AGRICULTURE

The items with an asterisk (✱) are related to the learning activities that will take place on the field trip.

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1. AGRICULTURE BACKGROUND

A. History of Montgomery County Agriculture and the Agricultural History Farm Park

Montgomery County Agriculture

Montgomery County has played a significant role through the years in the nation's most basic – but important – industry: agriculture. Throughout the 18th century "tobacco growing" days, the 19th century "grain production" and the growth of dairy farms in the 20th century, Montgomery County has continued as a forerunner in agricultural yields and methods.

The Depression, following prolonged tobacco culture at the end of the 18th century, resulted in the formation of the Sandy Spring Farmers' Society which promoted "scientific farming." Within a few years, county farmers organized what is considered the nation's first agricultural fair and the first agricultural journal.

The impact that county farmers had on local, state and national agricultural events would continue under the leadership of Sandy Spring's frugal *Quakers* and men like Dr. William Brewer of Poolesville, who was the founder of the Medley's District Agricultural Grange, which hosted Maryland's first Farmers' Institute. Allen Bowie Davis led the drive that created the Maryland Agricultural College, now the *University of Maryland*, even offering his own land for a campus!

Among these enterprising farmers was Otho Magruder, the mid-19th century owner of the land which is now the Agricultural History Farm Park. Magruder, an agricultural innovator, helped found the Montgomery County Agricultural Society in 1846. The farm became known as "Waveland" as a result of his successful conversion to wheat culture. The earlier owners, Scottish immigrants also named Magruder, had acquired the acreage for tobacco culture.

The farm was purchased in 1888 by Frederick County farmer, