



Feed Labels

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Goal (learning objective)

Youth will learn about ingredients and identify types of information found on feed labels.

Supplies

- Handout 1 “Feed Tag Worksheet” (enough copies for group)
- Handout 2 “Cereal Box Worksheet” (enough copies for group)
- Handout 3 “Beef Nutrition and Feeding: The Essential Nutrients Handout” (enough copies for group)
- Handout 4 “Sheep Nutrition Handout” (enough copies for group)
- Handout 5 “Swine Nutrition Handout” (enough copies for group)
- Several, different examples of feed labels (enough for when group breaks up into small groups)
- Several, different examples of cereal boxes (enough for when group breaks up into small groups)
- Pencils and paper (enough for group)
- Flip chart and marker

Pre-lesson preparation

- Make copies of the handouts
- Practice the activity
- Read through handouts and resources listed to familiarize yourself with the concepts and vocabulary

Lesson directions and outline

- Share the following information with the youth:

Proper animal nutrition is the key to a successful livestock business and a 4-H livestock project. Animals require proper nutrition for growth and development. Feed tags provide us important information about nutrients and ingredients to help us choose a feed that will meet the animal’s needs and give us the performance we expect.

Anyone selling feed commercially must supply a label or tag with each bag of feed. You should always read the tag to make sure you are getting what you want in the product and that you are not getting something that you don’t want. Unless you can understand what is written on these tags, you won’t know if you are providing your animal with the proper nutrition.

Livestock feeds can be classified or grouped as either complete feeds or supplements:

- Complete feed are those products containing all of the nutrients (except water and roughages) required by your animal. You can open the bag and empty the contents directly into the feeder.
- Supplements are products that are added or mixed into feed. They supply things such as additional protein, vitamins, minerals, and other ingredients that may be lacking in the base feed. Supplements are usually added in small, specified amounts and are not to be fed as the total ration.

A commercial law requires each bag, or bulk load of feed to be accompanied by a label showing several key items:

- Net Weight
- Product Name and Brand Name: A product name is always present and a brand name may also be present. A feed tag usually contains a unique name to identify the feed (Beef Start, Calf Starter, etc.).
- Purpose of Feed: A statement specifying the species and animal classes for which the feed is intended (Starting/Preconditioned Beef Cattle, Growing/Finishing Beef Heifers, etc.).
- Drug Additives: If a drug is used in the feed, the word MEDICATED must appear below the name with a statement and purpose of medication (claim statement), followed by a listing of the active drug ingredients and the amount of drug in the product.
- Guaranteed analysis: Gives information on various nutrients present in the feed. This will include:
 - a. Minimum percentage of crude protein (percentage of equivalent protein from non-protein nitrogen, if any): The amount of crude or total protein in a feed is guaranteed. Crude protein is determined by multiplying the nitrogen content of a feed by the factor 6.25.
 - b. Minimum percentage of crude fat: Fat has an energy value approximately 2.25 times the value of carbohydrate feedstuffs.

- c. Maximum percentage of crude fiber: Crude fiber is a measure of the indigestible or non-useful portion of a feed. Feeds having low fiber values tend to be higher in digestible energy or total digestible nutrients than those feeds having high fiber values.
- d. Minimum and maximum percentage of calcium.
- e. Minimum percentage of phosphorus.
- f. Minimum and maximum percentage of salt.
- g. Minimum Vitamin A in International Units (IU) per pound.

Note: The guarantees do not reflect the quality of feeding value of a feed. There is a difference in quality of various feed sources. For example, copper sulfate is 80-90% digestible, whereas copper oxide is only 0-10% digestible. Even different sites where the same mineral is collected will vary in digestibility.

1. When non-protein nitrogen (NPN) is added to feedstuffs, a statement of “for ruminants only” must appear underneath the name of the feed. Additionally, it must also have a guarantee for crude protein which has been supplied from non-protein nitrogen.
2. Minerals
3. Vitamins – only if guaranteed
4. Common and usual name of each ingredient or the collective term for each grouping of feed ingredient.
5. Directions for use and cautionary statements.
6. Name and principal mailing address of the manufacturer.

