R E P O R T R E S U M E S

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FEEDS SALES AND SERVICE. AGRICULTURAL SUPPLY - SALES AND SERVICE OCCUPATIONS, MODULE NUMBER 7.

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ONE OF A SERIES OF MODULES DESIGNED TO ASSIST TEACHERS IN PREPARING HIGH SCHOOL STUDENTS FOR AGRICULTURAL SUPPLY OCCUPATIONS, THIS GUIDE IS CONCERNED WITH UNDERSTANDINGS AND ABILITIES NEEDED IN THE RETAIL FEED BUSINESS. IT WAS DESIGNED BY A NATIONAL TASK FORCE ON THE BASIS OF DATA FROM STATE STUDIES. SECTIONS ARE (1) ECONOMICS OF LIVESTOCK FEEDING, (2) ANIMAL NUTRITION, (3) LIVESTOCK FEEDS AND THEIR VALUES, (4) REGULATIONS IN FORMULATING, LABELING, AND USING FEEDS, (5) GRAIN RATION FORMULATION, (6) FEED PREPARATION, AND (7) FEED MERCHANDISING METHODS AND TRENDS. DESIGNED FOR 36 HOURS OF CLASS INSTRUCTION, 12 HOURS OF LABORATORY EXPERIENCE, AND 48 HOURS OF OCCUPATIONAL EXPERIENCE, THE MATERIAL IS APPROPRIATE FOR USE BY TEACHERS WITH A BACKGROUND IN AGRICULTURAL SUPPLY AND STUDENTS WITH AN OCCUPATIONAL GOAL IN THAT FIELD. THIS DOCUMENT IS AVAILABLE FOR A LIMITED PERIOD AS PART OF A SET (VT 000 632 - 000 644) FOR $7.00 FROM THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION, THE OHIO STATE UNIVERSITY, 980 KINNEAR ROAD, COLUMBUS, OHIO 43212. (JM)

FEEDS
SALES AND SERVICE

One of Twelve Modules in the Course Preparing for Entry in

AGRICULTURAL SUPPLY - SALES AND SERVICE OCCUPATIONS

Module No. 7

The Center for Research and Leadership Development

in Vocational and Technical Education

The Ohio State University
980 Kinnear Road
Columbus, Ohio, 43212

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M E M O R A N D U M

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Appropriate School Setting High school
Type of Program General high school class in agricultural supply
Occupational Focus Job entry in retail business that sell agricultural supplies
Geographic Adaptability Nationwide
Uses of Material Instructor course planning
Users of Material Teachers

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Teacher Competency Background in agricultural supply--sales and services
Student Selection Criteria High school level, goal in agricultural supply--in the area of sales or service.
Time Allotment Estimated time listed in module. (P)

Supplemental Media --
Necessary x
Desirable
(Check Which)

Describe Suggested references given in module. (P)

Source (agency)
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FEEDS - SALES AND SERVICE

CONTENTS

FEEDS - SALES AND SERVICE

Major Teaching Objective

To develop the understandings and abilities needed for employment and advancement in the retail feed business

Suggested Time Allotment

At School		
Class instruction	36 hours	
Laboratory experience	12 hours	
Total at School		48 hours
Occupational Experience		48 hours
Total for Module		96 hours

Suggestions for Introducing the Module

With the students, prepare a list of business firms in the community which deal with livestock feeds. This list need not include all the business firms in the community involved in the processing and distribution of feeds, but should be complete enough to show all the functions that pertain to feeds which are performed by business firms.

Develop with the students a list of functions performed by these business firms. Examples of some of the major functions are:

1. To sell feed
2. To deliver feed
3. To prepare feed (grinding, mixing, pelleting)
4. To advise livestock producers about feeds and feeding problems

Discuss the types of farm livestock and other animals in the area for which business firms handle feed. Point out to the students the various types of feeds that firms handle.

1. Home-grown grains, such as corn, oats, and milo
2. Protein feeds, such as soybean meal and meat scraps
3. Mineral feeds, such as salt and bonemeal
4. Premix feeds, such as vitamins, antibiotics, and drug additives
5. Complete feeds, which contain all the nutrients needed by livestock
6. Supplement feeds, such as protein concentrates with or without drug additives

Discuss briefly the different requirements of farm livestock and other animals for which the firms handle feed.

1. Dairy cattle
2. Swine
3. Beef cattle
4. Sheep
5. Poultry
6. Horses
7. Small animals, dogs, cats, mink, fish, etc.

Develop with the students a list of understandings, abilities, and skills needed for employment in the retail feed industry. Ask what they should know in order to work in a business that deals with feed. As the students respond, list their answers on the board. Their wording will be somewhat different, but the ideas should be similar to the following list of competencies:

1. To understand the basic economics of feeding
2. To understand basic animal nutrition
3. To be familiar with the values of various feeds
4. To be familiar with the regulations in labeling and using feed
5. To be able to balance rations
6. To know how to prepare feeds
7. To be acquainted with the methods and trends in merchandising feed

Merchandising feed is the persuading of a farmer to start and to continue to use feed. Successful merchandising is determined by good results from feeding that feed which you sell, availability of the feed, cost, services provided, and relationships between customers and the feed business. The better that students are prepared, the more valuable they will be to the feed business and the customers they serve.

Feed is the major livestock expense, ranging from fifty per cent of the cost of dairy production to eighty-five per cent of the cost of beef production. In general, livestock producers spend more for purchased feed than for any other farm supply. The feed industry presently handles forty million tons of feed, valued at over three billion dollars, annually.

A highly developed livestock industry is a rarity among nations. Conversion of plant materials to meat, milk, and eggs supplies Americans with a greater abundance and variety of food than any other country in the world. Only more efficient livestock production will permit this production standard to continue as the population expands.

This module is designed to train students to assist in maintaining high production standards by being better prepared for employment in feed supply, sales, and service occupations. However, it is not designed to prepare a person to advise customers on detailed and complex nutrition, feeding, and management programs. This is best left to a post-high school course.

A pretest to determine the students' understandings and abilities in this area may be desirable for this module, so that the instructor may adjust the material to the level of the students.

Competencies to be Developed

I. To understand the basic economics of livestock feeding

Teacher Preparation

Subject Matter Content

The major objective in livestock feeding is the production that gives the maximum net income. This does not always require the lowest feeding cost nor the most rapid rate of gain, but, rather, a combination of proper feeding with the other factors of production.

Feed, the major expense of all livestock production, generally results in the following percentages of the total costs of producing livestock and livestock products:

1.	Whole milk	50-60%
2.	Market hogs	75-80%
3.	Poultry	60-70%
4.	Feeder calves	60-70%
5.	Market cattle	75-85%
6.	Market lambs	60-70%

Costs may vary from these averages, due to the individual producer's ability, quality of livestock, feed prices, and the producer's labor efficiency.

Feeding has an effect on rate of gain or production, feed efficiency, and market quality of the finished product. In general, the greater the rate of gain or level of production, the lower the feed cost; and the higher the market grade, the greater the net profit to the producer.

Minimal standards for rate of gain or production and feeding efficiency are given in the following table.

Livestock or Livestock Product	Rate of Gain Level of Production	Feed Efficiency
Market hogs	200 lbs. at 5 months	3.3-3.5 lbs. feed per 1 lb. gain
Poultry--eggs	240 eggs annually	3.8-4.0 lbs. per dozen eggs
--broilers	3 lbs. at nine weeks	2.3-2.5 lbs. feed per 1 lb. gain
Feeder calves	450 lbs. at seven months	5-6 lbs. milk and feed per 1 lb. gain
Market cattle	2.5 lbs. per day	7-8 lbs. feed on heavy grain program per 1 lb. gain
Market lambs	.33 lbs. per day	6-7 lbs. feed per 1 lb. gain
Whole milk	400 lbs. butter-fat annually	10-30 lbs. per day - hay or hay equivalent 6-25 lbs. per day - grain

Ten dollars' worth of feed will produce about:

1. 600 pounds of milk
2. 100 pounds of pork
3. 50 dozen eggs
4. 65 pounds of beef
5. 60 pounds of lamb

These levels of production vary widely, due to climate, value of home-grown feeds, management, and inherited characteristics of the animals. The same is true for feed efficiency.

Other economic losses result from the improper use of rations. Among these are:

1. Proper rations fed at low levels result in nutritional deficiencies, such as anemia, rickets, ketosis, and other diseases that reduce production.

2. Proper rations that are overfed cause uneconomical feed wastage and can result in other nutritional diseases that reduce production.

3. Improperly prepared rations that are unpalatable or difficult to digest are also inefficient.

Various rations may give equal rate of gain, feed efficiency, and a uniform market product but have different costs, which will result in varying net returns. The feed dealer needs to sell a feed that will give the producer the highest net return per animal unit. The success of the livestock producer determines the success of the feed dealer. Only satisfied customers continue as repeat customers.

Suggested Teaching-Learning Activities

1. Determine the value of various classes of market livestock and livestock products common to your area.

2. Determine the feed costs of producing these market livestock and livestock products in your area. Stress the why behind differences in cost per pound of gain, and explain the reasons for the economic losses listed at the top of this page.

3. Visit a local feeding trial and determine its purposes and validity. Have the students write a critique of their observations and evaluations. Determine the strengths and limitations of the trial.

4. Have each student determine how much feed is purchased by the average customer at the occupational experience centers where he works.

Suggested Instructional Materials and References

Instructional materials

1. State College of Agriculture data on production levels, rate of gain, and feed efficiency which will give realistic information for the local area.

2. Results of local feeding trials which would be good instructional material.

References

Feeds and Feeding, pp. 148-160.

Suggested Occupational Experiences

Have students develop and assist a producer with an informal feeding or trial program which will accurately measure rate of gain, feed efficiency, and net income.

Have students gain experience in livestock feeding and management by developing a livestock enterprise or by working on a livestock farm.

II. To develop an understanding of animal nutrition

Teacher Preparation

Subject Matter Content

The feed dealer has an important role in the proper nutrition of livestock. No livestock producer can grow economically all the feeds which provide the needed nutrients in the correct proportions for his livestock. Therefore, it is the feed dealer's responsibility to supply those feeds that will properly supplement the livestock producer's home-grown feeds. To do this with some accuracy, the feed dealer must understand the nutritional requirements of the producer's livestock.

Students need to know the basic nutrients and their use by the livestock, why the various classes and ages of livestock require different levels of the nutrients, and the value of feed additives in livestock nutrition.

The nutrients required by livestock are:

1. Carbohydrates (sugar and starch)

2. Fats (concentrated form of carbohydrates)--One pound of fat is equal to 2.25 pounds of carbohydrates.

   Carbohydrates and fats are often referred to as nitrogen-free extract (NFE), or energy feeds.

3. Proteins--Their quality is determined by the amino acid content.

4. Minerals--Most of the basic requirements are met by supplying calcium, phosphorus, salt, and trace-mineral elements.

5. Vitamins--They are needed in small amounts, but are essential for healthy livestock.

6. Water--Clean water in adequate amounts is necessary.

7. Air--Poorly ventilated buildings are a problem.

All nutrients are required by all classes and ages of livestock, but they are needed in varying amounts.

Livestock use basic nutrients for:

1. Body maintenance--Nutrients are necessary to carry on the life processes, such as digestion, controlling body temperature, respiration, and other vital body functions.

2. Growth--Young animals need nutrients for growth, in addition to those needed for maintenance.

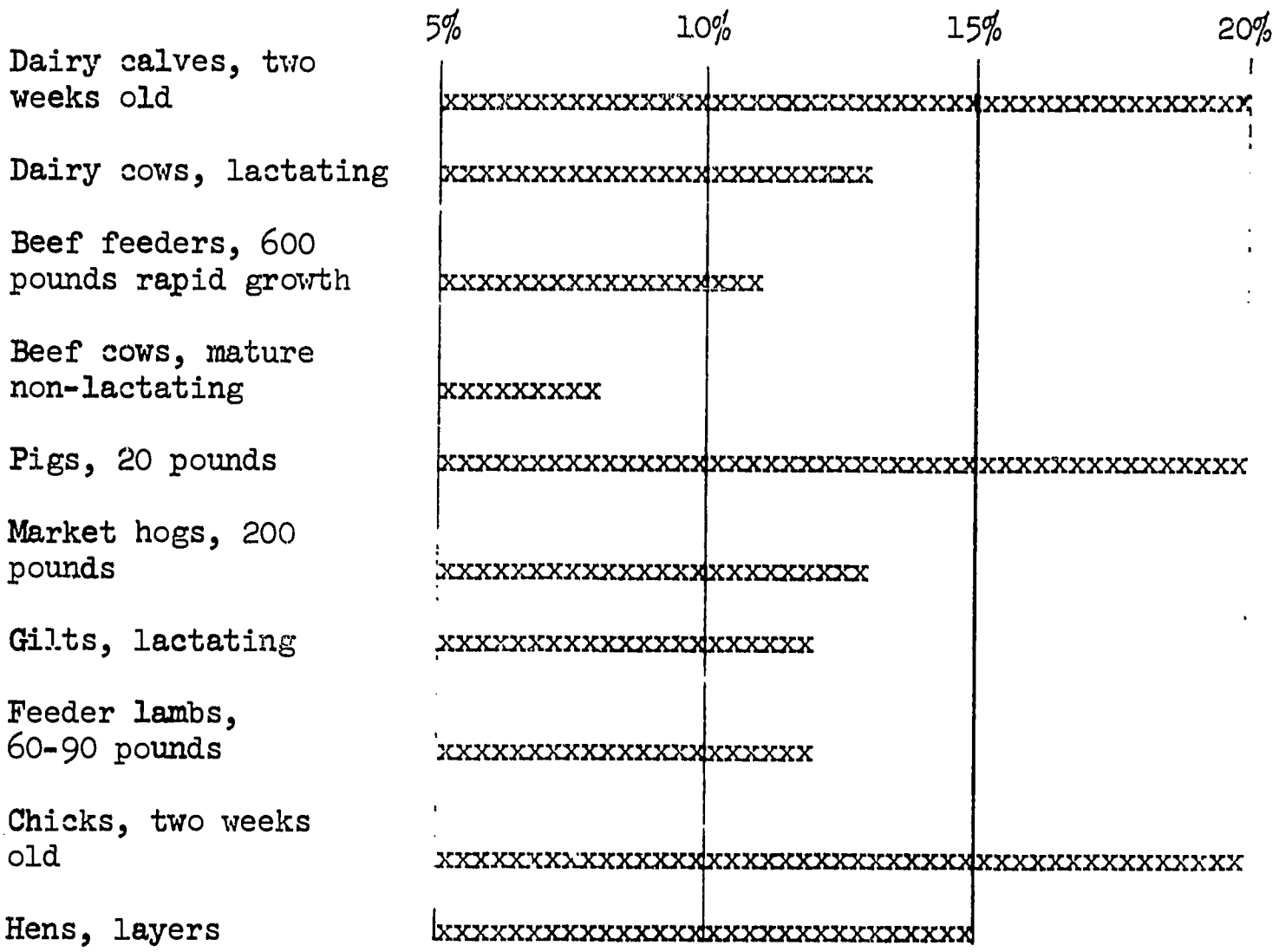
3. Reproduction--Nutrients are needed for the development of unborn young, and, in the case of poultry, for the production of eggs.

4. Production--Only when nutrients are fed at levels in excess of the needs of maintenance will livestock produce the milk, meat, eggs, wool, and other products that make their existence valuable to man.

The various classes of livestock have different nutrient requirements, primarily because of differences in their digestive systems. For purposes of this course, it is adequate to know that the ruminants have a large, compartment-type stomach that allows them to consume and digest large amounts of fibrous, bulky feeds, such as hay, silage, and pasture. Depending on the quality of these roughages and the production level of these ruminants, their ration is supplemented with the more nutritious grains and protein feeds. Swine and poultry have a much smaller and simpler stomach and therefore require a ration that contains less bulk, but more nutrients per pound. They are fed more concentrated feeds, such as grain, mill by-products, and protein supplements, in addition to higher levels of minerals and vitamins. Most

standard texts, bulletins, and other publications pertaining to animal production show photographs or drawings of ruminant and single-stomach digestive systems to which the students can refer, if necessary.

This graph shows how protein requirements vary by class and age of livestock.



There are similar variations of requirements for other nutrients, also. A few of the more important considerations are:

1. The rations of young animals and single-stomach animals (swine and poultry) need to be higher in energy, containing more of the high carbohydrate and fat nutrients.

2. The rations high in grain usually require additional minerals, especially calcium.

3. Minerals are critical in the ration of rapidly-growing animals and gestating and lactating animals.

4. Vitamins, particularly Vitamin D, are required in all rations, especially in those for young animals and animals being fed low-quality feeds. Ruminants can synthesize the B-vitamins and do not need to have them in their ration, but hogs and poultry do need them.

5. Clean water should be supplied to all animals in unlimited amounts.

6. When animals are confined to buildings, proper ventilation is required to supply adequate fresh air. Insulation of buildings may be needed, but sanitation facilities must be provided.

7. Feed additives are a relatively new development in animal nutrition. Since the discovery in 1949 that anti-biotics are of value in improving the rate of gain in chicks, the use of additives has expanded to all areas of animal nutrition. Although there is no evidence that these additives are essential to life, many spectacular claims regarding their value have been made, such as:

   a. Increased rate of gain or production

   b. Improved feed efficiency

   c. Reduction in the incidence of disease

Feed additives are important to stockmen and can be grouped into these categories:

1. Antibiotics (penicillin, aureomycin, streptomycin, terramycin and others)--Generally most effective with young animals; they are frequently sold as "pre-mixes" in combination with vitamins, minerals, and hormones.

2. Hormones (stilbestrol, thyroprotein, and others)--Most success has been obtained with beef, using stilbestrol to increase feed efficiency and rate of gain. It can be fed or implanted in the form of pellets under the hide of farm animals. It should not be fed to breeding stock.

3. Tranquilizers--These additives are still in the experimental stage. Certain studies indicate their value in improving the rate of gain and feed efficiency of steers.

4. Others--Chemobiotics (Dynafac), arsenicals, rumen cultures, and vermifuges are other feed additives. Some of these have shown promise in improving overall feeding performance in certain feeding trials.

While improvements in nutrition can be credited with the overall improvement in livestock production, progress in animal breeding is partially responsible. Selection of breeding stock with the genetic ability to develop rapid gains, high level of production, and increased feed efficiency must receive more recognition than in the past.

On the negative side, however, is the inadequate management which permits disease and parasites to nullify the performance that feeding and breeding might accomplish. The effect of infectious scours, parasites, and other diseases is to lower the effectiveness of feeds and increase costs. Feed dealers can serve livestock producers by suggesting improvements in management practices which, in turn, will bring good results from the feed and please the customer. Feed dealers should take the initiative in developing lasting working relationships and understandings with local veterinarians so that both will stress the importance of good management and feeding of livestock in the prevention and control of disease.

Suggested Teaching-Learning Activities

1. Collect feeds and feed additives and identify them. Determine the nutrients supplied by the various feeds.

2. Have the students divide the sample feeds collected into groups of high, medium, and low-energy feeds. Make a list of the feeds in each group. With the same feeds, follow the same procedure for protein, minerals, and vitamins. Point out that feeds may at the same time be high in some nutrients and low in others.

3. Calculate the nutritive requirements of various classes of livestock.

4. Have students question feed dealers about the management practices used by producers that reduce the effectiveness of their feeding programs.

5. Have a feed dealer give examples of specific cases where he has had to make management suggestions to a customer and could not have done so if he had not had some knowledge of animal nutrition.

6. Visit a local slaughterhouse to permit students to identify the four stomachs of a ruminant and note differences in size, structure, and function.

7. If possible, visit an experiment station and see a feeding trial, or nutritional trial, in operation. A ruminant with a "window" permanently placed on the rumen by surgery, for experimental work, may be seen at some experiment stations.

Suggested Instructional Materials and References

Instructional materials

1. Better Feeding of Livestock, Farmer's Bulletin No. 2052.

2. "Feeding Farm Animals." This film deals with the six basic feed nutrients and how animals use them.

3. "The Rumen Story." This film deals with the process of digestion in ruminants.

4. Samples of the various feeds

5. Charts showing the digestive tracts of ruminants, swine, and poultry

References

1. Feeds and Feeding, pp. 1-12, 48-135, and 625-631.

2. Approved Practices in Feeds and Feeding, Tables 1-6.

3. Livestock and Poultry Production, pp. 2-10, 31-35.

Suggested Occupational Experiences

Have students become familiar with the various feeds handled by retail feed outlets and identify the nutrients they supply to livestock.

III. To understand the different livestock feeds and their values

Teacher Preparation

Subject Matter Content

The numerous kinds of feeds handled in retail feed businesses are classified in many ways. The students should be familiar with these common terms:

1. Roughages
2. Concentrates
3. Home-grown feeds
4. By-products
5. Complete feeds
6. Commercial feeds
7. Formula feeds
8. Supplements
9. Mash
10. Pellets
11. Cubes
12. Crumbles
13. Wafers
14. Additives
15. Premix
16. Medicated feeds

Feeds are given for their nutrient value. Most feeds contain all the nutrients but are recognized for certain nutrients which they supply in abundance.

Carbohydrates and fats are the energy and fattening nutrients, best supplied by the grains.

1. Shelled corn (80% TDN) is palatable, low in cost, and abundant.

2. Oats (70% TDN) contain more fiber than corn.

3. Barley (78% TDN) has slightly more fiber than corn.

4. Wheat (80% TDN) is more costly than corn.

5. Rye (75% TDN) is unpalatable and may cause digestive disorders.

6. Sorghums (80% TDN) have less fat than corn.

7. Ear corn (73% TDN) has more fiber and more bulk than shelled corn.

Molasses furnishes a digestible supply of carbohydrates and is valued for its palatability. It is often used to encourage livestock to eat unpalatable feeds as well as to keep down dustiness in feeds. It is a good source of sugar to promote bacterial action in ruminants.

Roughages, such as hay and silage, are a low-cost source of carbohydrates. When they are of good quality, they generally supply all the energy required by ruminants for maintenance, but they are inadequate for fattening, for high production, or for feeding simple-stomach animals.

Certain feeds are excellent sources of fat and are in demand in high-energy rations. Soybeans and peanuts may contain as much as forty-five percent fat, whereas the small grains range from two to five and one-half percent fat. Animal fats are becoming more common in livestock feeds, but they can be unpalatable if incorrect processing or storage causes them to become rancid.

Providing protein of the proper quality and quantity is a critical problem in feeding. It is the most expensive nutrient, making feeding expensive and wasteful if too much, or the wrong kind, is used. Likewise, feeding too little protein is false economy. A feed-store employee must know the correct amount and quality of protein for various classes of animals.

Proteins are complex substances, consisting of twenty-four or more amino acids. Not all protein feeds contain all amino

acids, yet all animals require most of the amino acids. Bacteria in the rumen can synthesize certain amino acids, but this is not possible in simple-stomach animals such as swine, poultry, and other small animals. Special attention must be given to the protein quality in their rations to provide the essential amino acids.

Sources of protein:

1. Animal sources of protein are usually the highest in quality and are the most expensive. For economical feeding they should be used for only non-ruminant animals and young ruminants. Common animal proteins are:

   a. Tankage

   b. Meat scraps

   c. Blood meal

   d. Fish meal

   e. Dairy products and by-products

2. Plant sources of protein, which are generally lower in quality and price, can supply all the needed protein for most ruminants and a large part needed by non-ruminants. Seed by-products, such as soybean, cottonseed, linseed, and peanut meal, are the most common sources. These are residues left after the oil has been removed from the seed. Examples are:

   a. Soybean meal (41-46% high-quality plant protein) is equal to animal proteins for 75-pound or larger hogs.

   b. Cottonseed meal (38-47% protein) is of limited value for non-ruminants.

   c. Linseed meal (31-36% protein) should be limited in the amount given to non-ruminants.

   d. Peanut meal (40-47% protein) is laxative in nature.

Legume roughages are an excellent source of high-quality protein. They range from 10 to 20 percent protein content, depending upon the stage of maturity and harvest and storage methods. When properly fed to most classes of livestock, they can materially reduce the amount of purchased protein required.

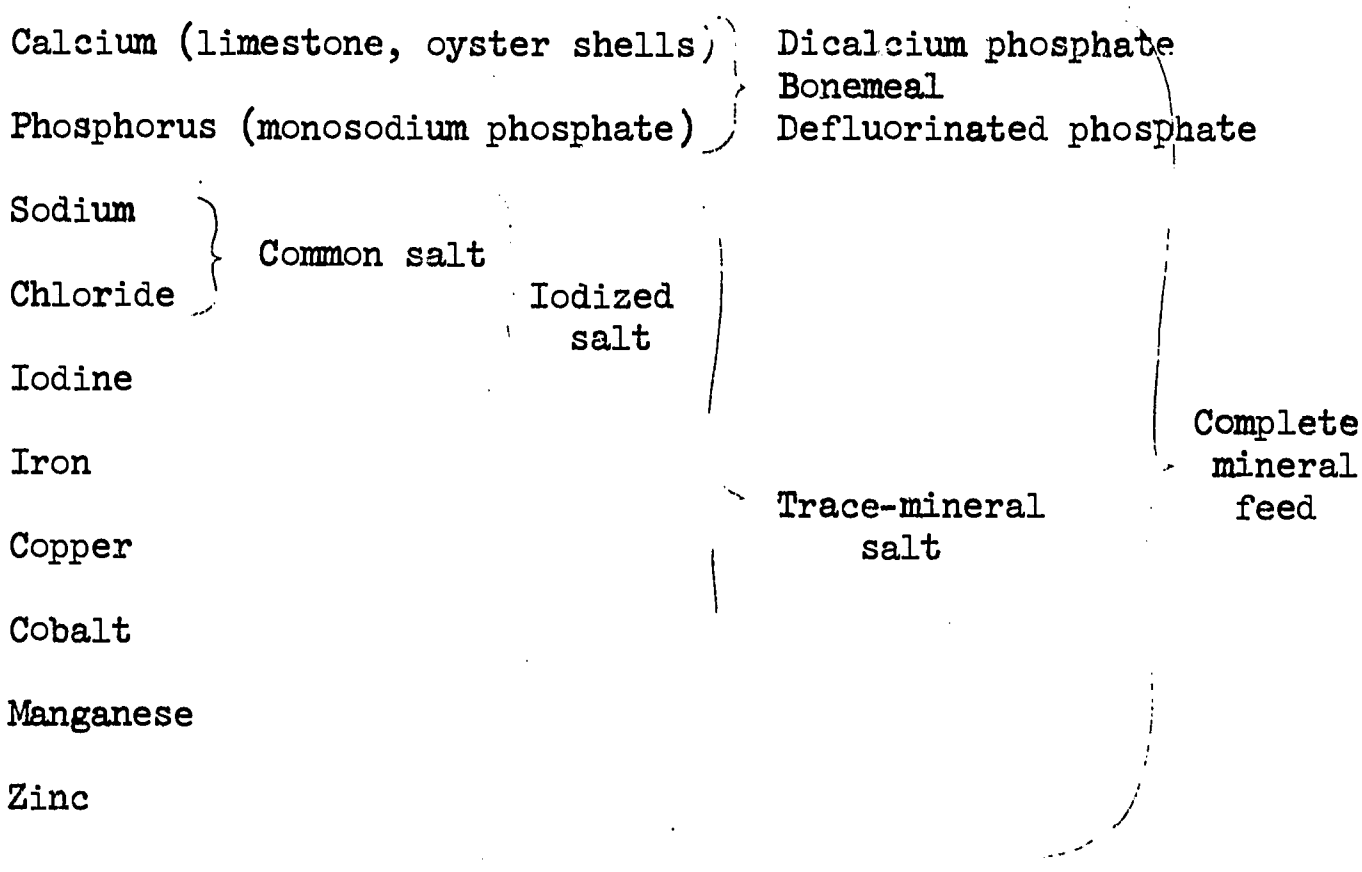
Urea is an economical, manufactured, nitrogenous substance that can be substituted for a portion of the protein in the ration of ruminant livestock and can substantially reduce the cost of protein. It is combined with carbohydrates and fats by bacterial action in the rumen to form protein. It must be fed in limited amounts with additional energy feeds and thoroughly mixed with the grain ration. Excessive amounts or improper mixing can result in poisoning. Because urea is unpalatable, it must be mixed with feeds that mask its flavor.

A common misconception is that home-grown small grains are a good source of protein. This is not true. For example, corn contains less than ten per cent protein of a low quality. Small grains range from ten to fourteen per cent protein of average quality. Grains should not be the sole source of protein as they do not contain the proper amino acid balance.

Oil-producing seeds, such as soybeans and cotton, the two most important crops generally raised, are high in protein (37-40%), but are too high in fat to be fed without processing. The processing not only produces oil which is valuable in a number of ways (e.g., butter substitute), but also improves the per cent and quality of protein of the meals for livestock feeding. Soybeans, which have a low quality of protein in the raw state, are vastly improved by the heat of processing into meal.

Most feed companies market protein-supplement feeds for various classes of animals. These feeds are mixtures of various protein concentrates in the proportions required to supply each class of livestock with all the needed amino acids in proper relationships. This protein supplement is either mixed with grain in the correct proportion to supply the livestock with the quantity needed, or sold as a protein supplement to be fed separately.

Minerals are supplied to farmers either as a supplement to be fed free-choice or as ingredients to mix into the grain ration. Minerals are available as individual ingredients or as complete or semi-complete mineral feeds. Following are some of the sources of commonly-required minerals.



Other minerals may be required in special situations. Most feeds contain some or all of the necessary minerals, but at levels that are frequently inadequate.

Following are some general rules in feeding minerals:

1. Supply salt free-choice to dairy and beef cattle and sheep.

2. Add one percent salt to the grain ration of dairy cattle and sheep if not fed free-choice.

3. Add one-half of one percent salt to the grain ration of beef cattle, swine, and poultry.

4. Loose salt is recommended for sheep since their smooth tongues become sore from licking salt blocks and their teeth are broken when they bite.

5. Legume feeds are relatively high in calcium and low in phosphorus.

6. Grains are relatively high in phosphorus and low in calcium.

For livestock on a high-grain ration, supply calcium at the rate of two parts limestone to one part salt. For livestock on a high-legume ration, supply phosphorus at the rate of two to three parts bonemeal to one part salt. When both calcium

and phosphorus are low in the ration, supply three parts bone-meal, one part limestone, and one part salt.

There is a close relationship between the amounts of calcium to phosphorus used in animal matabolism. The ratio in the entire ration should be about two parts calcium to one part phosphorus.

Vitamins are equally essential in livestock nutrition. Good sources of each are:

Vitamin	Sources
A	Green and yellow feeds, fish oil, milk
D	Direct sunlight, sun-cured feeds
E	Grain, such as corn and oats
B_2 (Riboflavin)	Milk, milk by-products, by-products of the fermentation industry
B_{12}	Tankage, fish meal (Ruminants synthesize B_{12} in rumen.)
K	Legumes
B_1 (Thiamine)	Small grain
Niacin	Forages, soybean meal, dairy by-products
Pantothenic acid	Small grains

Synthetic vitamins are available to fortify natural sources in rations at an economical price.

Vitamin premixes, which are added to many commercial feeds, are available to add to livestock rations.

With good feeding practices, vitamin nutritional problems seldom occur. Housed poultry, however, require special protection, since vitamins A, D, and riboflavin are likely to become deficient. Cattle and sheep on low-value roughages may be deficient in vitamin A from late winter to early spring.

