only such feeds should be purchased as will most efficiently supplement what can be grown. A balanced ration is most economical because it provides an allowance of feed for twenty-four hours which contains the digestible nutrients in such proportion that the needs of the cows are supplied with no waste. The closer the "balance" the less waste there is in feeding. The high-protein feeds are usually the most economical source of digestible protein in spite of their high cost. The cost of a pound of digestible protein in purchased feed is very important to the feeder who is choosing a feed to supplement home-grown grains.

It should be palatable. Feeds vary greatly in palatability. See Table 2. Some dairymen report that they have difficulty getting their cows to eat sweet clover when first turned into it. Later they report that their cows have learned to like it. It is rather commonly believed among feeders that even tho cottonseed meal is usually an economical source of digestible protein and for this reason very valuable as a dairy feed, some cows do not like it. When it is found that certain feeds are unpalatable they should be used in relatively small quantities and then thoroly mixed with feeds that are known to be palatable such as corn and wheat bran. Badly weathered or dusty hay is unpalatable to cows as is also silage that is in any way spoiled. Moldy or musty grains or hay may be harmful as well as distasteful to cows and for these reasons should not be fed.

It should vary. Sufficient variety may be insured by selecting first-class ingredients for a feed mixture from three or more plant sources. For example, a mixture of corn, wheat bran and cottonseed meal would be suitable. When the same

feed is used for several months it may become very monotonous to the cows but changes of the ingredients can be made which will alter the taste without materially affecting the digestible nutrient content of the mixture. Such changes will often stimulate greater production.

It should have a desirable effect on the cow. Feeds which contain much water (succulent feeds) usually have a cooling, laxative and thoroly beneficial effect on the cows. A sudden change from dry feed to rich, fresh green pasture in the spring may cause bloat. Spoiled, moldy feeds are fortunately so unpalatable that cows usually refuse them. Many molds are harmless. Certain others when eaten may have a harmful effect, especially if on silage that has been exposed to the air and has become somewhat dry. Under certain conditions cows that have received sweet clover hay for several weeks during the winter have been known to become "bleeders." Some feeds are laxative and others are inclined to have the opposite effect. See Table 2.

It should not have a harmful effect on the milk and butterfat. Milk and butterfat are easily affected by the flavor and odor of feed. The presence of wild onions in Kentucky pastures causes a great loss to dairymen in the state during the early pasture months. Feeds rich in fat such as linseed meal or cracked soybeans have a tendency to produce a soft butterfat, if used in excess. An excess of cottonseed meal in the ration has the opposite effect.

TABLE 2.

A Useful Classification of Feeds

Palatable		
Fresh green pasture	Corn (most palatable)	Cane molasses
Corn silage and roots	Wheat bran	Linseed meal
Legume hays in good condition	Oats	Hominy feed
		Corn gluten feed
Laxative		
Fresh green pasture	Wheat bran	Soybeans
Corn silage and roots	Linseed meal	Soybean meal
Legume hays in good condition	Molasses	

Constipating

All non-legume hays
Corn stover
Straw

High in Digestible Protein

All legume hays as compared with non-legume hays	Cottonseed meal	Corn gluten feed
	Soybean meal	Corn gluten meal
	Linseed meal	Brewers' dried grains
	Soybeans	Corn distillers' grains

Low in Digestible Protein

Non-legume roughages as compared with legume roughages	Corn	Molasses
	Hominy feed	Oats
		Barley

Rich in Minerals

Rich in Calcium	Rich in Phosphorus
All legume roughages	Wheat bran
Linseed meal	Cottonseed meal
Corn stover	Soybeans

PRACTICAL FEED MIXTURES SUITABLE FOR DAIRY COWS

TABLE 3.
Suggested Feed Mixtures* to Use With Good Quality Legume Hay Alone or Abundant Early Pasture.

