

S H E E P : *From the Animal's Point of View*

3

**SUBJECT OVERVIEW AND
BACKGROUND INFORMATION**

Just as humans need to monitor the food they eat as a way to help ensure their optimal health, they also need to monitor the food that their sheep consume since it affects the sheep's health too. Domesticated sheep consume the food provided for them by humans, so it is important that the animals' caretaker understand the nutritional needs of sheep so he or she can provide the sheep with a proper diet.

Sheep have basic dietary requirements that are very similar to those of humans. They require water, proteins, carbohydrates, fats, minerals, and vitamins, and they need to take supplements when these requirements are not met through their feed. One big difference between humans and sheep is in their digestive system. Unlike humans, sheep have a stomach with four separate chambers.

Animals with this type of stomach are called **ruminants**, and they also include cattle, deer, giraffes, and goats.

Sheep are herbivores and eat mainly plant material. In the wild or when living in pastures, sheep spend a good part of their day grazing on grass and weeds. Sheep that live in an enclosure with no grass to graze are often fed hay or silage. Silage includes foods such as fermented hay or corn. Grain is an excellent energy source for sheep and is usually fed when sheep need extra energy. Pregnant ewes, lactating ewes, and growing lambs are in life stages that can benefit from a grain diet. However, eating too much grain can cause problems such as bloating.



Sheep Nutrition:

What You Need to Know

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Concepts and Vocabulary

- **Balanced diet:** A diet that supplies the right types of foods in the right amounts to maintain a healthy body.
- **Basic nutrients:** Substances that help maintain a healthy body. These include carbohydrates, proteins, vitamins, and minerals.
- **Essential nutrients:** Nutrients that humans and animals must consume through their diet in order to live and function properly.
- **Life stages of sheep:** Sheep are categorized in different stages of development, or life stages. Sheep at each life stage have a different set of nutritional requirements that they need if they are to grow and stay healthy.

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, decision making, healthy lifestyle choices, keeping records, planning/organizing, problem solving, sharing, teamwork

Subject Links

Science, Language Arts

Overview of Activities

The first activity is entitled *Eat Your Vegetables!* In this activity, youth will look at a list of foods and categorize them according to the nutrients they provide. They will also be asked to create a list of the types of food they eat on a regular basis and to categorize them based on nutrient contents. They will compare these lists and determine whether the foods they eat provide their necessary daily nutrients.

The second activity is called *Diet Detectives*. Each group of youth will be given a scenario of the diet and common daily activities of a fictional person. They need to determine whether the person receives all of his or her necessary nutrients. If not, they will need to determine what nutrients and activities are in excess or what are lacking and come up with ideas about how that may have affected the person's daily activities. They will also need to make recommendations regarding dietary improvements.

The third activity, *Shopping by Chance in Sheep*, teaches youth that sheep do not have the luxury of choosing what they eat and that it is the job of the caretaker to ensure that his or her sheep are getting all their necessary nutrients. It is important for youth to know that sheep have different nutrient requirements at different life stages. This activity will help the youth to discover the importance of reading food labels and the consequences of providing sheep with an improper diet.

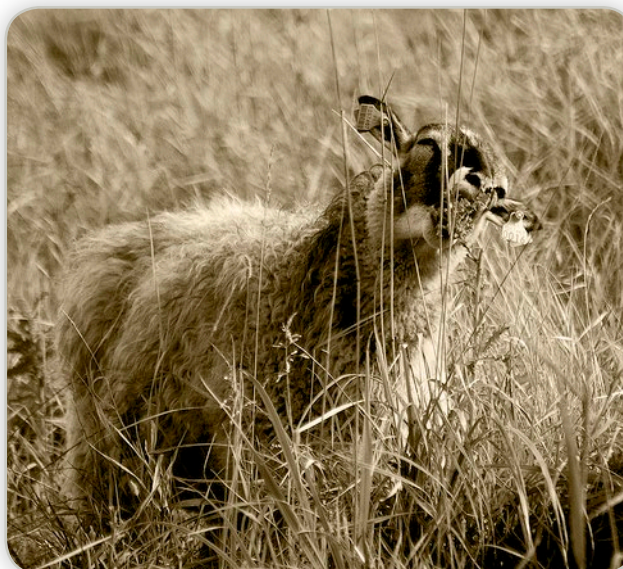
RESOURCES

Sheep101.info. Available at

www.sheep101.info/whatsheepeat.html.

Neary, M. The basics of feeding sheep.

<http://agansc.purdue.edu/sheep/articles/basics.html>.



FACTS ABOUT SHEEP

NUTRITION

Ruminants

- Sheep are ruminants. They have a four-part stomach made up of the rumen, reticulum, omasum, and abomasum. Ruminants chew cud, food that has been partially digested and then regurgitated to be re-chewed.
- The rumen is like a food storage site. When sheep eat food, it moves to their rumen where it is partially digested. Later, they regurgitate this food, re-chew it, and swallow it again. This process allows the sheep to absorb more of the nutrients from the forage they eat and occurs when they are resting.
- The rumen contains billions of microorganisms that allow the sheep to digest the tough fibers they eat. This process is called **fermentation**.
- Sheep need to burp! During fermentation, the rumen produces a lot of gas. If sheep are unable to get rid of the gas they can become bloated. Severe bloating can be life threatening!

Feed

- **Young sheep:** At birth, young sheep do not have a functional rumen or reticulum. Because of this, they need to be fed a supplemental feed called “creep feed.” Creep feed contains cracked or rolled grains and soybean meal. It is very digestible and helps the lambs develop their rumen.
- **Natural diet:** Grasses, legumes, and other natural forage.
- **Weeds:** Sheep often consume weeds, which can be very nutritious. **Note:** Some weeds are poisonous to sheep and should be avoided (e.g., milkweed, cocklebur, and nightshade).
- **Supplements:** Grain (which is like candy for sheep!) not only tastes great, but it also provides sheep with extra energy. **Warning!** Eating too much grain can make sheep sick.

Grazing

- Sheep can eat a variety of foods, ranging from low-quality grasses to high-quality twigs and shrubs.
- Sheep tend to prefer plants that are young and tender.
- Sheep will forage for food and graze for up to 7 hours a day. When there is no fresh forage, sheep can be fed hay or silage.

The Complete and Well-Balanced Diet

- A sheep's diet will vary based on factors such as age, body weight, sex, and stage of production. Young sheep require a diet high in energy and protein for growth, but these requirements decrease as the sheep get older. Ewes need increased nutrients during pregnancy and lactation.
- The essentials in a sheep's diet:
 - » **Water.** Sheep need a plentiful supply of clean water.
 - » **Energy.** Sheep can get energy from range forage, pasture, hay, and other roughage.
 - » **Protein.** Protein is important for growth, reproduction, lactation and maintenance of the sheep's body.
 - » **Vitamins and minerals.** Sheep usually obtain vitamins and minerals from the roughage they consume.

REFERENCES

- Kardong, K. 2001. Vertebrates: Comparative Anatomy, function, evolution. 3rd edition. McGraw-Hill Science/Engineering/Math.
- Neary, M. 2009. The basics of feeding sheep. Purdue University. <http://ag.ansc.purdue.edu/sheep/articles/basics.html>.
- Schoenian, S. 2010. What sheep eat. sheep101.info. www.sheep101.info/whatsheepeat.html.

ACTIVITY 1

Eat Your Vegetables!

BACKGROUND INFORMATION

Do you know why it's important to eat vegetables? Different kinds of foods provide us with different types of nutrients that allow our bodies to function properly. Some of the **basic nutrients** that we acquire from the foods we eat include carbohydrates, proteins, fats and oils, calcium, vitamin C, vitamin A, and fiber. Some people are very conscious of the foods they eat and the nutrients they provide, and some are not. By writing down what we eat we can get a better idea about whether we are getting the right nutrients in our daily diet.

Time Required

30 to 45 minutes

Concepts and Vocabulary

Basic nutrients (this includes carbohydrates, proteins, calcium, vitamin C, vitamin A, and fiber)

Life Skills

Communication, critical thinking, healthy lifestyle choices, keeping records, problem solving, sharing

Subject Links

Language Arts

State Content Standards

Language Arts

- Third Grade:
 - » Listening and Speaking Strategies–1.5
- Fourth Grade:
 - » Listening and Speaking Strategies–1.8
- Fifth Grade:
 - » Listening and Speaking Strategies–1.5

Suggested Grouping

Pairs

Materials Needed (* = Materials provided in curriculum)

- **General Source of Nutrients*
- **List of Familiar Foods for Humans*
- Notebook paper
- Pens or pencils; markers
- Flip chart paper

Getting Ready

- Make enough copies of the *General Source of Nutrients* worksheet so each youth receives two copies.
- Pass out the *List of Familiar Foods for Humans* to each pair of youth.
- Provide each pair of youth with flip chart paper and pens or pencils and markers.

OPENING QUESTIONS

1. **We've all heard our parents say, "Eat your vegetables!" Why do you think this might be important? What do you think makes vegetables and other foods such as fruit so important to our diets?** Ask the youth to explain their thoughts verbally and/or record their ideas on the flip chart paper provided.
2. **What other foods do you think are important to eat? Explain why you think they are important.** Ask the youth to share their ideas verbally and/or record their thoughts on the flip chart paper provided.

PROCEDURE (EXPERIENCING)

1. Working in pairs, have the youth look at the *List of Familiar Foods for Humans*. Have them organize the foods and place each one under the correct nutrient category (e.g., protein, carbohydrate) on the *General Source of Nutrients* worksheet.
2. Additionally, because everyone comes from a different background and culture, have each pair brainstorm and write down at least one other food that is common in his or her home or culture and that is not on the *List of Familiar Foods for Humans*. Have them place that food item under the correct nutrient category.