The effect of feed additives, antibiotics, hormones, etc., on livestock nutrition is being reviewed with increased interest. They can be added to livestock feeds as premixes, and are often part of manufactured protein supplements. Government

regulations of the use of additives are rigidly enforced, and only highly qualified personnel should be allowed to prepare feeds containing additives.

Students should make simple value comparisons of feeds. They should be able to compare feeds on a total digestible nutrient (TDN), net energy (NE), total protein (TP), and digestible protein (DP) basis, handling such problems as the following:

Problem: What is the value of oats as an energy feed when shelled corn is selling for $2.40 per cwt.?

Shelled corn--80% TDN--price: $2.40 cwt.
Oats----------70% TDN--price: $2.00 cwt.

$$\frac{80}{70} = \frac{\$2.40}{x} \qquad x = \$2.10$$

Oats are worth $2.10 when corn is valued at $2.40; therefore, oats at $2.00 cwt. is a good buy, other factors such as protein and fiber being equal.

Problem: Which is the better buy, soybean meal at $4.00 per cwt. or linseed meal at $3.80 per cwt.?

Soybean meal--46% TP--price: $4.00 cwt.
Linseed meal--37% TP--price: $3.80 cwt.

$$\frac{46}{37} = \frac{\$4.00}{x} \qquad x = \$3.13$$

Here soybean meal is the better buy, since linseed meal is priced at $3.80 but has a comparative value of only $3.13.

Problem: Which of the following is the better buy?

Meal scraps---45% DP--price: $6.00 cwt.
Tankage-------50% DP--price: $6.50 cwt.

$$\frac{45}{50} = \frac{\$6.00}{x} \qquad x = \$6.67$$

Tankage is the better buy, priced at $6.50 cwt. It has a comparative value of $6.67.

Similar comparisons can be made on minerals.

Problem: Which mineral is the better source of phosphorus?

Mineral A: 4% phosphorus--$5.00 cwt.
Mineral B: 6% phosphorus--$6.00 cwt.

$$\frac{4}{6} = \frac{\$5.00}{x} \qquad x = \$7.50$$

Mineral B, worth $7.50 and priced at $6.00, is the better buy. This illustrates that the cheapest buy per cwt. is not necessarily the best buy.

Students should understand nutritive ratios. As an example:

Feed	TDN	DP	Nutritive Ratio (NR)
Shelled corn	80%	6.7%	11:1
Wheat	80%	11.1%	6:1
Cottonseed meal	72.6%	36%	2:1
Blood meal	60.4%	60.4%	1:1

Problem: Shelled corn--80 % TDN
Minus 6.7% DP
73.3% NFE

$73.3 \div 6.7 = 11$

Nutritive ratio: eleven parts nitrogen-free extract (carbohydrates and fats) to one part digestible protein

Net energy (NE) is another way of comparing feeds and developing ratios. It is sometimes preferred to TDN or NR because it is easier to explain to farmers.

The nutritive value of feed can very. For example, not all ear corn has the same value. In addition, identical feeds do not have the same value for various classes of livestock. Factors that affect the value of feed are:

1. Moisture content of the feed
2. Stage of maturity
3. Fertility of soil on which the feed was grown

4. Climate conditions

5. Harvesting methods

6. Methods of storage of the feed

7. Preparation of the feed

8. Palatability of the feed

9. Proportion of nutrients in the feed

10. Amount of feed fed. Excessive feeding reduces digestibility.

Only when a student is familiar with feeds and their value for the various classes of livestock can he expect to be of real value to both the feed supply store and the customers.

Suggested Teaching-Learning Activities

1. Collect samples of local grains fed to livestock. Have students learn the TDN, NE, TP, and DP content of each, and list special values or limitations of each. Have students find the market price of each feed and determine the best as well as the poorest buys in TDN.

2. Have students collect samples and tags of protein supplements and then make feeding and cost value comparisons. Be sure to bring out the why aspect of these comparisons.

3. Collect samples and tags of mineral feeds and compare them.

4. Have each student give a sales presentation of a selected feed and compare it with another feed in feeding value.

5. Visit a local retail feed business and become acquainted with the feeds handled.

6. Assist the students in developing a list of "brand-name" feeds.

7. Have students learn to identify common feedstuffs.

8. Have students review a tag from a complete feed and give reasons why each ingredient is used. (Note: The feeding instructions and withdrawal information for a drug used in the feed are printed on the tag.)

9. Have the students determine the amount of protein in a feed furnished by urea.

10. Discuss the meaning of quality as applied to all feeds but, in particular, to the number and balance of amino acids in proteins. This may be done concurrently with numbers seven and eight or as a separate class discussion. Why are some protein feeds higher in quality than others?

11. With the students, develop a chart on the chalkboard to compare the various forms of protein supplements and their purposes (i.e., rations for growth, fattening, and milk) for different types of livestock.

Suggested Instructional Materials and References

Instructional materials

1. "Animals and Poultry Nutrition," pp. 14-26.

2. "Mineral Feeding Facts," pp. 1-13.

3. Samples of common feeds

4. Tags from commercial feeds

References

1. Livestock and Poultry Production, pp. 12-30, 36-40.

2. Feeds and Feeding, pp. 38-47, 269-347, 580-607.

3. Approved Practices in Feeds and Feeding, pp. 66-86.

Suggested Occupational Experiences

1. Become acquainted with the location of feed stores, the feeds handled, their prices, and values.

2. Determine the policies of the business in promoting feed products. These policies will probably be concerned with those feeds that give customers satisfactory results or are special profit items for the business.

3. Gain experience in explaining the merits of various feeds to the customers.

IV. To understand the regulations in the formulating, labeling, and using of feeds

Teacher Preparation

Subject Matter Content

Regulation of the sale of ingredients and formula feeds began prior to 1900, simultaneously with the development of the feed industry. These restrictions, which vary somewhat from state to state, were imposed by every state except Nevada which does not regulate the sale of feedstuffs. The feed industry is promoting a uniform federal feed law.

Federal regulation in the feed industry was limited until 1958 when the Food Additives Amendment (Delaney Clause) was enacted. This legislation states that additives which induce cancer cannot be put into feed unless the material is proved safe for the animal under the intended conditions of use and the edible products of the animal (meat, milk, or eggs) are free from residue harmful to man. The burden of proof that an additive is safe is the responsibility of the manufacturer.

Federal regulations deal with:

1. The additives that can be added to feeds
2. The level of additives in the feed
3. How the medicated feed is to be fed
4. Proper labeling of medicated feeds

In addition to the information required from non-medicated feeds, the following information concerning medicated feeds must be clearly stated on the bag or label.

1. The purpose of the medication
2. Directions for use of the feed
3. The common names and amounts of all active drug ingredients
4. A warning statement of a withdrawal period, when required, for a particular drug in the feed

5. Warnings against misuse

   Example: stilbestrol for beef cattle

   Purpose: fattening beef cattle
   Directions: 10 milligrams per head per day

   Required warning statement: Discontinue use of this feed 48 hours before slaughter. Do not feed to breeding or dairy animals.

Labels for feed should contain the following information in the following order:

1. Net weight
2. Brand or trade name
3. Product name (for example, medicated steer supplement)
4. Purpose of medication
5. Active drug ingredients, by common names, expressed in percentage or grams
6. Guaranteed analysis of feed
7. Feed ingredients expressed by their common names
8. Name and address of manufacturer
9. Detailed feeding directions:
   a. Purpose
   b. When to feed
   c. How to feed
   d. Precautions
   e. Warning statement

State laws vary widely from the detailed control regulations in the states of South Dakota and New York to the absence of any direct feed laws in Nevada. Most states have the following feed regulations:

1. Licensing or registration of each brand of feed
2. Labeling regulations:
    a. Net weight of the package
    b. Name, brand, or trademark
    c. Name and address of manufacturer or distributor
    d. Minimum percent of crude protein
    e. Minimum percent of crude fat
    f. Maximum percent of crude fiber
    g. Names of ingredients
3. Penalties for violation

Certain states require other information on the labels:

1. Minimum percent nitrogen-free extract
2. Percentage and kinds of minerals
3. Minimum amount of nutrient, if the feed is advertised as a special type of supplement (for example, "vitamin-fortified supplement")

There are two types of formula feeds, closed and open. Closed formula feeds list only the ingredients, whereas open formula feeds name the ingredients and the percent of each.