	Mixture No. 1	Mixture No. 2	Mixture No. 3	Mixture No. 4	Mixture No. 5	Mixture No. 6
About 12 per cent of protein	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Cracked corn (Dent No. 2)	100	200	100	100	200	300
Wheat bran	100	100	100			100
Ground oats	100		200			
Commercial mixed feeds						
16% straight mixed feed. (Not yellow tag)				100		
20% straight mixed feed. (Not yellow tag)					100	
24% straight mixed feed. (Not yellow tag)						100

*Mixtures Nos. 1, 2 and 3, Table 3, should not be interpreted as a suggestion that a 12 percent special purpose mixed feed be manufactured for dairy feeding. Dairymen are warned against the purchase of low protein, yellow tag, adulterated mixed feeds.

TABLE 4.

Suggested Feed Mixtures to Use With Good Quality Legume Hay and Silage or Substitute, or Abundant Mid-summer or Fall Pasture.

	Mixture No. 1	Mixture No. 2	Mixture No. 3	Mixture No. 4	Mixture No. 5	Mixture No. 6
About 16 per cent of protein	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Cracked corn (Dent No. 2)	400	300	300		100	100
Wheat bran	200	200			100	100
Ground oats			200			
Cottonseed meal (41%)	100		100			
Linseed meal (O. P.)		100				
Commercial mixed feeds						
16% straight mixed feed. (Not yellow tag)				straight		
20% straight mixed feed. (Not yellow tag)					200	
24% straight mixed feed. (Not yellow tag)						100

TABLE 5.

Suggested Feed Mixtures to Use With Mixed Hay or Medium Quality Legume Hay, With or Without Corn Silage or Substitute or Fair Pasture

	Mixture No. 1	Mixture No. 2	Mixture No. 3	Mixture No. 4	Mixture No. 5	Mixture No. 6
About 20 per cent of protein	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Cracked corn (Dent No. 2)	200	200	200			100
Wheat bran		200	300			100
Ground oats	200		100			
Corn gluten feed		100	100			
Cottonseed meal (41%)	100	100	100			
Linseed meal (O. P.)	100		100	100		
Commercial mixed feeds						
16% straight mixed feed. (Not yellow tag)				300		
20% straight mixed feed. (Not yellow tag)					straight	
24% straight mixed feed. (Not yellow tag)						300

TABLE 6.

Suggested Feed Mixtures to Use With Non-Legume Roughages Such as Timothy Hay or Corn Fodder, With or Without Corn Silage or Substitute or Short, Poor Pasture.

	Mixture No. 1	Mixture No. 2	Mixture No. 3	Mixture No. 4*	Mixture No. 5*	Mixture No. 6
About 24 per cent of Protein	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Cracked corn (Dent No. 2)	100	200				
Wheat bran	200	100	300	100	100	
Ground oats	100	200	200			
Corn gluten feed		100	100			
Cottonseed meal (41%)	100	200	200			
Linseed meal (O. P.)	200	200	200	200	200	
Commercial mixed feeds						
16% straight mixed feed. } Not yellow tag				200		
20% straight mixed feed. } Not yellow tag					400	
24% straight mixed feed. } Not yellow tag						straight

*The most common source of protein in special purpose mixed feeds is cottonseed meal. To avoid the danger of feeding too much cottonseed meal it is recommended in mixtures Nos. 4 and 5 that linseed meal or soybean meal be used to supply the protein which is lacking in the inferior roughage.

HOW TO USE THESE FEED MIXTURE TABLES

First—Choose the table in which the roughage that is available may be classed. For example, during April, May and June when much fresh green pasture is available refer to Table 3. Later, as the pastures become somewhat dried, choose a feed mixture from Table 4 or Table 5, depending on the condition of the pasture. A dairyman who has a sufficient quantity of good quality legume hay so that his cows can have what they will eat twice daily without any other roughage, should select a feed mixture from Table 3. If corn silage is fed with good quality legume hay a mixture should be chosen from Table 4. The use of first quality legume hays such as alfalfa or soybean enables the dairyman to feed grain mixtures which cost less per hundredweight.

Second—Based on the feeds that have been grown on the farm and the local prices of ingredients which must be purchased a careful selection should be made of the feed mixtures in a single table. Whether or not a dairyman should mix his feed at home or purchase a special purpose straight mixed feed should depend on the relative cost of the ingredients, the amount of home grown grains, and the cost of mixing it on the farm.