Conducting the activity (DO)

1. Divide members into small groups
2. Distribute to each of the groups:
 - a. Cereal box
 - b. Handout 2 “Cereal Box Worksheet”
 - c. Feed tag
 - d. Handout 1 “Feed Tag Worksheet”
3. Have groups examine and compare the cereal boxes and feed tag as a group.
4. Record cereal box findings on Handout 2 “Cereal Box Worksheet.”
5. Record feed tag findings on Handout 1 “Feed Tag Worksheet.”
6. Do a group discussion, have a volunteer record answers on the flip chart to draw comparisons. Ask the following questions:
 - a. What are some of the major ingredients on a feed tag or cereal box?
 - b. How do you know what ingredients are in the feed you give your animal?
 - c. Does the feed you give your animal meet its nutritional needs?
 - d. What kind of animal is the feed you are feeding meant for?
 - e. What are the sources of protein, energy, vitamins, and minerals in the feed?
 - f. Why are some feeds medicated?
 - g. What does a “guaranteed” analysis mean?

What did we learn? (REFLECT)

- Ask: Calcium and phosphorus are examples of what type of nutrients? (Minerals)
- Ask: Besides a balanced ration, a clean, fresh supply of this item is essential? (Water)
- Ask: What are two causes of scours? (Soured feed, feed too finely ground, too much protein, or over-feeding legume hays)

Why is that important? (APPLY)

- Ask: Why is it important to understand what the sources are in feeds, such as vitamins? How does that impact your animal’s health?
- Ask: Your animal has reduced its water consumption. Is monitoring water consumption something you should worry about? Why?
- Ask: Can your animal’s immune system be impacted from poor nutrition? How does poor nutrition impact humans?

Resources

- Malone, B. & Schwartz, V. (n.d.). Lesson 3: Interpreting Feed Labels. *Putting Science into Animal Science Projects*. Ohio State University Extension. Retrieved from <http://www.ohio4h.org/statewide-programs/animal-sciences/livestock/livestock-resources>
- National 4-H Council. (2005). Bite Into Beef. BU-08143 (page 11).
- Ohio State University Extension. (2011). Nutrition and Feeding. *Beef resource handbook* (pages 7-1 through 7-16).
- Ohio State University Extension. (2008). Nutrition. *Goat resource handbook* (pages 51-55).
- Ohio State University Extension. (2011). Nutrition. *Sheep resource handbook for market and breeding projects* (pages 49-50).
- Ohio State University Extension. (2000). Nutrition. *Swine resource handbook for market and breeding projects* (pages 8-1 through 8-3).

NUTRITION: FEED LABELS – HANDOUT 1

Feed Tag Worksheet

Questions adapted from “Putting Science into Animal Science Projects” (The Ohio State University Extension) by Bonnie Malone & Vicki Schwartz.

Answer the following questions using the feed label provided.

1. What is the major ingredient in this feed?
2. How many active ingredients are in this feed?
3. Is this feed medicated? If yes, what is the purpose of the medication?
4. How many days prior to slaughter should this feed be removed?
5. At what weight range should this ration be fed?
6. Can you feed this feed to all livestock, or is it only permitted for one species?
7. Fill in the following table for your feed tag:

Minimum Crude Protein Level	
Minimum Crude Fat Level	
Maximum Crude Fiber Level	
Range of Calcium Level	
Range of Phosphorus Level	
Range of Salt Level	
Minimum Selenium Level	

NUTRITION: FEED LABELS – HANDOUT 2

Cereal Box Worksheet

Adapted from: "How to Read Feed Tags" Beef, Level II, (University of Idaho Extension 4-H Beef Curriculum), Date? Kirk Astroth, Extension Specialist, 4-H Youth Programs, Kansas State University.

Cereals are required to include nutrition information on the box. The label includes a list of ingredients which are listed in order from most to least. It also lists percentages of recommended daily allowances and amounts of some nutrients per serving.

1. Name of Cereal:
2. Main Ingredient:
3. Serving Size:
4. Servings per package:
5. What does U.S. RDA mean?
6. Which vitamins are listed?
7. Does this cereal provide all of your daily need (100%) for any of the nutrients? If so, which ones?
8. Which nutrients increase when milk is added?
9. Which nutrients are minerals?

BEEF Nutrition and Feeding: The Essential Nutrients Handout

Source: Beef Resource Handbook 4-H 117R. (2001). The Ohio State University Extension. Chapter 7. Pages 7-1 through 7-7.

Water

Water is an extremely important part of an animal's diet. It is found in every cell in the body. It helps keep the body cool and carries other nutrients throughout the body. Water also helps the body form waste materials.

Be sure cattle have plenty of fresh water every day. Limitations on water intake depress animal performance more quickly and more drastically than any other nutrient deficiency. Domesticated animals can live about sixty days without food but only seven days without water. Hearing and sight are impaired without water.

Cattle will drink up to 20 gallons or more of water in one day, depending on their weight and the environmental temperature. For example, a calf that drinks three gallons a day in the winter, will drink nine gallons a day in the summer.

Water should be at a comfortable temperature. Drinkable water is usually between 40°F and 65°F. Steers that have access to cool drinking water will gain between 0.3 to 0.4 pounds more per day than those drinking warm water.

Therefore, you may want to occasionally check water temperature. Dip a thermometer into the water. Do not allow the thermometer to rest on the bottom. Touching the heated bottom of the pan can result in higher temperatures. Check the temperature over several cold days. Water temperatures of at least 40°F should minimize mechanical water system problems and maintain animal performance.

Energy

Energy is used for growing and also for producing a calf. Carbohydrates and fats give beef cattle most of the energy they need. Examples of carbohydrates that you eat are bread and potatoes. Grains cattle eat which are high in energy include corn, barley, wheat, and oats. Other feeds, like hay, are intermediate in energy while corn stalks are low in energy.

There are several different ways to measure energy levels. The two most common methods are Total Digestible Nutrients (TDN) and the Net Energy (NE) systems. The Net Energy system is becoming more common. While you may still use the older TDB system, some labs are now only reporting feed energy in Net Energy values.

Protein

Beef cattle use protein to build muscles, hair, hooves, and tissues inside their bodies. Protein works with carbohydrates so the animal will grow properly. Proteins are made up of small building blocks called "amino acids". We eat meat and eggs, which are high in protein. Soybean oil meal and alfalfa hay (legumes) are examples of livestock feeds that are high in protein.

Cattle protein supplements may be composed of a natural protein source or may contain some Non-Protein Nitrogen (NPN). For example, a common natural protein supplement is soybean meal, and a common NPN source is urea. Urea is better suited for older cattle on higher energy diets.

Note: Urea cannot be given to calves until their rumens are developed, so calves must be older than four months. Animals under 450 pounds generally gain more efficiently on natural protein sources. The amount of urea fed in the rations should not exceed one percent of the total ration or three percent of the concentrate mixture.

Minerals

Minerals are needed to build strong bones and teeth and to make blood, muscle, and nerves. Some minerals may need to be supplemented directly in the ration. Salt, calcium, and phosphorus are minerals needed in larger amounts than other minerals. (*Table 7.01*) Cattle should have a salt-mineral box to supply them with the extra minerals they do not get from their feed. This box should be accessible to cattle at all times. Minerals needed in smaller amounts are called trace minerals. Examples of trace minerals are calcium and phosphorus. We eat cheese and drink milk to get calcium and phosphorus. For beef cattle, grass and hay can be a source of calcium, while grains are high in phosphorus. Beef is an excellent source of many trace minerals for us.

Salt

Feeds generally do not contain adequate amounts of salt, the main source of sodium. Sodium can be supplemented as sodium chloride or sodium bicarbonate, and both forms are easily absorbed by the animal. Iodized salt should always be used to avoid an iodine deficiency. Cattle fed maintenance rations while confined in a dry lot often consume high levels of mineral mixtures, perhaps from boredom.

Calcium and Phosphorus

A calcium to phosphorus ratio of less than 1:1 or more than 8:1 may reduce performance. The typical calcium to phosphorus ratio is 1.5 to 2.0:1 for beef cattle. However, high levels of calcium from legumes do not appear to depress gains in growing rations. Calcium supplementation will probably be needed for growing steers and heifers receiving some grain.

Phosphorus

Phosphorus is often deficient in forage diets. Around calving time, cows should have free-choice access to 10-12% phosphorus mineral. An example would be ½ dicalcium phosphate. At other times of the year, cows and stockers would need a mineral consisting of 25-35% dicalcium phosphate or 7-8% phosphorus.

Magnesium

A mineral that may be deficient in feed is magnesium. The result of such a deficiency is called grass tetany, grass staggers, or magnesium tetany.

Magnesium tetany results when cattle, particularly cows that are milking and grazing on lush pastures, use up their existing body supplies of magnesium without a steady replacement from their diet. Another likely group to get magnesium tetany is cows in late gestation because of the nutritional requirements of the growing fetus. However, any animal that is grazing lush, green pastures of either grass or small

grain is running the risk of magnesium tetany. A high level of calcium will also tie up the availability of magnesium. Therefore, you should use dolomitic lime if magnesium is deficient in your area.

Symptoms of magnesium tetany include nervousness and irritability. Often, muscle twitching, usually in the face, eyelids, ears or flanks, will occur. Animals may bellow loudly while in the pasture or do some frenzied galloping. Later, animals will exhibit a staggering gait and fall down. After falling, they go into convulsions and eventually die. Mineral supplements containing magnesium and grain should be readily available to encourage consumption.

Vitamins

There are two categories of vitamins, water-soluble and fat-soluble. Produced in the rumen of the animal. Produced in the rumen of the animal, B complex vitamins are soluble. Fat-soluble vitamins of importance in cattle are A, D, E, and K. Cattle usually receive enough vitamin D from sunlight or from sun-cured hay. Vitamin E is usually received through feed, while vitamin K is produced in the rumen.

Vitamin A may need to be supplemented if green, leafy forages are not available. Vitamin A can be supplemented in the diet or by an injection. One million International Units of vitamin A palmitate injected intramuscularly (for example, when cows are palpated for pregnancy) will meet their vitamin A needs for two to four months. In the mineral mix, add 10,000 to 50,000 International Units per 0.1 to 0.2 lbs. of mineral mix. Be very cautious if you are mixing your own vitamin-mineral mix. Only a very small amount of vitamin A pre-mix is needed and mistakes in mixing can lead to toxicity situations. Vitamin A will not remain stable very long in homemade mineral mixes (approximately 2-3 weeks). Utilize or request protected forms of vitamin A for your vitamin-mineral mix.

SHEEP Nutrition Handout

Source: Sheep Resource Handbook 4-H 194R. (2000). The Ohio State University Extension. Chapter 4. Pages 49 through 50.

Nutrients are elements in feed that are used by the animal for growth and production. Nutrients are normally divided into five categories: Water, protein, carbohydrates, minerals, and vitamins.

Water

Water is the main constituent of the body. Two-thirds of the body is water, thus, an animal can live much longer without feed than water. Water helps the body digest food and carries nutrients to body tissues. It also helps get rid of wastes and keeps the body regulated. Sheep should always have access to a supply of clean, fresh water.

Protein

Proteins are the building blocks of the body. They are very complex chemicals, made up of amino acids that are used to build muscle, blood, internal organs, and skin. They also help form parts of the nervous system and the skeleton. Proteins can be used as energy too. When feed contains too much protein, the extra protein is used as energy. Soybean oil meal and fish meal are high in protein. Corn and barley are lower in protein.

Energy

Carbohydrates and fats are used to supply energy for lambs. The main use of energy is to make chemical reactions, resulting in conversion of feed to meat. Energy nutrients that are not used are stored as fat until needed. Sugar, starch, and fiber are carbohydrates. Corn oil and tallow are fats. Fat furnishes two and one-fourth times more energy than equal amounts of carbohydrates.

Minerals

Minerals are needed in small amounts and are used to build bones and teeth and in chemical reactions necessary for many life processes. Salt (NaCl) is a regulator in the body and sheep need 7-11 grams daily. Salt should only be fed in loose form to ensure that sheep can get enough to eat. Calcium is essential for bone growth and maintenance. Legumes (alfalfa) are high in calcium. Calcium can be supplemented by adding limestone to the ration. Phosphorus is needed in bone growth also. Phosphorus deficiencies can be overcome by feeding dicalcium phosphate. Iodine is another important mineral and is best supplied by feeding. There are minor minerals that are important such as copper and selenium. Feeding a trace mineral salt will help avoid deficiencies or toxicities.

Vitamins

Vitamins are needed in small amounts by sheep. All the necessary vitamins except for Vitamin A, D, and E are produced in the rumen of the mature sheep. Vitamin A is available from green feeds, such as hay, and stored in the liver for 3-4 months. Vitamin D is made available from the sun shining on the skin. Vitamin E and the mineral selenium are important for the prevention of white muscle disease. Selenium should be supplied in the diet in areas that are selenium deficient, like some parts of Idaho. Vitamin E is important for maintaining the healthiness of body cells, and thus, is important for reproduction because it maintains the cells of the reproductive organs. Wheat germ meal, dehydrated alfalfa meal, and some green feeds are good sources of Vitamin E.

SWINE Nutrition Handout

Source: Swine Resource Handbook 4-H 134R. (2001). The Ohio State University Extension. Chapter 8. Pages 8-1 through 8-3.

In general, nutrients are divided into five categories: Water, protein, carbohydrates, minerals, and vitamins. Except for water, which is largely supplied separately, nutrients are supplied to animals in the food materials we provide them (known as feedstuffs).

Water

Water is so common that we seldom think of it as a true nutrient, but it is the most essential and the cheapest of all nutrients. Water is the largest single component of a pig's body. It also passes through the body, transporting nutrients and removing wastes. Depriving pigs of water reduces feed consumption and limits growth and feed efficiency. Therefore, ample water should be provided continuously. A pig needs to drink two to three pounds of water for every pound of feed it eats. Water is usually taken into the body at a lower temperature than the body itself, therefore, a portion of the body's heat or energy must be used in the warming of the water. In hot weather, this can be a comforting advantage, but in the winter, it can be a serious disadvantage. If the water is ice cold, the pig will drink less. Reduced water consumption will limit performance as significantly as a lack of any other nutrient.

It is important that you make certain your animals always have all the fresh, clean water they need and that it is relatively cool in the summer and warmer in the winter.

Protein

Proteins are composed of 20 simpler building blocks called amino acids, and it is actually the amino acids that are the essential nutrients. Pigs, in fact, do not specifically need protein, but rather require amino acids for the formation of muscle and other body proteins.

Ten of the amino acids are called essential, because these cannot be produced within the pig's body.

The pig's growth or performance can be limited by a lack of even one of the essential amino acids, even if the other nine are adequately supplied. The ten essential amino acids that must be provided in swine diets are: lysine, threonine, tryptophan, methionine, cysteine, isoleucine, histidine, valine, arginine, and phenylalanine. Most cereal grains are limiting in lysine, threonine, tryptophan, and methionine.

Therefore, when one evaluates feed ingredients, these amino acids are most important in determining protein quality.

Energy

Energy is technically not a nutrient, but is a result of metabolism of carbohydrates (starch) and fats that are in a pig's diet. Carbohydrates and fats are the main source of energy in the diet. They are the primary fuels that are used in maintaining body temperature and producing muscular movement.

Energy must be provided in large amounts over what is needed for maintenance to achieve optimum growth and reproduction responses. Energy is needed in many chemical changes that occur within the body. Because energy is needed constantly by a growing pig, the body stores some energy in the form of fat. The major source of dietary energy for the growing pig is from the carbohydrate component of grains in their feed.

Minerals

Minerals are needed in body tissues and to assist in some of the body's chemical reactions. In particular, calcium, phosphorus, and salt (often referred to as macro-minerals) are major needs. Calcium is important in bone formation. Phosphorus is also involved in bone building and assists in energy utilization. Salt is important for maintaining good appetites and water consumption in hogs. Other minerals are needed in small amounts and are called trace minerals (or micro-minerals). These include iron, copper, zinc, magnesium, manganese, iodine, and selenium.

Of all farm animals, the pig is the most likely to suffer from mineral deficiencies. This is due to the following:

1. Hogs are primarily fed cereal grains which are low in minerals (except calcium).
2. The skeleton of a pig, in contrast to those of other animals, supports greater weight in proportion to its size, which means it needs more mineral content than most animals.
3. Hogs do not consume great amounts of roughages, which would balance the mineral deficiencies of grain.
4. Hogs are fed to grow at a maximum rate and are marketed before they reach full maturity. Emphasis on rapid growth and lean meat production requires adequate mineral concentrations, yet under these conditions, minerals are often overlooked in diet formulations. Most minerals are supplied in purchased supplements.

Vitamins

Vitamins are compounds that assist the body in the assimilation and use of the other nutrients. They are described in two classes, fat soluble (A, D, E, K), and water soluble (the B vitamins). The body can keep reserves of the fat soluble vitamins for a time, but the water soluble vitamins must be supplied in the diet daily.

Fat Soluble Vitamins:

- Vitamin A (carotene) is found in feedstuffs like alfalfa and corn. Converted by the body from carotene, it assists in maintaining the surface or epithelial cells. Such cells make up the outer skin as well as the lining of the digestive and respiratory tracts.
- Vitamin D is in compounds that have been exposed to sunlight. Some Vitamin D is fixed in the animal itself during exposure to sunlight. This vitamin assists in the utilization of calcium.
- Vitamin E's function is for normal muscle activity and reproduction. It helps to prevent the membrane surrounding individual cells from deteriorating, influences the production of various hormones, and defends against infection.
- Vitamin K's function is to help calcium and Vitamin D metabolism. The blood requires Vitamin K to form clots.

Water Soluble Vitamins:

- These vitamins occur or are supplied as chemical compounds in feeds. They assist particularly in the changes of nutrients into energy for growth. They may also assist in maintaining the health and soundness of the lining of the digestive organs. This group is also called the B-complex group. The B Vitamins generally added to swine diets include thiamine, riboflavin, niacin, pantothenic acid, B₁₂, and pyridoxine.