Roughages, whole seeds, and the unmixed meals made directly from entire grains generally do not need to be registered, licensed, or labeled for sale.

Suggested Teaching-Learning Activities

1. Obtain copies of feed regulations for your state and review them with the class. Copies can be obtained in most states from the State Department of Agriculture.
2. Have students collect labels from feeds and identify those things that are common to all labels.
3. Review the labels to determine which labels contain information required by the Food Additives Amendment.

4. Determine with the students if the labels are from closed or open-formula feed. Attempt to locate an open-formula label. Discuss with them why most concerns have closed-formula feeds.

5. Check to determine if any local feed mills manufacture and label feeds. Visit this mill and have the manager explain the process of registration, licensing, and labeling.

6. Have the students learn to differentiate between the terms name and brand of a feed.

Suggested Instructional Materials and References

Instructional materials

A wide assortment of feed labels

References

1. Copies of your state feed laws

2. Feed Additives Compendium

Suggested Occupational Experiences

Have students gain experience in reading and understanding feed labels and in advising customers on the use of medicated feeds.

V. To formulate grain rations

Teacher Preparation

Subject Matter Content

The primary purpose of formulating grain rations is to provide a palatable, balanced ration at the lowest cost. The grain ration may be a complete feed for chickens and hogs, or it may be a supplement to the roughages fed to cattle. In both cases, the goal is a balanced ration that supplies all basic nutrients in the proper amounts.

The factors to consider when formulating feeds are:

1. Protein--Protein is frequently the most limited nutrient in a ration. All essential amino acids must be supplied. Limiting nutrients can be compared to the

amount of water in a stave barrel. The barrel will hold water only to the height of the shortest stave. The extra length of the other staves is of no value. Likewise, if protein is limited in a ration, production will be limited, and additional carbohydrates, fats, minerals or vitamins will be of no value.

When the grain ration is the complete ration, all the protein is supplied by the ration. However, frequently the grain ration is fed to supplement the nutrients of less nutritious feeds, such as hay, silage, and pasture. Then the grain ration needs to contain more protein than the complete ration.

Example: Assume dairy cows require 12 percent protein in their entire ration, but 50 percent of their ration is low-quality pasture containing 10 percent protein. Then the 50 percent of their ration supplied by grain needs to be 14 percent protein.

10% Pasture

Equal amounts

14% Grain

24% ÷ 2 = 12% protein

2. Cost--Earlier it was pointed out that feeds containing different levels of protein vary in cost. When formulating a grain ration, the lowest-cost grains with the lowest-cost protein concentrates which will result in a balanced ration should be used. The mixture must be adequate in other nutrients and palatable. Grain rations equal in protein content and suitable in all other respects may, however, vary as must as 25 percent in cost.

3. Variety of feeds--Most livestock producers prefer a grain ration with a variety of feeds in order to make the ration more palatable, to obtain a better balance of amino acids, and to have a more uniform quality. This will not be the lowest-cost ration.

4. Palatability--Most common grain-ration ingredients are palatable, but moldy feeds, rye, rancid fats or oils, and bonemeal are examples of food generally unpalatable. A balanced grain ration will not balance the nutrient requirements of an animal that fails to eat the feed. Improper preparation and storage can make most feeds unpalatable.

5. Fiber content--Caution must be taken to insure that the ration does not contain too much milk or fiber. This is of particular concern with young animals, swine, and poultry. Rations for horses need a bulkier grain ration, as digestive disorders are more likely with "heavy" feeds.

6. Mineral content--Check to be sure that animals are being fed the required minerals. If not, see that salt, calcium, phosphorus, and other necessary trace minerals are included in the grain ration. Some livestock producers do not include minerals in the grain ration but feed them separately, free-choice.

7. Vitamin content--Grain rations accurately balanced for protein and containing a variety of feeds generally contain ample levels of vitamins. However, there are exceptions. For example, rations for young animals and chicks need to be fortified with vitamins, and cattle on extremely poor winter rations may need vitamin A supplement.

8. Energy content--Animals fed adequate levels of rations which include grain and are balanced for protein, normally receive all the carbohydrates and fats necessary. Special attention may be necessary for high-producing cows as well as laying hens in high production.

Students need to know how to calculate the protein content of a feed. This can be done by the Pearson square, fully explained in standard feeding handbooks. An illustration follows of both the use of the Pearson square and the ratio formula for computing rations.

You wish to develop a 15 percent crude protein ration for hogs, containing shelled corn, soybean meal, and tankage. (Crude protein is used since purchased feed has the protein expressed as crude protein.)

Step 1

Keeping in mind the relative costs of the soybean meal and tankage, and not considering mineral values at the moment, determine the proportion of each to use. Since soybean meal is generally lower in cost than tankage, use ten parts soybean meal to one part tankage.

Step 2

Calculate the average protein content of the soybean meal and tankage.

Soybean meal	9 lbs. x .457* =	4.203 lbs.
Tankage	$\frac{1}{10}$ lb. x .594* =	$\frac{.594}{4.797}$ lbs.

Thus, ten pounds of this protein mixture contains 4.8 pounds of crude protein and $\frac{4.8}{10}$ = forty-eight percent crude protein in the mixture.

*Percent crude protein expressed as a decimal

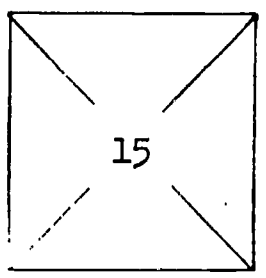
Step 3

Calculate the amount of shelled corn needed to be combined with the protein mixture to produce a feed containing fifteen percent protein. Construct a square; put the percent of protein content in the shelled corn at the upper left-hand corner and the percent of protein in the protein mixture at the lower right-hand corner. Draw diagonal lines through the square and put the desired protein content (fifteen percent of the finished product) in the center of the square.

Step 4

Subtract diagonally across the square, always subtracting the smaller number from the larger one.

(Percent of protein in shelled corn) 8.7



33 pounds of shelled corn to use

(Percent of protein in protein mix) 48

6.3 pounds of protein mix to use

Thus, a mixture of 33 pounds of shelled corn and 6.3 pounds of the protein mix will result in a ration containing fifteen percent crude protein.

Step 5

Since seldom does anyone want 39.3 (33 + 6.3) pounds of feed, use the same simple ratio formula used when cost comparisons of feeds were made to figure what is needed with a ton of corn a customer has provided.

$\frac{33}{6.3} = \frac{2000}{x}$ x = 382 pounds of protein mix

Step 6

How much of the 382 pounds should be soybean meal and how much should be tankage are still to be determined. If nine parts of soybean meal and one part tankage is desired, use ratio formulas for the correct amounts.

$\frac{10}{9} = \frac{382}{x}$ x = 342.8 pounds of soybean meal

$\frac{10}{1} = \frac{382}{x}$ x = 38.2 pounds of tankage

Therefore, we will have:

Shelled corn----	2000	pounds
Soybean meal----	344	pounds
Tankage---------	38	pounds
	2382	pounds of a fifteen percent protein hog feed

Many customers of a feed business are not aware of the protein requirements of their livestock, nor are they capable of balancing a ration. A feed store employee can be of service in providing this type of assistance, thus creating a satisfied customer who is likely to return.

Suggested Teaching-Learning Activities

1. Have students gain experience in balancing rations for various classes of livestock under different feeding programs.

2. Have students analyze rations to determine if all nutrients are supplied.

3. Have the students calculate the costs of the rations.

Suggested Instructional Materials and References

Instructional materials

1. Mimeographed copies of examples using the Pearson square

2. Mimeographed work copies of the Pearson square for student use

References

1. Approved Practices in Feeds and Feeding, pp. 87-94.

2. Feeds and Feeding, pp. 136-147.

Suggested Occupational Experiences

1. The students should be given real ration-balancing problems by the feed business operator.

2. The students may work directly with customers in balancing rations.

VI. To understand the methods used to prepare feeds

Teacher Preparation

Subject Matter Content

Feeds are prepared for several reasons:

1. To make the feed more palatable

2. To make the feed more digestible

3. To make the feed easier to store, handle, feed

4. To mix feeds more accurately

5. To reduce the danger of weed contamination

6. To increase the amount an animal can consume

7. To reduce digestive disorders

8. To improve or maintain the quality of the feed

Feeds are prepared in several ways as follows: (In the strict sense the making of silage, harvesting hay, combining grain, etc., are steps in the preparation of feed for use by livestock. From the point of view of the feed dealer and his employees, however, the preparation process does not start until the feed leaves the farm.)

1. Grinding

   a. It increases digestibility in animals that fail to chew feed thoroughly.

   b. It is easier to blend or mix various feeds if they are all ground to about the same particle size.

   c. Fine grinding makes feed less palatable and is more costly, since it requires more power.

2. Crushing, rolling, or cracking

   a. Is preferred by some livestock producers as feed for horses and calves. Many poultrymen prefer cracked grain.

   b. Requires less power than grinding

3. Mixing

   a. Permits the inclusion of all nutrients in one feed

   b. Prevents animals from eating selected parts of the ration

   c. Masks unpalatable feeds

   d. Reduces the number of feeds

   e. Makes self-feeding more feasible

4. Pelleting

   a. Increases consumption by permitting more feed intake

   b. Frequently increases rate of gain

   c. Generally improves feed efficiency

d. Permits pelleting of the entire ration, or only a portion, as desired

e. Reduces dustiness of feed

f. Reduces wastage by wind and animals

g. Reduces storage and handling

h. Increases palatability of certain rations

i. Increases processing costs

Pellets are made by grinding the feed, mixing ingredients together with some bonding agent (molasses, fat, etc.), and then forcing the feed through various-sized-diameter dies (with heat) under pressure.

5. Crumbling

a. Reduces pellets to granular form for poultry, rabbits, and other animals

b. Creates characteristics similar to pellets, but smaller in size

6. Cooking

a. Decreases feed value of small grains and roughages

b. Increases feed value of beans and potatoes

c. Reduces disease incidence when feeding garbage (usually required by state law) when feeding hogs

7. Soaking

a. Increases digestibility of hard grains that are not ground or crushed

b. Increases palatability of finely ground feeds

c. Adapts feed to liquid feeding methods

8. Fermenting, pre-digesting, malting, sprouting

All these, and others, have been advocated from time to time as methods of increasing gains and improving feed efficiency. Carefully conducted feeding trials have

generally proved these methods ineffective and costly. Palatability may be improved.

The various classes of livestock require different methods of feed preparation for best feeding results.

1. Dairy cows

   a. Roughages ordinarily should not be ground.

   b. Grain should be ground coarsely. Pelleting is not required.

2. Dairy calves

   a. Whole grains, if cracked, rolled, crushed, or pelleted, are recommended.

   b. Grinding is not recommended because of unpalatability.

3. Sheep

   a. Whole grain, if cracked, rolled, crushed, or pelleted, is recommended

   b. Complete pellet feeds for lambs are gaining support.

   c. Grain for old ewes with poor mouths should be ground or crushed.

4. Beef cattle

   a. Grains should be coarsely ground or crushed, unless the cattle are followed by hogs.

   b. Protein concentrates in pellets are popular.

5. Beef calves

   a. Grains should be treated the same as for dairy calves.

6. Swine

   a. Whole grain is satisfactory for young pigs as soon as they begin to eat solid food.

b. Grain should be ground to medium coarseness for sows.

c. Most producers prefer ground feed for all hogs. It permits more accurate mixing of ration ingredients, and works well in automated feeding systems.

d. Pellets are popular for weaning pigs.

7. Poultry

a. All-mash program: feeds are ground and mixed and may be made into crumbles. This is generally a complete 14 to 16 percent protein-level feed.

b. Grain-mash program:

1) Grain is fed whole or cracked.

2) Mash is a 32 to 40 percent protein supplement with ingredients which are ground, mixed, and sometimes made into crumbles.

8. Other small animals

a. Generally, these are fed complete feeds with ingredients which are ground, mixed, and made into a pellet or crumble form.

There are certain terms that a feed store employee should know to discuss feeds and feed preparations intelligently.

1. Commercial feed--all materials used for livestock feed or for mixing in feed except:

a. Unmixed grain

b. Unground roughage

c. Individual chemical compounds

2. Feed ingredients--materials used in making up a commercial feed

3. Formula feed--two or more ingredients proportioned, mixed, and processed according to specifications

4. Commercial formula feed--feed processed to the specifications of the manufacturer

5. Customer formula feed--feed processed to the specifications of the customer; may contain some commercial formula feeds

6. Complete feed--feed containing all the nutrients (except water) needed to sustain life, growth, and/or production

7. Supplement--commercial feed that is not complete, to round out or complete a ration

8. Concentrate--same as supplement (supplement is the recommended term); feed low in bulk and high in feed value

9. Scratch grain--whole or cracked grain

10. Meal--ground ingredient

11. Mash--mixture of meals

12. Pellets--agglomerated feeds formed by compacting and forcing feed through die openings by a mechanical means.

13. Cubes--large pellets

14. Crumbles--pellets reduced to granular form

15. Rolled grain--grain flattened by rollers

16. Crimped grain--grain flattened by corrugated rollers

17. Micro-ingredients--vitamins, trace minerals, drugs, and other materials added in minute amounts

18. Additives--antibiotics, drugs, tranquilizers, hormones, chemobiotics, and other substances that are not nutrients

19. Pre-mix--combinations of one or more micro-ingredients and/or additives with an extender

20. Magnetic separating--removing metal from feeds with magnets

21. Cleaning--removing foreign material from feed by screens, air, or other methods

22. Proportioning--measuring amounts of various ingredients

23. Grinding--reducing to particle size by impact, shear, or attrition

24. Pellet durability--ability of a pellet or crumble to withstand size reduction during handling

25. Fines--in pellets, materials that will pass through a sieve where openings are slightly smaller than the pellets; in crumbles, materials which will pass through a 12-mesh sieve

Suggested Teaching-Learning Activities

1. Have students collect samples of feeds prepared by different methods, learn to identify them, determine the use of each, and give the advantages and disadvantages of each.

2. Visit a feed mill and become acquainted with the various types of equipment used in preparing feeds.

Suggested Instructional Materials and References

References

1. Feeds and Feeding, pp. 38-42, 380-382, 420-421, 443-444, 488-489, 519-520.

2. Approved Practices in Feeds and Feeding, pp. 113-129.

Suggested Occupational Experiences

1. Give suggestions to customers on the preparation of their feeds.

2. Learn to operate the various machines used in preparing feed.

VII. To understand the methods used and the common trands in feed merchandising

Teacher Preparation

Subject Matter Content

Local feed firms use the same media for merchandising their products as do other business concerns. Although the methods used

vary from area to area, brand name to brand name, and feed store to feed store, there are basically four steps in merchandising.

1. Acquaint the potential customers with the supplies and services available (advertising).

2. Develop customer interest in the supplies and services by demonstrating or explaining the product.

3. Overcome the natural resistance to purchase. Relate the supply or service to the customers' needs or desires.

4. Make the sale.

Before an effective sale can be accomplished, however, certain information must be known by the salesman. This should include:

1. Customer's need for the feed (amount, what kind, when needed)

2. Customer's ability to pay, whether by cash or on credit

3. What feeds are handled for the different types of livestock (complete feeds, ingredients, supplements)

4. The sales methods used by the service-center (telephone, standing orders, call at farms)

5. Methods of delivery used by the service-center (bag or bulk, special delivery, or regular routes)

6. Content of advertising used by media such as radio, newspaper, mailers, displays, etc.

7. Services which may be provided (credit, delivery, management advice, marketing or product merchandising)

8. Costs of services that can be provided, including hidden costs (delivery, grinding, mixing, management advice, etc.)

Some of the new trends in feed merchandising are as follows:

1. Pick-up and delivery service. The mill picks up home-grown feeds at the farm, takes them to the mill, adds the purchased ingredients, processes the feed, and returns it to the farm. The charge for this service is small when the amount of feed purchased is

great or the competition keen. Small dealers may have to make a larger charge than the larger ones when a part of the cost for this service contract cannot be absorbed in other ways.

2. Bulk handling, with company trucks or customers' trucks. In order to keep trucks busy at all times, and facilitate scheduling, the telephone is used to arrange for orders. The trucks used are usually pneumatic or auger-equipped and require less labor than the ordinary farm truck.

3. Keeping "fill" services, where farmers' bulk bins or feeders are regularly filled by the mill

4. Contract feeding in many forms, whereby the feed business supplies the feed for a particular feeding operation for a given period of time

5. Increased use of complete and formula feeds

6. Home-grown grain banks operated by feed businesses. The harvested feeds are delivered to the feed business in exchange for a warehouse receipt. The feed is prepared and delivered to customers as needed.

7. Road service, salesmen to contact producers, provide feeding and management advice and obtain feed orders. This is more applicable to larger firms than to smaller dealers.

8. Increased farm grinding and mixing, with dealers providing needed supplements

9. Large feeding operations where the producer may buy directly from wholesale outlets, by-passing the retail dealer

An employee of a feed business must understand not only the services rendered and the merchandising methods used by the concern, but also the rationale behind these services and methods. He must also know why other services and methods are not used. Services provided by a feed business are expected to be economically profitable. Many mills, however, need to provide certain services that are not in themselves profitable to maintain customer satisfaction. These unprofitable services must thus be supported by other activities. Two examples are:

1. The grinding operation may be a money-losing service, but the grinding service brings customers that

purchase supplements from which the profits offset the losses of the grinding operation.

2. Providing credit costs money, but the purchased items have a price markup that covers the credit cost.

All employees of a feed business are salesmen, whether they operate the cash register, write sales slips, drive a truck, or grind feed. Everyone deals with the customer and provides a service. All relationships with the customer help him decide whether he will continue doing business with the concern.

Suggested Teaching-Learning Activities

1. List on the chalkboard and discuss methods used by feed industries to advertise feeds in your community. Evaluate the effectiveness of these modules.

2. List on the chalkboard the services rendered by dealers in your community. Discuss which are most used, the reasons for their use, what new services are being offered, and whether dealers should offer additional services. Discuss the reasons why these services are not offered.

3. Have students determine the services and costs of the different methods of advertising used by local firms.

4. Discuss local credit policies used by the feed business. Explain those that are used (net--30 days; 2% cash discount; $\frac{1}{2}$ to 1% per month carrying charges).

Suggested Instructional Materials and References

Instructional materials

1. Samples of local feed store advertising for use when discussing services offered and effectiveness of advertising

Suggested Occupational Experiences

1. Students should gain experience in providing services for which they have the adequate maturity and training, such as:

   a. Delivering feed

   b. Making farm calls with the accomplished sales-service representative

   c. Answering customer questions and making sales

d. Providing ideas for radio and newspaper advertising

e. Arranging displays

Suggestions for Evaluating Educational Outcomes of the Module

Students should be evaluated on their ability to use the content of this module effectively. Basic understandings of the principles of nutrition, feeding values, feed preparation, rations balancing, feed merchandising and trends, and labeling may be evaluated in the classroom.

However, the ability to translate these understandings to particular problem situations in an occupational experience situation is the best measure of the effectiveness of this module. The employer-cooperator should evaluate the student in these areas of competency. A form questionnaire is a useful tool for this. A suggested form follows:

Name of trainee _____

Name of cooperator _____

Please evaluate the trainee on his performance of the following skills related to feed merchandising. Please check in the appropriate column.

Skill	Highly Competent	Competent	Incompetent
Understanding of basic nutrition			
Understanding of feeds			
Understanding of feed preparation			
Ability to balance rations			
Ability to advise customers			
Ability to sell feed			
Ability to read and interpret labels			

What essential understandings, skills, and abilities does the trainee lack or need to develop further? _____

_____

Does the trainee have the attitudes and appreciations necessary to become a successful employee in the retail feed industry? _____

_____

_____

Sources of Suggested Instructional Materials and References

Instructional materials

1. "Feeding Farm Animals," film (19 minutes, black and white), Washington, D. C.: Motion Picture Service, Office of Information, USDA.

2. "The Rumen Story," film (24 minutes, color), St. Louis: Ralston Purina Company, Checkerboard Square.

References

1. Bundy, C. E., et al Livestock and Poultry Production, 2nd edition, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961. Price: $4.90.

2. Cassard, D.W., et al Approved Practices in Feeds and Feeding, Danville, Illinois: The Interstate Printers and Publishers, 19-27 N. Jackson, 1959. Price: $2.50.

3. Cole, H. H. Introduction to Livestock Production, San Francisco: W. H. Freeman and Company, 1962. Price: $8.75.

4. Morrison, F. B. Feeds and Feeding, 9th edition, abridged, Ithaca, New York: The Morrison Publishing Company, 1956. Price: $4.75.

5. Animal and Poultry Nutrition, St. Louis: Ralston Purina Company, Checkerboard Square. Free.

6. Better Feeding of Livestock, Washington, D. C.: USDA Farmer's Bulletin No. 2052, Office of Information, USDA, 1952.

7. Feed Additive Compendium, Minneapolis: Feedstuffs, 2501 Wayzata Blvd., P.O. Box 67, issued quarterly. Price: $2.50 per year.

8. Mineral Feeding Facts, 1964-1965 edition, Chicago: Darling and Company, Union Stock Yards. Free

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INSTRUCTOR NOTE: As soon as you have completed teaching each module, please record your reaction on this form and return to the above address.

1. Instructor's Name_____

2. Name of school_____State_____

3. Course outline used: _____Agriculture Supply--Sales and Service Occupations
_____Ornamental Horticulture--Service Occupations
_____Agricultural Machinery--Service Occupations

4. Name of module evaluated in this report_____

5. To what group (age and/or class description) was this material presented?____
_____

6. How many students:
a) Were enrolled in class (total) _____
b) Participated in studying this module _____
c) Participated in a related occupational work experience program while you taught this module _____

7. Actual time spent teaching module:

		Recommended time if you were to teach the module again:
_____hours	Classroom Instruction	_____hours
_____hours	Laboratory Experience	_____hours
_____hours	Occupational Experience (Average time for each student participating)	_____hours
_____hours	Total time	_____hours

(RESPOND TO THE FOLLOWING STATEMENTS WITH A CHECK (✓) ALONG THE LINE TO INDICATE YOUR BEST ESTIMATE.)

	VERY APPROPRIATE	NOT APPROPRIATE
8. The suggested time allotments given with this module were:		
9. The suggestions for introducing this module were:		
10. The suggested competencies to be developed were:		
11. For your particular class situation, the level of subject matter content was:		
12. The Suggested Teaching-Learning Activities were:		
13. The Suggested Instructional Materials and References were:		
14. The Suggested Occupational Experiences were:		

(OVER)

15. Was the subject matter content sufficiently detailed to enable you to develop the desired degree of competency in the student? Yes_____No_____
Comments:

16. Was the subject matter content directly related to the type of occupational experience the student received? Yes_____No_____
Comments:

17. List any subject matter items which should be added or deleted:

18. List any additional instructional materials and references which you used or think appropriate:

19. List any additional Teaching-Learning Activities which you feel were particularly successful:

20. List any additional Occupational Work Experiences you used or feel appropriate:

21. What do you see as the major strength of this module?

22. What do you see as the major weakness of this module?

23. Other comments concerning this module:

_____ _____
(Date) (Instructor's Signature)

_____
(School Address)