Third—Mixtures Nos. 1, 2 and 3 in each table may be mixed from single ingredient feeds. For example, Mixture No. 1, in Table 4, is made from 400 pounds of cracked corn, 200 pounds of wheat bran and 100 pounds of cottonseed meal. Mixtures Nos. 4, 5 and 6 in each table suggest a method for combining special purpose mixed feeds of different protein content with common feeds in order that the resulting mixture may be suited to the needs of the cows. Under the conditions indicated at the top of Table 4, mixture No. 5 suggests that 200 pounds of a 20-percent straight mixed feed should be mixed with 100 pounds each of cracked corn and wheat bran.

Fourth—The percent of total protein which appears at the top of each table of feed mixtures corresponds to the statement of protein content on a feed tag. This must not be confused with the percent of digestible protein in a feed or mixture. See Table 8.

Fifth—There are many other combinations of feeds which, based on the digestible nutrients they contain, would be expected to give equally good results. Several modifications which may offer a feeder an opportunity to greatly reduce the cost of the mixture which he chooses in accordance with local feed prices are suggested with a few words of caution to be observed in making such substitutions.

1. A part or all of the cracked corn may be replaced with an equal weight of corn and cob meal, hominy feed or ground barley.

2. A part of the wheat bran may be replaced with an equal weight of ground oats.

3. An equal weight of brewers' dried grains or dried corn distillers' grain may be substituted for corn gluten feed.

4. It is not considered a safe practice to feed a cow more than two pounds of cottonseed meal a day and it should not constitute more than 25 percent by weight of the feed mixture. Soybean meal, linseed meal, gluten meal, or cracked soybeans may be substituted for all or a part of the cottonseed meal in a feed mixture.

5. The best method of feeding cottonseed meal is with corn silage.

6. When corn silage is not available for winter feeding it is necessary to increase the allowance of grain 15 to 20 percent.

GENERAL AND PRACTICAL SUGGESTIONS

1. *Feed grain according to production.* See *summer feeding* and *winter feeding* for details. There is no more important rule in profitable dairying.

2. Feed with hay all the corn silage the cows will eat without wasting. This will reduce the consumption of hay about one-half. A 1000-pound cow will eat about 30 pounds of silage in two feeds.

3. Feed all the good quality hay the cows will eat without wasting after they have eaten their grain or grain and silage. This will average about 15 to 20 pounds daily for a 1000-pound cow during the winter when corn silage is not available. The amount eaten will vary with different cows and with the kind and quality of the hay.

SUMMER FEEDING

An abundance of rich, succulent pastures and moderate temperatures during the early summer make the feeding problem very simple. In Kentucky conditions are ideal for high production at a low cost of feed during April, May and June. The skillful dairyman makes every effort to imitate these conditions thruout the year. The pasture should be given an opportunity to get a good start before the cows are turned in. Early pasture may contain 80 to 90 percent water but the dry

matter which it contains is relatively rich in protein. While pastures are good, grain should be fed only to the higher-producing cows.

During August and September many Kentucky dairy farmers have little or no pasture unless they have sown a mixture of legumes or a catch crop of sudan grass. Production can be maintained to some extent with spring freshening cows by feeding green corn, alfalfa or other green soiling crops, but much labor is involved in this practice which may make it uneconomical. More grain must be fed to take the place of the pasture which is gone, but nothing can take the place of abundant pasture for economy. Cows which are bred to freshen in November and December should be dried up during the dry pasture months.

When Good Pasture is Available Feed

	To Jerseys and Guernseys Producing	To Holsteins and Other Breeds Producing
No grain	Less than 15 lbs. milk daily	Less than 20 lbs. milk daily
2 lbs. grain	15-20 lbs. milk daily	20-25 lbs. milk daily
4 lbs grain	20-25 lbs. milk daily	25-30 lbs. milk daily
6 lbs. grain	25-30 lbs. milk daily	30-35 lbs. milk daily

WINTER FEEDING

A combination of legume hay and corn silage during the winter very effectively duplicates the ideal conditions that exist during early summer. Choose a feed mixture from the proper table based on the roughages that are available.

During the Winter Feed

To Jerseys and Guernseys	Holsteins or other breeds
1 lb. of grain to 2½ to 3 lbs. of milk produced daily	1 lb. of grain to 3 to 4 lbs. of milk produced daily

The above suggestions are helpful guides for feeding dairy cows but no rule can take the place of common sense. The condition of the individual cow and the period of lactation must

be taken into consideration. This also applies to the feeding of fresh cows to gradually bring them to high production four to six weeks after freshening and the liberal feeding of the proved high-producing cows during the six to eight weeks dry period.

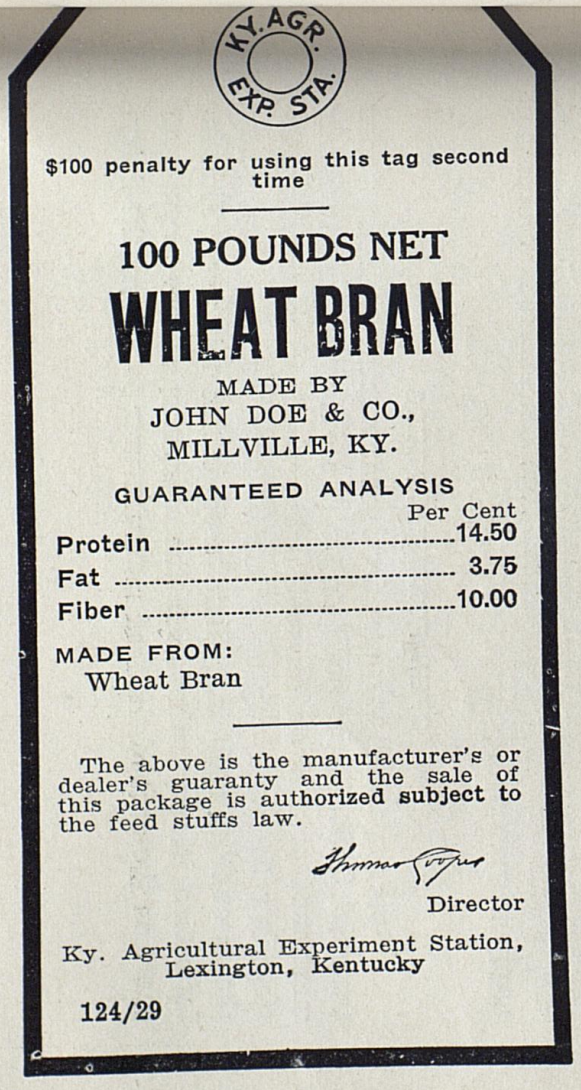
THE USE OF SPECIAL PURPOSE MIXED FEEDS

There are some very good as well as some very inferior special purpose mixed feeds on the market. In Kentucky most special purpose mixed feeds are classed as 24 percent, 20 percent or 16 percent protein feeds. Tables 3 to 6 offer practical suggestions for the economical use of such mixtures. When used as supplements to farm grown feeds the value of these mixtures is about in proportion to their protein content because farm-grown feeds are most likely to be low in protein.