SHARING, PROCESSING, AND GENERALIZING

Ask the youth to share their group's list with the rest the groups and to compare the lists. What are the similarities? What are the differences? What are some reasons behind the differences? Ask the youth also talk about their own ethnic foods and ask them to compare those foods with those of other groups.

Each nutrient has an important function for the body and is easily obtained from food. Follow the lines of thinking developed through the general questions raised by the youth

to draw out their thoughts, and ideas; if necessary, use more targeted questions as prompts to get to particular points.

Specific questions might include:

1. **Are there differences in the way different groups categorized the foods? Discuss these differences and work toward a consensus.**
2. **In your view, why is it important to eat a variety of foods each day?** Ask the youth to share their ideas verbally or to write their thoughts and ideas on the paper provided.
3. **Why do you think that certain foods are called “junk foods?” What do you think are the differences between junk foods and healthy foods?** Ask the youth to share their ideas verbally or to write their thoughts and ideas on the paper provided.

CONCEPTS AND TERMS

At this point, volunteers need to make sure that the concept **basic nutrients** has been introduced to or discovered by the youth. (**Note:** The goal is to get the youth to develop concepts like this through their exploration and to have them define terms using their own words.)

CONCEPT APPLICATION

1. Ask each youth to develop a list of foods that he or she eats frequently.
2. Working in pairs, ask the youth to categorize their lists under the correct nutrient categories on the *General Source of Nutrients* worksheet.
3. Have the youth discuss their food choices. If they believe that they are not getting the essential nutrients they need, ask them to decide on some alternative foods they might choose in order to obtain these nutrients.

REFERENCES

- Applegate, L. 2004. Nutrition basics for better health and performance. Iowa. Kendall/Hunt Publishing Company.
- Netzer, C. T. 2000. The complete book of food counts. New York: Dell Publishing
- United States Department of Agriculture. n.d. Choose My Plate. www.choosemyplate.gov/.

LIST OF FAMILIAR FOODS FOR HUMANS

- apples
- avocados
- bananas
- beef
- broccoli
- brown (whole grain) rice
- butter
- candy
- canola oil
- carrots
- cheese
- chicken
- chili
- chocolate
- coconut oil
- corn
- cucumbers
- deep-fried foods
- donuts
- eggs
- grapefruit juice
- grapes
- green beans
- ice cream
- kidney beans
- lemons
- margarine
- milk
- oatmeal
- oranges
- pasta (processed)
- pastries
- peaches
- peanuts
- pork
- potatoes
- pretzels (processed)
- salmon
- soda
- spinach
- strawberries
- syrup
- tomatoes
- tuna fish
- white bread (processed)
- white rice (processed)
- whole grain bagels
- whole wheat bread
- whole wheat pasta
- yogurt (plain, low-fat)

GENERAL SOURCE OF NUTRIENTS WORKSHEET

Note: The examples for each category are common sources for each nutrient.

Protein

Protein is found in animal products, nuts, and beans.

1. _____
2. _____
3. _____
4. _____
5. _____

Carbohydrates

Carbohydrates are found in processed wheat and grains and in starchy vegetables.

1. _____
2. _____
3. _____
4. _____
5. _____

Fiber

Fiber is found in whole grains, beans, oats, and bran.

1. _____
2. _____
3. _____
4. _____
5. _____

Calcium

Calcium is found in dairy products and dark green vegetables.

1. _____
2. _____
3. _____
4. _____
5. _____

Vitamin C

Vitamin C is found in fruit, especially citrus fruit.

1. _____
2. _____
3. _____
4. _____
5. _____

Vitamin A

Vitamin A is found in animal products and reddish colored foods.

1. _____
2. _____
3. _____
4. _____
5. _____

Fats and Oils

Oils can be found in fish, nuts, and vegetable oils. Fats come from many animal foods and processed vegetable oils, including butter and margarine.

1. _____
2. _____
3. _____
4. _____
5. _____

Limited Nutritional Value

These are foods that do not provide important nutrients. This includes processed snack foods that are high in salt and sugar.

1. _____
2. _____
3. _____
4. _____
5. _____

GENERAL SOURCE OF NUTRIENTS KEY

Note: The examples for each category are common sources for each nutrient

Protein

- beef
- cheese
- chicken
- chili
- corn
- eggs
- kidney beans
- milk
- peanuts
- pork
- salmon
- tuna fish

Carbohydrates

- brown rice
- corn
- pasta (processed)
- pretzels
- white bread
- white rice
- whole grain bagels

- whole grain pasta
- whole wheat bread

Fiber

- apples
- broccoli
- brown rice
- chili
- corn
- kidney beans
- oatmeal
- oranges
- peaches
- potatoes
- strawberries
- whole grain bagels
- whole grain pasta
- whole wheat bread

Calcium

- broccoli
- cheese

- low-fat milk
- spinach
- whole milk
- yogurt (low-fat, plain)

Vitamin C

- apple juice
- apples
- broccoli
- cucumbers
- grapefruit juice
- grapes
- green beans
- lemons
- oranges
- peaches
- potatoes
- spinach
- strawberries
- tomatoes

Vitamin A

- beef
- broccoli
- carrot
- cheese
- eggs
- green beans
- milk
- peaches
- spinach
- strawberries
- tomatoes

Fats and Oils

- avocados
- butter
- canola oil
- coconut oil
- margarine
- peanuts
- salmon

Limited Nutritional Value

- chocolate
- deep-fried foods
- donuts and other pastries with high sugar content
- ice cream
- other candy
- soda
- syrup

REFERENCE

Nutrition Data. 2008.

www.nutritiondata.com

ACTIVITY 2

Diet Detectives

BACKGROUND INFORMATION

What we eat can have a big influence on what we can do and how we feel. Having deficiencies for a period of time in important nutrients such as carbohydrates, proteins, calcium, vitamin C, vitamin A, and fiber can lead to problems like low energy, poor concentration, and illness. A balanced diet that contains all essential nutrients will help keep our minds and bodies healthy, active, and strong.

Time Required

40 to 60 minutes

Concepts and Vocabulary

Balanced diet

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, healthy lifestyle choices, keeping records, problem solving, sharing, teamwork

Subject Links

Science, Language Arts

State Content Standards

Science

- Third Grade:
 - » Investigation and Experimentation – 5d
- Fourth Grade:
 - » Investigation and Experimentation – 6c
- Sixth Grade:
 - » Investigation and Experimentation – 7a, 7e

Language Arts

- Third Grade:
 - » Reading Comprehension – 2.2
- Fourth Grade:
 - » Reading Comprehension – 2.3
 - » Listening and Speaking Strategies – 1.7, 1.8
- Fifth Grade:
 - » Reading Comprehension – 2.4
 - » Listening and Speaking Strategies – 1.5
- Sixth Grade:
 - » Reading Comprehension – 2.3
 - » Listening and Speaking Strategies – 1.5

Suggested Grouping

Groups of 2 to 5 individuals

Materials Needed:

(* = Materials provided in curriculum)

- **Sample Diets*
- **General Facts on Nutrients Handout*
- **General Source of Nutrients Key*
- **MyPlate* handout
- Flip chart paper
- Pencils/pens
- Notebook paper

Getting Ready

- Make enough *Sample Diets* worksheets for each group.
- Make enough copies of the *General Facts on Nutrients Handout* and *General Source of Nutrients Key* for each group.
- Make enough *MyPlate* handouts for each group to get one.
- Pass the materials out to each group.

OPENING QUESTIONS

1. **When you hear the phrase “a balanced diet,” what does that mean to you?** Ask the youth to share their ideas verbally and/or record their ideas on the flip chart paper provided.
2. **What do you think might happen if we do not eat enough of the types of foods that provide the nutrients we need?** Ask the youth to share their thoughts verbally and/or record their ideas on the flip chart paper provided.

PROCEDURE (EXPERIENCING)

Facilitator: Please set up the following scenario for the students. Explain to the youth that they are “Diet Detectives.” Their job is to review people’s diets and use the resources provided as a basis for recommending changes to make their diets more balanced.

1. A set of *Sample Diets*, a copy of the *General Facts on Nutrients Handout*, and a copy of the *MyPlate* handout will be distributed to each group.

2. Each group will read the *Sample Diets*. From the information provided on the diets, the *General Facts on Nutrients Handout*, and the *MyPlate* handout, youth will work together to determine:
 - » Which nutrients (if any) they believe to be missing from or present in excess in the different diets. Have them record and explain their ideas on the flip chart paper provided.
 - » How each diet can be improved. What foods would they recommend be added to or removed from the diets to make them more balanced? Have them record and explain their ideas on the flip chart paper provided.
 - » **Volunteer Note:** It may help if the youth make a chart to organize their thoughts.

SHARING, PROCESSING, AND GENERALIZING

After the youth have completed the procedure, invite them to share their thoughts and responses to the different scenarios. Follow the lines of thinking developed through the general thoughts, observations, and questions raised by the youth; if necessary, use more targeted questions as prompts to get to particular points. Specific questions might include:

1. **If your group's answers differ from those of other groups, why do you think that is?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the flip chart paper provided.
 - » **Volunteer Tip:** Below is a key for the different *Sample Diets*:
 - › Mark's diet: Low in protein
 - › Jenny's diet: Low in carbohydrates
 - › Justin's diet: Low in calcium
 - › Claire's diet: Low in vitamin C
 - › Ryan's diet: Low in vitamin A
 - › Molly's diet: High in fiber
 - › Scott's diet: Too many sweets
 - › Sydney's diet: Too much saturated fat
2. **What do you think might happen if people who were missing an essential nutrient continued on that diet for a longer period of time?** Ask the youth to record their thoughts and ideas on the flip chart paper provided.
 3. **What are some ways you can make sure you have a balanced diet and get the proper nutrients?** Ask the youth to record their thoughts and ideas on the flip chart paper provided.

CONCEPTS AND TERMS

At this point, volunteers need to make sure that the concept of **balanced diet** has been introduced to or discovered by the youth. (**Note:** The goal is to get the youth to develop concepts like this through their exploration and to have them define terms using their own words.)

CONCEPT APPLICATION:

1. Ask the youth to write down everything they can remember eating in the last three days on their own sheet of paper. Ask the youth in each group to share their lists with one another, then have the different groups share and compare their results.
2. Ask the groups to combine their food lists into categories based on food types on a piece of flip chart paper. Then ask them to rank the categories relative to quantity (how much of a given food type was eaten) and importance (healthy vs. not-so-healthy).

- » **Volunteer Tip:** Encourage the youth to develop their own organizational schemes for categorizing the food.
3. Once everyone has completed steps 1 and 2, ask them to compare their results with the *MyPlate* handout. What are some of their observations?
 4. Based on the foods that they eat, ask each group to prepare a three-day menu that complies with the recommendations of the *MyPlate* handout.

Ask the groups to share and compare their three-day menus.

REFERENCES

- Applegate, L. 2004. Nutrition basics for better health and performance. Iowa: Kendall/Hunt Publishing Company.
- Dietary Guidance. 2009. USDA. Food and Nutrition Information Center. Food Guide Pyramid Resources. http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=3&tax_subject=256&topic_id=1348&level3_id=5715.
- The Food Pyramid. 1995. National Agricultural Library. www.nalusda.gov/fnic/Fpyr/pyramid.gif.
- Nutrition Info Sheet. 2009. Nutrition. University of Maryland Medical Center. www.umm.edu/altmed/ConsModalities/Nutritioncm.html.
- Saltos, E. n.d. The Food Pyramid-food label connection. www.fda.gov/fdac/special/foodlabel/pyramid.html.
- UC Berkeley. 2010. 14 Keys to a healthy diet. Foundations of Wellness. www.berkeleywellness.com/html/fw/fwNut01HealthyDiet.html.

GENERAL SOURCE OF NUTRIENTS KEY

Note: The examples for each category are common sources for each nutrient listed.

List of Familiar Foods for Humans

Protein

- beef
- cheese
- chicken
- chili
- corn
- eggs
- kidney beans
- milk
- peanuts
- pork
- salmon
- tuna fish

Carbohydrates

- brown rice
- corn
- pasta (processed)
- pretzels
- white bread

- white rice
- whole-grain bagels
- whole-grain pasta
- whole-wheat bread

Fiber

- apples
- broccoli
- brown rice
- chili
- corn
- kidney beans
- oatmeal
- oranges
- peaches
- potatoes
- strawberries
- whole-grain bagels
- whole-grain pasta
- whole-wheat bread

Calcium

- broccoli
- cheese
- low-fat milk
- spinach
- whole milk
- yogurt (low-fat, plain)

Vitamin C

- apple juice
- apples
- broccoli
- cucumbers
- grapefruit juice
- grapes
- green beans
- lemons
- oranges
- peaches
- potatoes

- spinach
- strawberries
- tomatoes

Vitamin A

- beef
- broccoli
- carrots
- cheese
- eggs
- green beans
- milk
- peaches
- spinach
- strawberries
- tomatoes

Fats and Oils

- avocados
- butter
- canola oil

- coconut oil
- margarine
- peanuts
- salmon

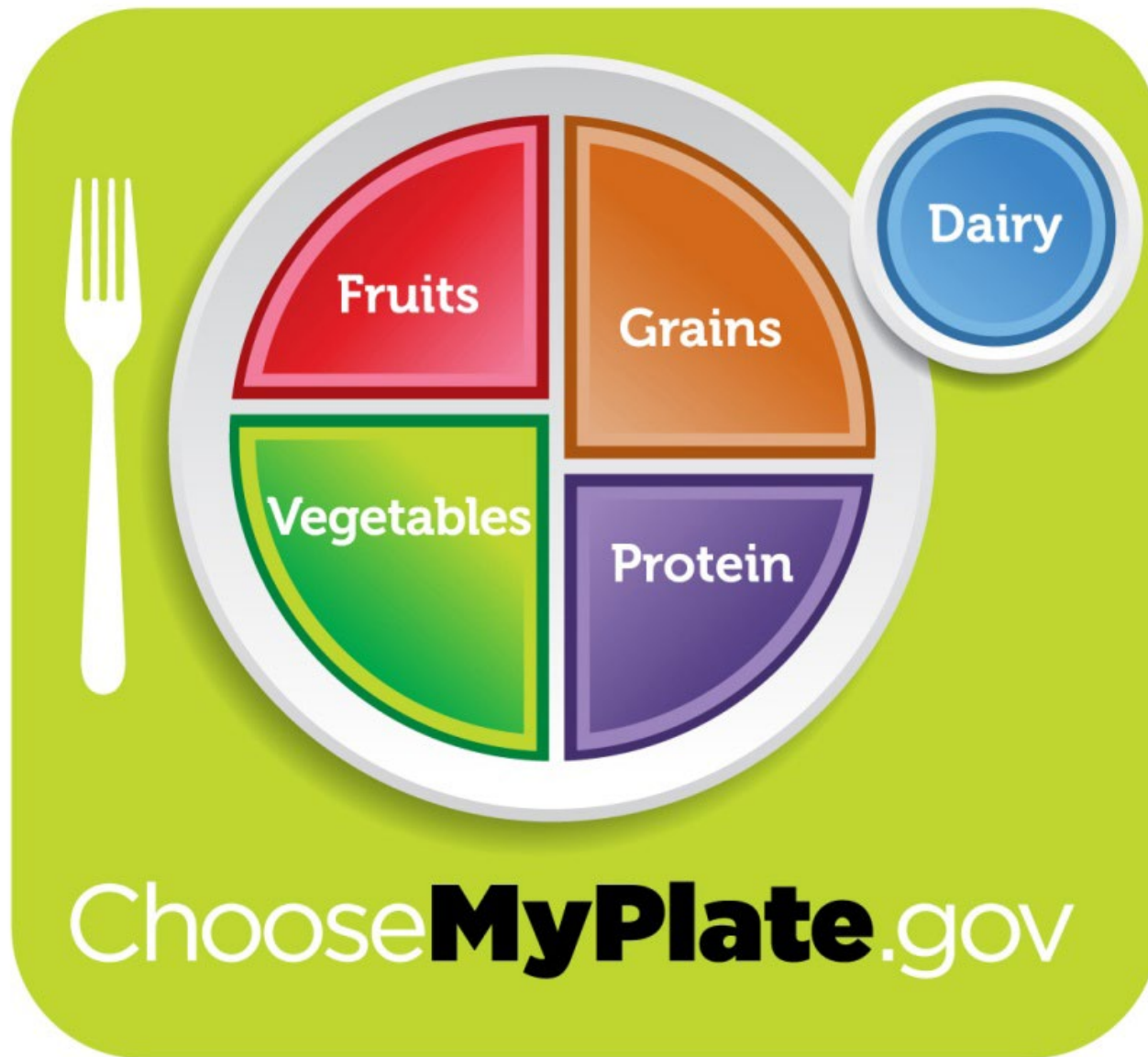
Limited Nutritional Value

- chocolate
- deep-fried foods
- donuts and other pastries with high sugar content
- ice cream
- other candy
- soda
- syrup

REFERENCE

Nutrition Data. 2008.

www.nutritiondata.com.



SAMPLE DIETS

Mark's diet:

- Breakfast: 3 pieces of white toast with butter
- Lunch: White rice with chopped spinach
- Dinner: White pasta with steamed carrots, apple juice

Jenny's diet:

- Breakfast: Eggs and sausage
- Lunch: Hotdog on a white bun
- Dinner: Steak with chicken, apple juice

Molly's diet:

- Breakfast: 2 pieces of whole wheat toast with butter, milk
- Lunch: Brown rice topped with peanuts, grapefruit juice

- Dinner: Whole-wheat bagel with cheese, apple juice

Scott's diet:

- Breakfast: 2 donuts
- Lunch: Two orders of French fries, one candy bar
- Dinner: Deep-fried chicken, broccoli, soda

Sydney's diet:

- Breakfast: Bacon, French toast (made with white bread) with lots of butter and syrup
- Lunch: Fried chicken strips, French fries
- Dinner: 4 slices of cheese pizza, chocolate cake

GENERAL FACTS ON NUTRIENTS

Carbohydrates

- Function: Carbohydrates provide energy to the body, especially to the brain and the nervous system.
- Types and sources of carbohydrates:
 - » Simple carbohydrates: Fruits, some vegetables, some dairy products, refined grains (processed flour), sugar, and corn syrup.
 - » Complex carbohydrates: Starchy vegetables, whole grains and cereals.
- Possible effects:
 - » Too little: Fatigue or lack of energy, malnutrition, and increased fat intake.
 - » Too much: Obesity.

Protein

- Function: Protein is an important source of energy and is essential for growth and organ function.
- Sources of protein: Meat, fish, eggs, cheese, beans, lentils, tofu, and nuts.
- Possible effects:
 - » Too little: Muscle loss, decrease in growth, decreased immunity (making it easier to get diseases or illnesses).
 - » Too much: Can cause high cholesterol and different types of diseases like gout.

Calcium

- Function: Calcium is a very important mineral because it makes up important structures like teeth and bones. It helps us grow and maintains our bodies. It also helps to prevent diseases like osteoporosis (weak bones).
- Sources: It is found in many types of foods, but is very abundant in dairy products. It is also found in green leafy vegetables (e.g., broccoli), some seafood (e.g., salmon), almonds, and dried beans.
- Possible effects:
 - » Too much: Normally no side effects appear, but if calcium intake is high over a long period of time it can cause the development of kidney stones.
 - » Too little: Deficiencies in calcium can lead to increased chance of broken bones or tooth decay.

Vitamin A

- Function: Vitamin A helps maintain healthy teeth, bones, soft tissue, and skin. It also helps promote good vision.
- Sources: Meats and animal products (milk, eggs), dark leafy green vegetables (e.g., spinach), and brightly colored vegetables (e.g., carrots) and fruits (e.g., cantaloupe).
- Possible effects:
 - » Too little: Vision problems; decreased resistance to disease.
 - » Too much: Can cause vitamin A poisoning when consumed in very large amounts.

Vitamin C

- Function: Vitamin C is essential for normal growth and development. It is needed to make skin, scar tissue, heal wounds, and repair bone, cartilage and teeth. Since our body cannot make or store vitamin C, we must get it from foods we eat.
- Sources: Fruits and vegetables
- Possible effects:
 - » Too little: Damaged hair, bleeding gums, rough and dry skin, easy bruising, slow healing of wounds, and nosebleeds.
 - » Too much: Vitamin C toxicity can occur which can lead to upset stomachs and diarrhea.

Fiber

- Function: Fiber is important in the diet because it helps us feel full after eating, which can help control weight. It also helps with digesting food and prevents constipation.
- Types and sources of fiber:
 - » Soluble fiber: This type of fiber is slowly digested in the body and can lower cholesterol and help prevent heart disease. Sources of soluble fiber include oat bran, barley, nuts and seeds, beans, and some fruits and vegetables.
 - » Insoluble fiber: This helps food pass through the stomach and intestines faster and adds bulk to the stool. Types of food high in insoluble fiber include wheat bran, vegetables, and whole grains.

- Possible effects:
 - » Too little: Constipation (difficulty passing bowel movements).
 - » Too much: Eating too much in a short period of time can cause gas, bloating, and cramps.

Fats and Oils

- Function: Fats and oils are a source of energy. There are essential fatty acids that our body cannot make so we must get them from our diet. Fat are like storage boxes, storing calories for when we do not have food to eat. Fat also helps insulate the body, maintains healthy hair and skin, and helps our body absorb different vitamins.
- Types of fats:
 - » Saturated fats: These types of fats are referred to as “bad cholesterol” and can increase cholesterol levels in a person’s blood. They are found in some animal products (e.g., butter, cheese, ice cream) and fatty meats.
 - » Unsaturated fats: These types of fats are referred to as “good cholesterol” and can decrease cholesterol levels in a person’s blood. They are found in most liquid vegetable oils.

- Possible effects:
 - » Too little: Hair loss or dull hair, brittle nails, and lack of cushioning for organs. (Note: This is for unsaturated fats.)
 - » Too much: Too much of saturated fats can cause heart disease, clogged arteries, and obesity.

Sweets

- Function: Quick source of energy.
- Sources: Processed foods that have an excess of sugar (e.g., candy).
- Possible effects: Too much sugar can cause a “sugar high” which is when a person gets a “rush” of energy for a period of time and then get an energy “crash.” Dental decay, excess weight gain, and stomachaches can occur from eating too much sugar.

NUTRIENT REFERENCES

- Matthews, G. 2009. Carbohydrates: What you must know. Bodybuildingforyou.com. www.bodybuildingforyou.com/articles-submit/gary-matthews/carbohydrates-nutrition.htm.
- Diet Bites. 2009. Dietary fat: The importance of keeping fat in your diet. www.dietbites.com/article1097.html.
- Family Nutrition. 2006. Sugar. AskDrSears.com. www.askdrsears.com/html/4/T045000.asp.
- Keepkidshealthy.com. 2003. Fats, oils, and sweets. www.keepkidshealthy.com/nutrition/food_pyramid/fats_oils_sweets.html.
- Medline Plus. 2009. Calcium in diet. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002412.htm.
- Medline Plus. 2008. Carbohydrates. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002469.htm.
- Medline Plus. 2009. Fats. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002468.htm.
- Medline Plus. 2008. Fiber. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002470.htm.
- Medline Plus. 2009. Protein in diet. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002467.htm.
- Medline Plus. 2009. Vitamin A. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002400.htm.
- Medline Plus. 2009. Vitamin C. Medical encyclopedia. www.nlm.nih.gov/medlineplus/ency/article/002404.htm.
- Nutrition Source: Protein. 2010. Protein. Harvard School of Public Health. www.hsph.harvard.edu/nutritionsource/protein.html.

ACTIVITY 3

Shopping by Chance for Sheep

BACKGROUND INFORMATION

Sheep have been kept as domesticated animals for thousands of years and rely on their owners for the type of food they eat. Their range of reliance varies for different types of production systems. **An extensive system** is similar to the type of environment and lifestyle experienced by wild sheep that roam and forage on natural vegetation. In an **intensive system**, the feed comes directly from the herd owners, so the sheep do not have a choice of what to eat. This makes it important that owners of sheep in an intensive system know which nutrients are essential for sheep. Equally important, they need to know that for different sheep at different life stages there are different requirements for types and quantities of nutrients.

Time Required

40 to 60 minutes

Concepts and Vocabulary

Essential nutrients, life stages of sheep

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, decision making, keeping records, planning/organizing, problem solving, sharing, teamwork

Subject Links

Science, Language Arts, Math

State Content Standards

Science

- Third Grade:
 - » Investigation and Experimentation–5a, 5c, 5d, 5e
- Fifth Grade:

- » Investigation and Experimentation–6g, 6h

- Sixth Grade:

- » Investigation and Experimentation–7d, 7e

Language Arts

- Third Grade:

- » Reading Comprehension–2.2

- Fourth Grade:

- » Listening and Speaking Strategies–1.2, 1.7, 1.8

- Fifth Grade:

- » Reading Comprehension–2.4

- » Listening and Speaking Strategies–1.5

- Sixth Grade:

- » Listening and Speaking Strategies–1.5

- » Speaking Applications–2.5b

Math

- Fourth Grade:

- » Statistics, Data Analysis, and Probability: 1.0

- » Students organize, represent, and interpret numerical and categorical data and clearly communicate their findings–1.1

Suggested Groupings

Small groups or pairs

Materials Needed

(* = Materials provided in curriculum)

- **Sheep Life Stage Cards* (pre-weaned lamb, growing lamb, finishing lamb, maintenance ewe, late-gestation ewe, lactating ewe)
- **Sheep Nutrient Requirements*

- **Feed Cards*

- **Nutrients Worksheet*

- **Facts about Nutrients*

- **Nutrient Comparison Graphs Worksheet*

- *Appendix B: *Sheep Nutrient Requirements Table* (Concept Application)

- *Appendix C: *Grain and Hay Ratio for Market Lamb Projects* (Concept Application)

- Flip chart paper

- Markers or colored pencils

- Tape

Getting Ready

- Make 3 to 5 copies of each of the *Feed Cards* and staple identical cards together. Display the different *Feed Cards* on a table.
- Make enough copies of the *Sheep Life Stage Cards* so each group gets a card. Additional copies may be needed later. Cut the cards out.
- Make enough *Sheep Nutrient Requirements Tables* for each group and each individual to have one.
- Make enough copies of the *Nutrients Worksheet* and *Nutrient Comparison Worksheet* for each group.
- Make enough copies of *Sheep Nutrient Requirements Table* (Appendix B) and *Grain and Hay Ration for Market Lamb Projects* (Appendix C) for each youth to have one of each (Concept Application).

OPENING QUESTIONS

1. **What do you know about the different types of food that sheep eat?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.
2. **Remember what nutrients are essential for humans. What do you think some of the essential nutrients for sheep might be? How do you think sheep acquire these nutrients?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

PROCEDURE (EXPERIENCING): PART A

1. Pass out the *Nutrients Worksheet* to each group.
2. Each group of youth will have a sheep from a specific life stage. Determine this by passing out *Sheep Life Stage Cards* randomly to each group (one card per group). Have them write down the sheep they received under Part A of the *Nutrients Worksheet*.
3. Explain to the youth that they are sheep owners and they are going to the store to buy a type of feed for their particular sheep.
4. Have each group go to the “store” (the table with the *Feed Cards*) to pick out a feed for their sheep. Once each group has decided on the feed they want, have them remove one *Feed Card* and take it back with them. Write the feed type they picked under Part A of the *Nutrients Worksheet*.

SHARING, PROCESSING, AND GENERALIZING

Ask each group to discuss why they chose the particular feed that they did. Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

PROCEDURE (EXPERIENCING): PART B

1. Pass out the *Sheep Nutrient Requirements Table (Appendix A)* to each group.
2. Have the youth determine the particular nutrient requirements for their sheep and record the information down under Part B of the *Nutrients Worksheet*.
3. Next, have the youth compare the feed they chose with the nutrient requirements of their sheep. Did the feed they chose meet the nutrient requirements of their sheep? Why or why not? Have them fill out and write their responses under Part B of the *Nutrients Worksheet*. Pass out the *Facts about Nutrients* page to help them complete the *Nutrients Worksheet*.

SHARING, PROCESSING, AND GENERALIZING

As a group, have each group discuss their sheep's diet and whether its diet met its nutrient requirements. Also have them discuss the potential benefits and possible drawbacks of their sheep's diet. Discuss ways they can improve their sheep's feed.

PROCEDURE (EXPERIENCING): PART C

1. For groups that did not pick the correct diet, ask them to return to the “store” and shop for another diet that best meets their sheep's requirements. Include any modifications that might be needed. Have them fill out and write their responses under Part C of the *Nutrients Worksheet*.
2. For groups that did pick the correct diet, have the youth go and choose appropriate diets for the other sheep listed in the *Sheep Nutrient Requirements Table*. Have them fill out the table in Part C of the *Nutrients Worksheet*.

Note: The youth who completed step 1 may now continue with step 2. Wait until each group has completed at least one other sheep before moving to the next section.

SHARING, PROCESSING, AND GENERALIZING

Have each group share the diets they picked for each sheep and tell why they made those choices. Get the groups to compare their findings and see if they are similar or different and try to figure out why.

PROCEDURE (EXPERIENCING): PART D

1. Using the *Nutrient Comparison Worksheet* and the *Sheep Nutrient Requirements* handout, have the youth graph out the nutrient requirements for each life stage as a line graph.
2. Once each group has completed graphing, have them look at the trends in nutrient requirements for each life stage. Ask them to share their thoughts and ideas either verbally or on the flip chart paper provided.

SHARING, PROCESSING, AND GENERALIZING

Follow the lines of thinking developed by the youth as they share and compare their thoughts and observations on the overall activity; if necessary, use more targeted questions as prompts to get to particular points. Specific prompts might include:

1. Ask each group to share their thoughts and ideas on the trends of each life stage.
2. Ask the youth to share what they have learned about different life stages of sheep. Have them share their thoughts and ideas either verbally or on the flip chart paper provided.

3. Ask the youth to share what they have learned about food labels. Have them share their thoughts and ideas either verbally or on the flip chart paper provided.
4. Ask the youth to explain why they think it is important to read food labels. Have them share their thoughts and ideas either verbally or on the flip chart paper provided.
 - » **Volunteer Tip:** Notice that on the different feed diets, crude fat and crude fiber are shown. Since calculating the specific requirements of these nutrients for sheep at different life stages is a complicated process, we omitted this information to avoid confusion. However, both nutrients are still extremely important in a sheep's diet, so it is always important to take both the crude fat and crude fiber content of each feed into consideration for different sheep. Please consult a sheep nutrition book or your local feed store to find the best diet for your sheep.

CONCEPTS AND TERMS

At this point, volunteers need to make sure that the concept **life stages of different sheep** and that the term **essential nutrients** have been introduced to or discovered by the youth. (Note: The goal is to get the youth to develop concepts and terms like this through their exploration and to have them define terms using their own words.)

CONCEPT APPLICATION

For youth who have sheep:

1. Ask the youth to determine the life stage of their sheep.
2. Using the *Sheep Nutrient Requirements* (from the activity) and *Appendix B: Sheep Nutrient Requirements Table*, have the youth figure out what the nutritional requirements are for their sheep.
3. Let the youth go online and research how to obtain the essential nutrients for their sheep.
 - » **Note:** *Appendix C: Grain and Hay Ratio for Market Lamb Projects* is a helpful reference for youth who have market lambs.

For youth who do not have sheep:

1. Ask the youth to choose a sheep at a particular life stage.
2. Have them use *Appendix B: Sheep Nutrient Requirements Table* to figure out the nutritional requirements for their particular sheep.
3. Let the youth go online and research how to obtain those essential nutrients for their sheep.

REFERENCES

- Glenn, J., et al. 1997. Animal care series: Sheep care practices. University of California Cooperative Extension. www.vetmed.ucdavis.edu/vetext/INF-SH_CarePrax.pdf.
- Grandin, T. 1993. Livestock handling and transport, 2nd edition. Wallingford, UK: CAB International.
- Greiner, S. Summer lamb management. Virginia Tech Cooperative Extension. www.ext.vt.edu/news/periodicals/livestock/aps-00_07/aps-0248.html.
- Harvard School of Public Health. 2010. Protein. www.hsph.harvard.edu/nutritionsource/protein.html.
- Johnson, C. Personal communication, December 6, 2007, February 9, 2008.
- Jordan, R. M. 2008. Sheep diseases. University of Minnesota Extension. www.extension.umn.edu/distribution/livestocksystems/DI1877.html.
- Neary, M. 2009. The basics of feeding sheep. Purdue University. <http://ag.ansc.purdue.edu/sheep/articles/basics.html>.
- New Mexico State University. 2010. Essential nutrient requirements of sheep. Sheep Production and Management. www.cahe.nmsu.edu/sheep/sheep_nutrition/essential_nutrition.html.
- Nix, J. 2005. The role of vitamin A in ruminant nutrition. Sweetlix. www.sweetlix.com/user_files/File/articles/Cattle_RoleVitAinRuminantDiets.pdf.
- North Dakota State University. 1996. Sheep pocket guide: Nutrition. www.ag.ndsu.edu/pubs/ansci/sheep/as989-3.htm.
- Radostits, O. M., O. C. Gay, D. C. Blood, and K. W. Hinchcliff. 1999. Veterinary medicine: A textbook of the diseases of cattle, sheep, pigs, goats, and horses, 9th Edition. China. Elsevier Health Sciences.
- Schoenian, S. 2009. An introduction to feeding small ruminants. University of Maryland Cooperative Extension. www.sheepandgoat.com/articles/feedingsmallruminants.html.
- Subcommittee on Sheep Nutrition, Committee on Animal Nutrition, Board on Agriculture, National Research Council. 1985. Nutrient requirements of sheep, Sixth revised edition. Washington, D.C. National Academy Press. www.ansci.cornell.edu/sheep/management/feeding/nrctable.html.
- Umberger, S. 2009. Feeding sheep. Virginia Tech Cooperative Extension. www.ext.vt.edu/pubs/sheep/410-853/410-853.html#L5I.

SHEEP NUTRIENT REQUIREMENTS

(Note: These are estimates of the daily requirements for each sheep.)

Sheep type	Nutrient		
	Crude protein	Calcium	Phosphorus
Pre-weaned lamb	26%	0.82%	0.38%
Growing lamb (60 to 90 lb)	15.5%	0.53%	0.24%
Finishing lamb (90 to 130 lb)	14%	0.55%	0.28%
Maintenance ewe (Weighs 154 lb [70 kg])	9.4%	0.20%	0.20%
Late gestation ewe (Last 4 weeks of gestation; weighs 154 lb [70 kg])	11.3%	0.40%	0.24%
Lactating ewe (First 6 to 8 weeks of lactation suckling twins; weighs 154 lb [70 kg])	15%	0.39%	0.29%

FEED CARDS (Note: The ingredients are from actual feeds but the names of the feeds are fictional.)

Fabulous Fiber for your Fabulous Flock

...Guaranteed Analysis...

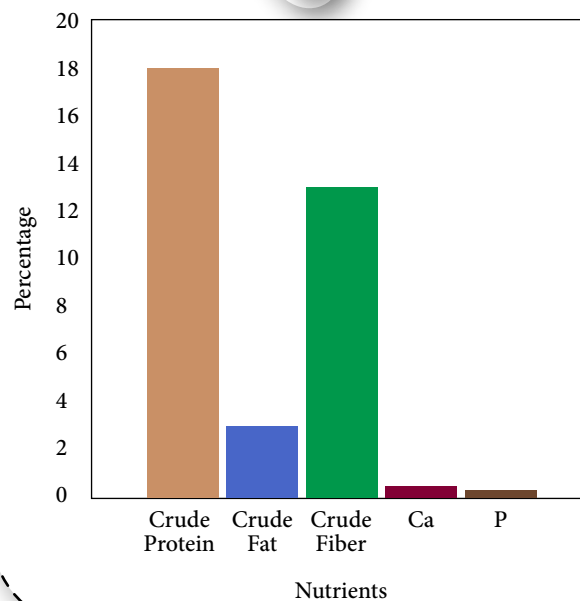
Crude Protein not less than 18.00%

Crude Fat not less than 3.00%

Crude Fiber not less than 13.00%

Calcium (Ca) between 0.50%–0.90%

Phosphorous (P) not less than 0.30%



Awesome Almonds!

...Guaranteed Analysis...

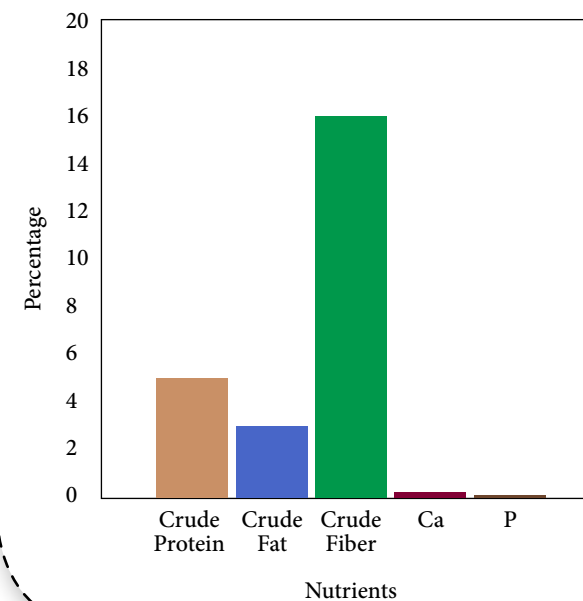
Crude Protein...5.00%

Crude Fat...3.00%

Crude Fiber...16.00%

Calcium (Ca)...0.25%

Phosphorous (P)...0.10%



Pellets for the Palate Show Quality Alfalfa

...Guaranteed Analysis...

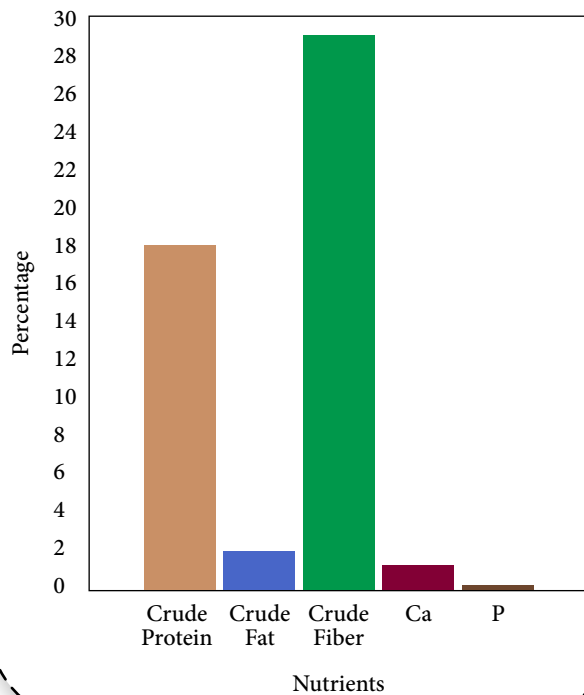
Crude Protein...18.00%

Crude Fat...2.00%

Crude Fiber...29.00%

Calcium (Ca)...1.30%

Phosphorous (P)...0.23%



Corn Cobs Complete

...Guaranteed Analysis...

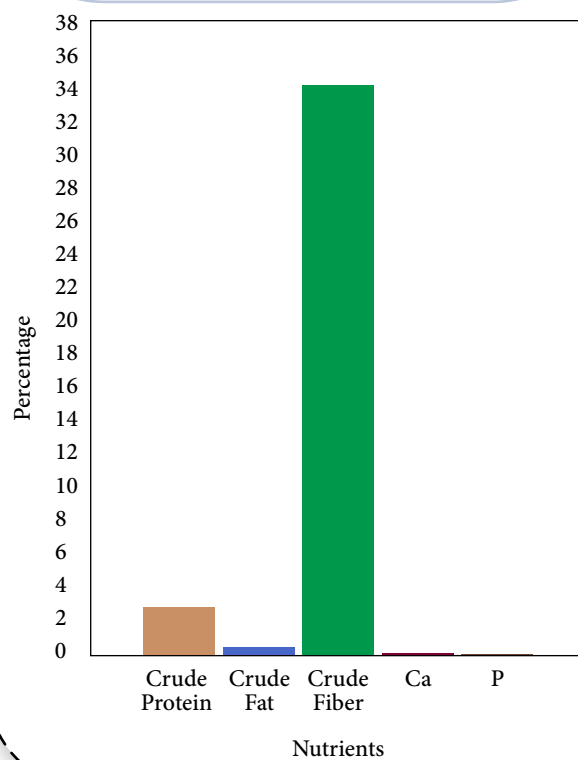
Crude Protein...3.00%

Crude Fat...5%

Crude Fiber...36.00%

Calcium (Ca)...0.12%

Phosphorous (P)...0.04%



Oat Hay Everyday

...Guaranteed Analysis...

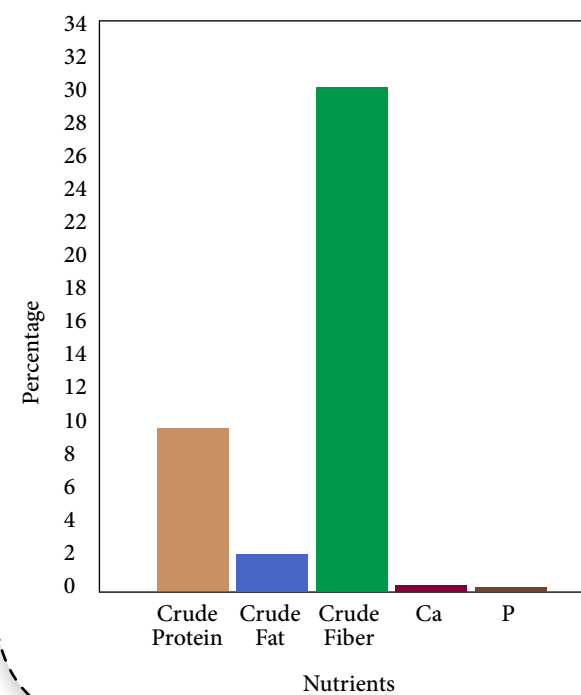
Crude Protein...10.00%

Crude Fat...2.30%

Crude Fiber...31.00%

Calcium (Ca)...0.40%

Phosphorous (P)...0.27%



Special Hay for Special Animals Vetch Hay

...Guaranteed Analysis...

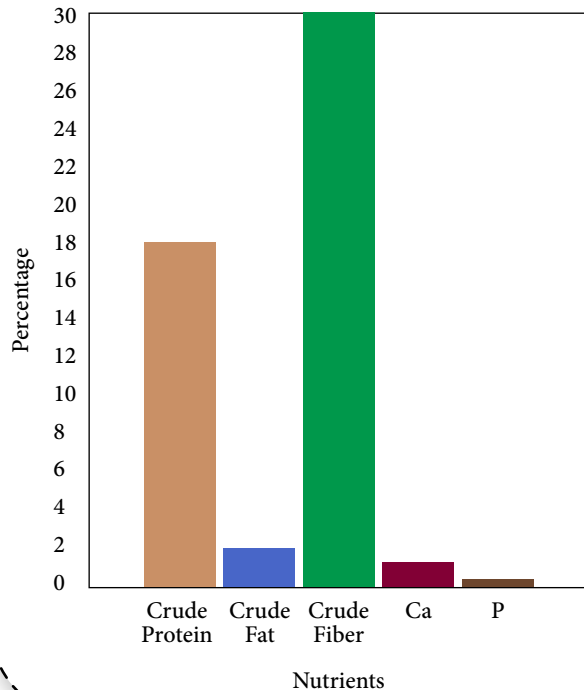
Crude Protein...18.00%

Crude Fat...1.80%

Crude Fiber...30.00%

Calcium (Ca)...1.25%

Phosphorous (P)...0.34%



Quality Alfalfa Hay Gourmet

...Guaranteed Analysis...

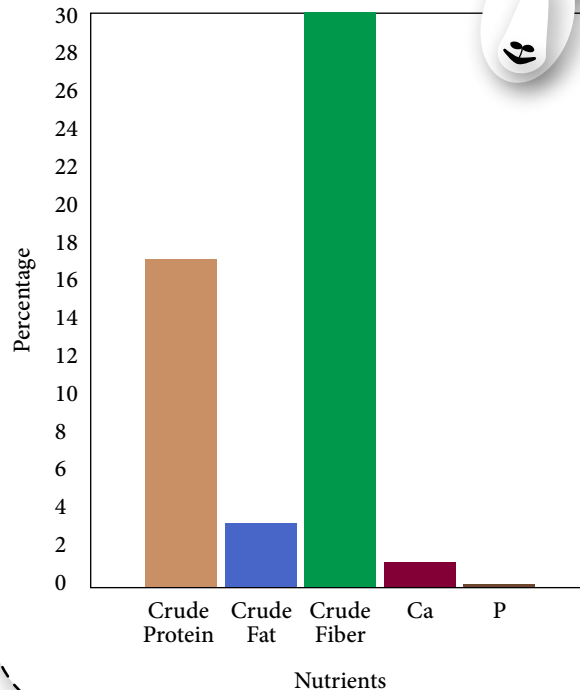
Crude Protein...17.00%

Crude Fat...3.60%

Crude Fiber...30.00%

Calcium (Ca)...1.40%

Phosphorous (P)...0.20%



Lamb-a-Day Keeps the Vet Away!

...Guaranteed Analysis...

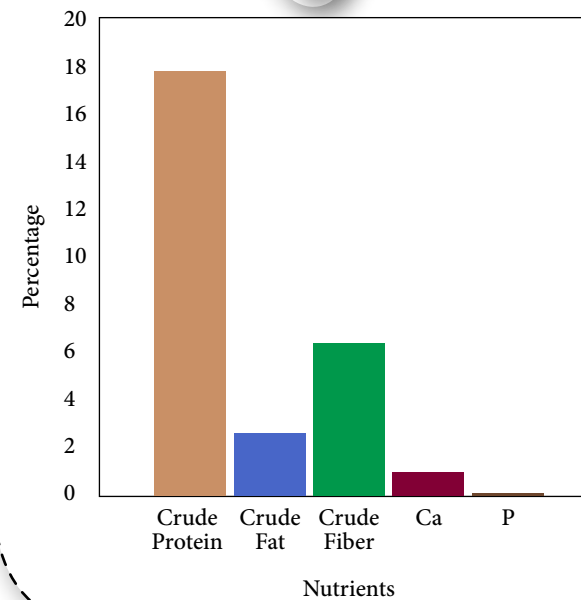
Crude Protein...minimum 18.00%

Crude Fat...minimum 2.40%

Crude Fiber...maximum 16.00%

Calcium (Ca)...between 0.78% and 1.20%

Phosphorous (P)...minimum 0.16%



Robust Ram Rations

...Guaranteed Analysis...

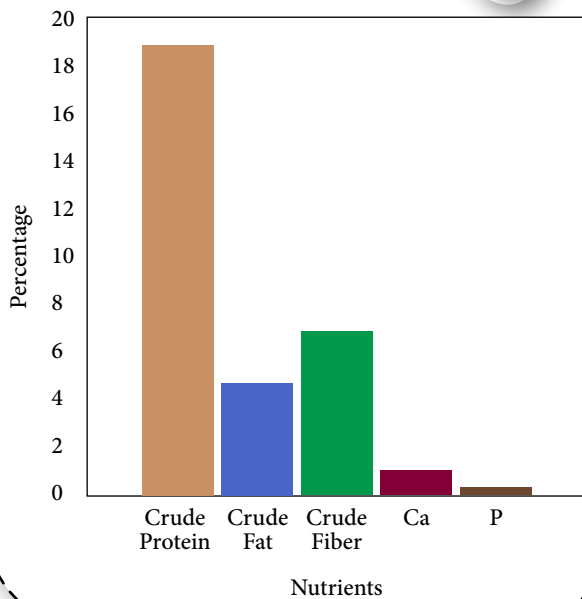
Crude Protein...minimum 19.00%

Crude Fat...minimum 4.50%

Crude Fiber...maximum 7.30%

Calcium (Ca)...between 0.78% and 1.80%

Phosphorous (P)...minimum 0.42%



Fleet Sheep Chow

...Guaranteed Analysis...

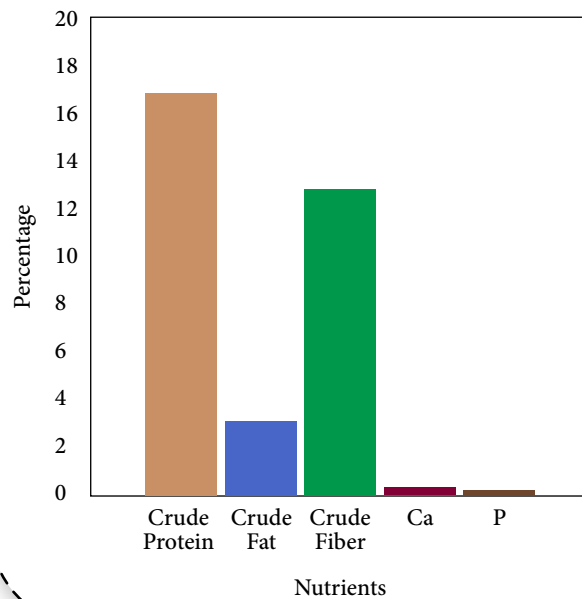
Crude Protein...minimum 17.00%

Crude Fat...minimum 3.00%

Crude Fiber...maximum 13.00%

Calcium (Ca)...between 0.50% and 0.90%

Phosphorous (P)...minimum 0.30%



Fiber for Your Flock

...Guaranteed Analysis...

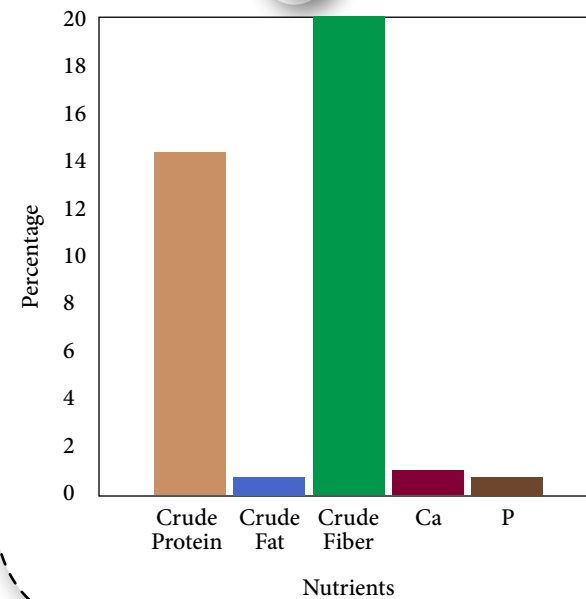
Crude Protein...minimum 14.00%

Crude Fat...minimum 0.75%

Crude Fiber...maximum 20.00%

Calcium (Ca)...between 0.75% and 1.00%

Phosphorous (P)...between 0.30% and 1.00%



Better Balance

...Guaranteed Analysis...

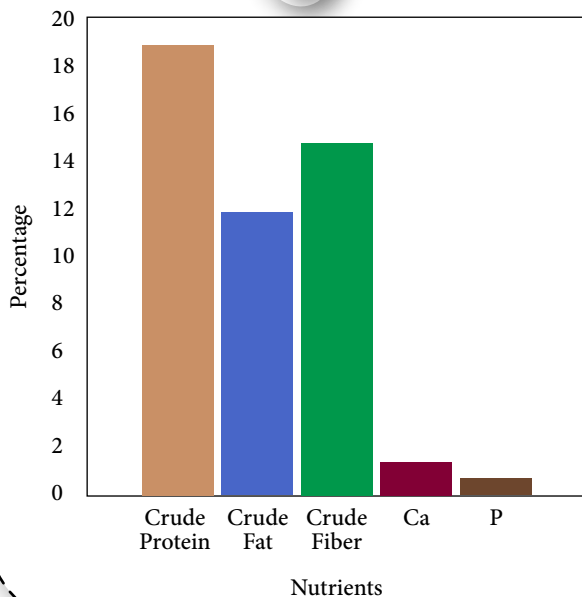
Crude Protein...minimum 19.00%

Crude Fat...minimum 12.00%

Crude Fiber...maximum 15.00%

Calcium (Ca)...between 1.40% and 1.90%

Phosphorous (P)...between 0.60% and 0.90%



NUTRIENTS WORKSHEET

Part A:

Life stage of sheep: _____

Feed type: _____

Part B:

Sheep nutrient requirements

Crude protein: _____

Calcium: _____

Phosphorus: _____

Feed nutrients

Crude protein: _____

Calcium: _____

Phosphorus: _____

Based on your understanding of your sheep's nutritional needs, determine whether you believe the feed you chose:

sufficiently meets sheep dietary requirements (please explain). _____

does not sufficiently meet sheep dietary requirements (please explain). _____

unable to determine (please explain). _____

Potential Benefits of the feed you chose: _____

Potential Drawbacks of the feed you chose: _____

What might you do to improve your sheep's feed? (please explain) _____

Part C:

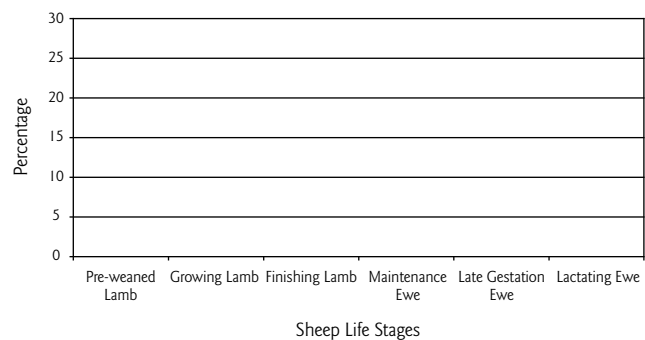
Of the feeds available, which diet best meets your sheep's requirements? (please explain) Include any modifications you might have for the feed. _____

Life stage of sheep	Feed type	Why did you choose this feed?
Pre-weaned lamb		
Growing lamb		
Finishing lambs		
Maintenance ewe		
Late gestation ewe		
Lactating ewe		

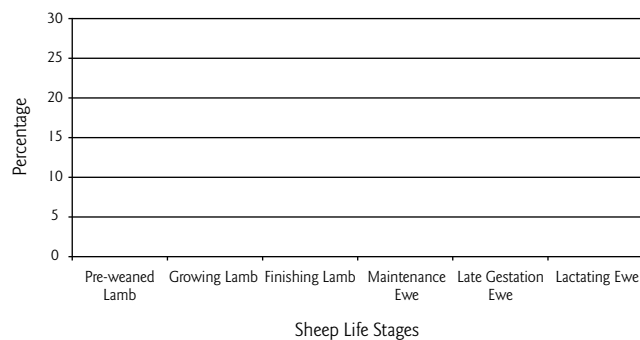
Part D:

Please use *Sheep Nutrient Requirements* worksheet to complete each graph below as a line graph.

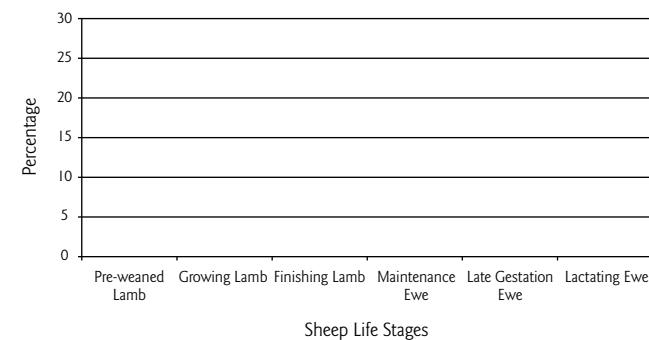
Crude Protein



Calcium



Phosphorus



Facts about Nutrients

Lack of Nutrients

- *Lack of Protein:* A lack can cause muscle loss, reduction in growth, weakened defenses against disease, and weakened heart and respiratory system.
- *Lack of Calcium:* This can lead to poor growth and muscle definition as well as bone diseases such as rickets.
- *Lack of Phosphorus:* A lack of phosphorus can be associated with a lack of vitamin D. Symptoms include poor growth and development of bone diseases such as rickets in lambs. In sheep, symptoms include weight loss, fractures, and loss of appetite.

Excess of Nutrients

- *Excess Protein:* Feeding sheep an excess of protein is expensive and is an inefficient source of energy. Very large excess of protein can cause ammonia toxicity, which causes nervousness, loss of coordination, difficulty breathing, bloating, and can lead to death.
- *Excess Calcium:* An excess of calcium in a diet can cause deficiencies in other minerals, including phosphorus, magnesium, iron, iodine, zinc, and manganese.
- *Excess Phosphorus:* If sheep are fed an excess of phosphorus, they can develop problems such as defective bone development or stones in the urinary tract.

Other Important Nutrients

Fat

- *Lack of Fat:* A lack of fat has indirect effects on the sheep. Mainly it reduces the production of essential fatty acids, and that can cause skin problems, loss of wool, and unthrifty appearance.
- *Excess Fat:* An excess of fat in the diet can cause reductions in future milk production in ewes. A decreased feed intake with feed containing over 10% fat can cause health problems in sheep.

Fiber

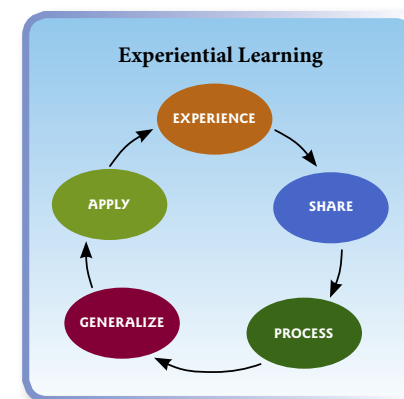
- *Lack of Fiber:* A lack of fiber can cause digestive problems in sheep and can lead to diseases, including acidosis. It also has the potential to harm the “good” microbes in the rumen of the sheep.
- *Excess Fiber:* An excess of fiber can cause decreased digestibility of the diet and reduced animal performance (that is, reduced gain and feed efficiency).

Recommendations to Improve Sheep Feed

- Look at other feed types and see if there is one that better matches the type of sheep you have.
- Combine different types of feed to meet your sheep's nutrient requirements.
- Add supplements to the feed when you identify a lack of vitamins or minerals.

APPENDIX A

The activities in this curriculum are designed around inquiry and experiential learning. Inquiry is a learner-centered approach in which individuals are problem solvers investigating questions through active engagement, observing and manipulating objects and phenomena, and acquiring or discovering knowledge. Experiential learning (EL) is a foundational educational strategy used in 4-H. In it, the learner has an experience phase of engagement in an activity, a reflection phase in which observations and reactions are shared and discussed, and an application phase in which new knowledge and skills are applied to a real-life setting. In 4-H, an EL model that uses a 5-step learning cycle is most commonly used. These five steps—Exploration, Sharing, Processing, Generalizing, and Application—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL and the 5-step learning cycle, please visit the University of California's Science, Technology, Environmental Literacy Workgroup's Experiential Learning website, www.experientiallearning.ucdavis.edu/default.shtml.

APPENDIX B

Sheep Nutrient Requirements Table

Class	Weight	ADG	DMI (%)	TDN (%)	DE (mcal/kg)	ME (mcal/kg)	CP (%)	CA (%)	P (%)
Ewes									
Maintenance	—	—	1.5–2.0	55.0	2.4	2.0	9.4	0.20	0.20
Flushing (2 weeks pre-breeding to 3 weeks post-breeding)	—	—	2.2–3.2	59.0	2.6	2.1	9.1	0.32	0.18
Non-lactating, first 15 weeks of gestation	—	—	1.8–2.4	55.0	2.4	2.0	9.3	0.25	0.20
Last 4 weeks of gestation (130 to 150% lambing rate) or last 4 to 6 weeks of lactation suckling singles	—	—	2.2–3.2	59.0	2.6	2.1	10.7	0.35	0.23
Last 4 weeks of gestation (180 to 225% lambing rate)	—	—	2.3–3.4	65.0	2.9	2.3	11.3	0.40	0.24
First 6 to 8 weeks of lactation suckling singles or last 4 to 6 weeks of lactation suckling twins	—	—	3–4.2	65.0	2.9	2.4	13.4	0.32	0.26
First 6 to 8 weeks of lactation suckling twins	—	—	3.6–4.8	65.0	2.9	2.4	15.0	0.39	0.29
Ewe lambs									
Non-lactating, first 15 weeks of gestation	—	—	2.4–3.5	59.0	2.6	2.1	10.6	0.35	0.22
Last 4 weeks of gestation (100 to 120% lambing rate)	—	—	2.6–3.8	63.0	2.8	2.3	11.8	0.39	0.22
Last 4 weeks of gestation (130 to 175% lambing rate)	—	—	2.6–3.8	66.0	2.9	2.4	12.8	0.48	0.25
First 6 to 8 weeks of lactation suckling singles	—	—	3.6–4.2	66.0	2.9	2.4	13.1	0.30	0.22
First 6 to 8 weeks of lactation suckling twins	—	—	3.9–5.2	69.0	3.0	2.5	13.7	0.37	0.26
Replacement ewe lambs	66	0.50	4.0	65.0	2.9	2.4	12.8	0.53	0.22
	88	0.40	3.5	65.0	2.9	2.4	10.2	0.42	0.18
	>110	0.25	2.5	59.0	2.6	2.1	9.1	0.31	0.17
Replacement ram lambs	88	0.65	4.5	63.0	2.8	2.3	13.5	0.43	0.21
	132	0.60	4.0	63.0	2.8	2.3	11.0	0.35	0.18
	>176	0.45	3.5	63.0	2.8	2.3	9.6	0.30	0.16
Lambs, finishing, 4–7 months old	66	0.65	4.3	72.0	3.2	2.5	14.7	0.51	0.24
	88	0.60	4.0	76.0	3.3	2.7	11.6	0.42	0.21
	110	0.45	3.2	77.0	3.4	2.8	10.0	0.35	0.19
Early weaned lambs, moderate/rapid growth potential	22	0.55	5.0–6.0	80.0	3.5	2.9	26.2	0.82	0.38
	44	0.66	5.0–6.0	78.0	3.4	2.8	16.9	0.54	0.24
	66	0.72	4.3–4.7	78.0	3.3	2.7	15.1	0.51	0.24
	>88	0.88	3.0–3.8	78.0	3.3	2.7	14.5	0.55	0.28

*DMI, % of BW: The lighter the animal or the more rapid the gain means the higher percent of body weight (BW) that the animal can eat. For example, ram lambs under 100 lb can eat about 4.5% of their BW, whereas ram lambs over 150 lb can eat about 3.5% of their BW in DM. From *Nutrient Requirements of Sheep, Sixth Revised Edition* (1985), National Academy Press, Washington, D.C.

APPENDIX C

Grain and Hay Ratio for Market Lambs Projects

Sheep are ruminants, so it is very important that you always provide them with hay to keep their rumen healthy.

Weight (lb)	Grain (lb)	Hay (lb)	Total (lb)
60	1 – 1.5	0.5 – 1	1.5 – 2.5
70	1.5 – 2	0.5	2 – 2.5
80	2 – 2.5	0.5	2.5 – 3
90	2.5 – 3	0.25	2.75 – 3.25
100	3 – 3.5	Handful*	3 – 3.5
110	3.5 – 3.75	Handful*	3.5 – 3.75
120	3.6 – 4	Handful*	3.6 – 4
130	4	Handful*	4
140	4.5	Handful*	4.5

* Once a lamb weighs 100 pounds, feed it a handful of good quality grass hay or alfalfa hay in addition to the grain.

Table by Celina Johnson.

GLOSSARY

- **Balanced diet:** Eating the right types of food in the right amounts to maintain a healthy body.
- **Basic nutrients:** Substances that help maintain a healthy body. These include carbohydrates, proteins, vitamins and minerals.
- **Care:** Having concern for someone or something which leads to tending or overseeing that person or thing.
- **Direct contact:** Physical contact between an ill person or animal and a healthy person or animal.
- **Disease:** An abnormal condition that affects the normal function and health of an organism, decreasing the health of that organism. Disease prevention: Taking the necessary steps to prevent humans and/or animals from getting sick.
- **Disease transmission:** To transfer a disease from one person or animal to another.
- **Environmental needs of humans and sheep:** The things that both humans and sheep need in their home or living area to help them survive and live comfortably.
- **Essential nutrients:** Nutrients that humans and animals must have to live and function properly.
- **Extensive systems:** Systems that don't constrain animals and allow them to perform their natural foraging behavior.
- **Facial recognition:** Being able to identify and remember a face or several faces.
- **Flight zone:** A buffer zone around an animal. Animals will move away from anything they perceive as a threat if it intrudes within this buffer zone.
- **Flock (n)/Flocking (v):** A group of animals that stick and feed together.
- **Flocking instinct:** A natural instinct of a group of animals to stick together and follow the actions of the leader of the group.
- **Germ:** A microorganism that has the potential to cause diseases.
- **Health care monitoring:** Closely observing an animal's health, behavior and activity everyday to determine what is normal or abnormal about your animal.
- **Herd:** The act of gathering and keeping a group of animals together.
- **Herd strategies:** Different techniques that are used to gather and control a group of animals.
- **Illness:** Being unhealthy or in poor health.
- **Indirect contact:** When an uninfected person or animal touches the contaminated surface (e.g., table top) of an inanimate object (e.g., food dish).
- **Intensive systems:** Systems where animals are confined to a smaller area of land and where feeding is more controlled.
- **Life stages of sheep:** Sheep are categorized in different stages of development or life stages. Sheep at each life stage have different nutritional requirements to grow and stay healthy.
- **Predator:** Animals that hunt and eat other animals to survive.
- **Preventative health care:** The act of maintaining the health of humans and animals by preventing them from catching an illness or disease.
- **Prey:** Animals that are considered food to other animals.
- **Responsibility:** Being accountable for one's actions or behaviors.

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