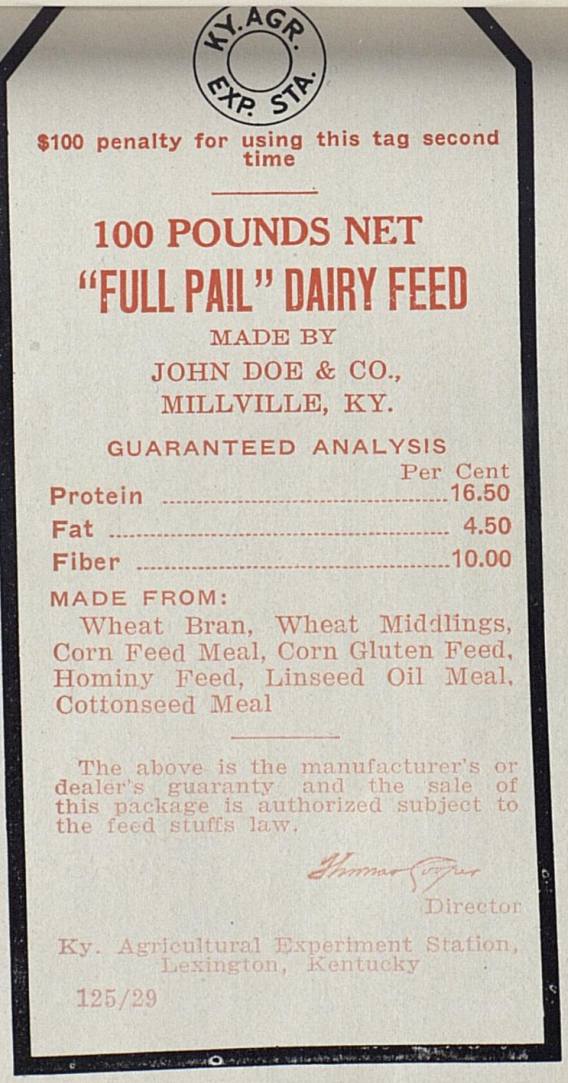
HOW TO UNDERSTAND A FEED TAG

The Kentucky Feed Stuffs Law requires that each sack of concentrate feed sold in the state must carry an official tag bearing the signature of the Director of the Experiment Station. This tag must give the following information which is the manufacturer's guaranty to the state.

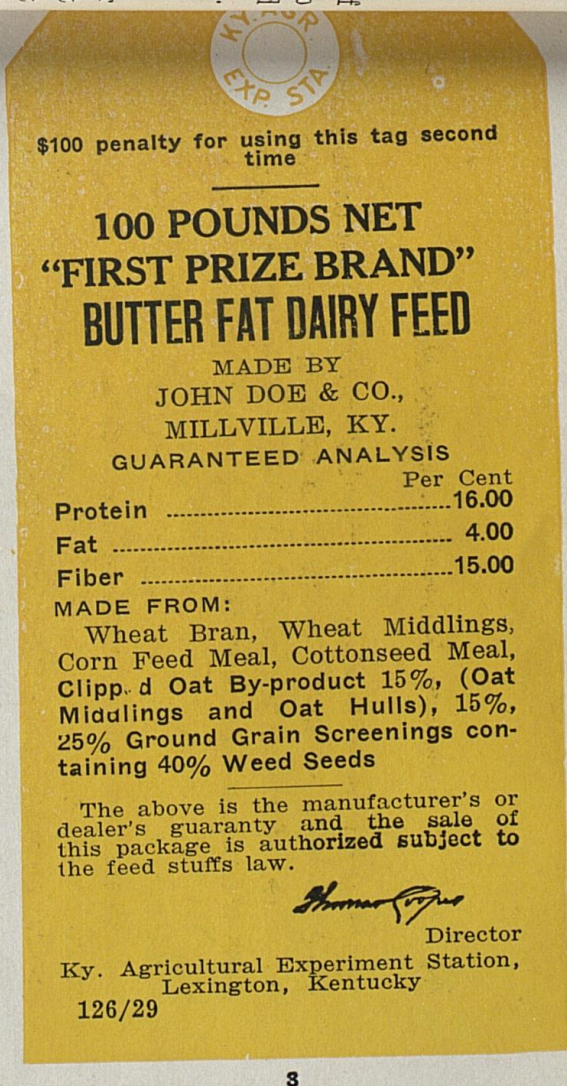
1. Net weight of contents of bag.
2. The brand name of the feed. No word or phrase may be used in naming a special purpose mixed feed which may lead a purchaser to believe that it is a dairy feed unless it contains at least 16 percent protein, 3.5 percent fat and not more than 15 percent fiber. It must also contain a sufficient variety of first-class ingredients which are suitable for dairy cows.
3. Name and address of manufacturer or dealer.
4. Minimum percent of total protein.
5. Minimum percent of total fat.
6. Maximum percent of crude fiber.
7. The specific name of each ingredient used in the mixture.
8. If a material of little or no feeding value is used such as cob meal, oat hulls, cottonseed hulls, mill sweepings, weed seeds, etc., the percent must be given.



1
Straight Feed



2
Straight Mixed Feed



3
Yellow Tag Feed or Adulterated Feed

9. If screenings are used the percent must be given and the statement whether ground or unground.

The percent of protein and fat shown on a feed tag represents a chemical analysis. Not all of this is digestible and it is only the digestible part of the feed that benefits the cow. Where first-class ingredients are used in home-mixed feeds or in special purpose mixed feeds about 75 to 85 percent of the nutrients are digestible. A high percent of crude fiber indicates lower percent digestibility. Purchasers of feed should keep these facts in mind.

In addition to the information printed on the official tag which is very valuable to the feeder, purchased feeds are further classified according to a color scheme of tags.

1. A manilla tag printed in *black letters* indicates a feed product or by-product made of one grain or plant such as wheat bran, cottonseed meal, alfalfa meal, linseed meal, etc., commonly known as *straight feed.*

2. A manilla tag printed in *red letters* indicates a feed made of the product or by-product of two or more grains, or cereals. This is *straight mixed feed.*

3. A yellow tag in *black letters* indicates that the feed contains a material of little or no feeding value such as oat hulls, cottonseed hulls, cob meal, screenings waste, etc. Such feeds are known as *adulterated or yellow tag feeds.* Yellow tag feeds are usually cheaper per bag but they are most expensive when the dairyman considers their actual worth. The suggestions for using ready mixed feeds in Tables 3 to 6 do not apply to yellow tag feeds.

OPEN FORMULA FEEDS

Some special purpose feed manufacturers sell "open formula feeds." In addition to the information previously mentioned printed on the official tag which is required by the state law the same tag on a bag of open formula feed states the amount of each ingredient used in the mixture. This information is very valuable to the dairyman and represents an effort on the part of the feed manufacturer to inform the dairy-

man as completely as possible regarding the feed that he is contemplating purchasing. The purchaser of feed must realize, however, that the value of such a feed depends to a considerable extent on the quality of the ingredients used in the mixture and the integrity of the manufacturer the same as closed formula feeds.

$100 penalty for using this tag second time

100 POUNDS NET

24% DAIRY FEED

MADE BY
JOHN DOE & CO.,
Incorporated
MILLVILLE, KY.

GUARANTEED ANALYSIS

	Per Cent
Protein	24.00
Fat	5.00
Fiber	11.00

MADE FROM:

100 lbs. Old Process Linseed Oil Meal
300 lbs. Wheat Middlings
300 lbs. Choice Cottonseed Meal
300 lbs. Corn Gluten Feed
340 lbs. Distillers' Dried Grains
100 lbs. Ground Corn
200 lbs. Ground White Oats
20 lbs. Steamed Bone Meal
20 lbs. Calcium Carbonate
20 lbs. Fine Salt
300 lbs. Wheat Bran

This sale of this package is authorized subject to the provisions of the feeding stuffs law.

Kentucky Agricultural Experiment Station, Lexington, Ky.

Director

105/29

SALT IS NECESSARY

Common stock salt should be before the cows at all time in a sheltered box, preferably near the water tank.

MINERALS FOR DAIRY COWS

There are many commercial mineral mixtures on the market which contain a wide assortment of ingredients, the majority

of which are of little or no benefit to the cows. Where feeds which are low in calcium and phosphorus (See Table 2) are being fed, high-producing dairy cows may need calcium and phosphorus in some form added to their ration. In sections of the country where calves are born with "big neck" or "goiter" or pigs are born without hair it is evidence that there is a lack of iodine in the soil and water in that section. So far as is known there is no such section in Kentucky. Calcium and phosphorus are more likely to be lacking in the dairy ration. Bone meal in the form of raw bone meal, steamed bone meal or special steamed bone meal contain both calcium and phosphorus in approximately the proportion they are needed in the animal body. High-grade ground limestone is rich in calcium but in some instances it contains magnesium in such quantities as to make it unsuitable for feeding, High-producing cows, cows that are advanced in pregnancy and cows that are receiving feeds that are lacking in minerals should have free access to bone meal in a sheltered box or it may be mixed with the salt at the rate of one part salt to four parts bone meal. Cows will eat only about one ounce daily. It will do them no harm and may be of real benefit especially to the high-producing cows.

TABLE 7.
Digestible Nutrients Required for Body Maintenance and Milk Production

Adapted from Morrison's Feeding Standard

For Body Maintenance of 1,000-Pound Cow	Digestible Protein, Pounds .700	Digestible Carbohydrate Equivalent pounds 7.225
To maintenance requirement add:		
For each lb. of 2.5 percent milk	.049	.207
For each lb. of 3.0 percent milk	.052	.234
For each lb. of 3.5 percent milk	.055	.261
For each lb. of 4.0 percent milk	.060	.286
For each lb. of 4.5 percent milk	.063	.313
For each lb. of 5.0 percent milk	.067	.335
For each lb. of 5.5 percent milk	.071	.357
For each lb. of 6.0 percent milk	.074	.380

Select feeds from Table 8 based on the digestible nutrients which they contain.

1. *Total Protein.* The figures in the first column of Table 8 correspond to the statement of protein content on a feed tag and are the averages of many chemical analyses.

2. *Digestible Protein.* Protein which is not digestible is of little value to the animal. The same is true of the other nutrients. No figure which corresponds to this appears on the feed tag.

3. *Digestible carbohydrate equivalent* is the percent of digestible fat multiplied by 2¼ plus the percent of digestible carbohydrates in a feed. This is a very convenient term to use as it includes fats and carbohydrates, both of which serve as sources of heat and energy. Digestible fat is 2¼ times as rich in heat and energy as digestible carbohydrates.

4. *Total digestible nutrients* is the digestible protein plus the digestible carbohydrate equivalent.

TABLE 8.

Nutrients in 100 Lbs. of Common Feeds

(Adapted from Henry and Morrison. Appendix Tables 1 and 3)

Feeds	Total Protein	Dig. Protein	Dig. Carbohydrate Equivalent	Total Dig. Nutrients
Dry Roughages	Lbs.	Lbs.	Lbs.	Lbs.
Alfalfa hay	14.9	10.6	41.0	51.6
Clover and timothy hay	8.6	4.0	42.2	46.2
Clover (red) hay	12.8	7.6	43.3	50.9
Corn fodder (stover)	5.7	2.1	44.0	46.1
Cowpea hay	19.3	13.1	35.9	49.0
Lespedeza hay	12.1	8.6	43.6	52.2
Oat hay	8.4	4.5	41.9	46.4
Soybean hay	16.0	11.7	41.9	53.6
Sudan grass hay	8.2	3.7	47.7	51.4
Timothy hay	6.2	3.0	45.5	48.5
Succulent Roughages				
Alfalfa (pasture)	4.5	3.3	11.3	14.6
Bluegrass (pasture)	4.1	2.3	16.2	18.5
Clover and mixed grass	3.0	2.2	15.5	17.7
Corn silage	2.1	1.1	16.6	17.7
Lespedeza (pasture)	6.7	4.5	18.5	23.0
Sweet clover (pasture)	4.4	3.3	11.0	14.3
Sweet sorghum silage	1.5	.6	12.7	13.3
Sudan grass (pasture)	1.8	.8	12.7	13.5
Concentrates				
Barley, ground	11.5	9.0	70.4	79.4
Brewers' dried grains	23.1	21.5	44.2	65.7
Corn and cob meal	8.5	6.1	72.0	78.1
Corn, cracked (Dent No. 2 grade)	9.6	7.1	74.6	81.7
Cottonseed meal, prime	41.0	33.4	42.1	75.5
Corn gluten feed	25.4	21.6	59.1	80.7
Hominy feed	10.6	7.0	77.6	84.6
Linseed meal (O. P.)	34.0	30.2	47.7	77.9
Oats, ground	12.4	9.7	60.7	70.4
Soybeans, cracked	36.5	33.2	60.9	94.1
Wheat bran	16.0	12.5	48.4	60.9
Feed Mixtures				
Table 3, Mixture No. 1	12.7	9.8	61.2	71.0
Table 4, Mixture No. 1	15.9	12.4	62.3	74.7
Table 5, Mixture No. 1	19.7	16.2	59.9	76.1
Table 6, Mixture No. 1	23.3	19.4	52.7	72.1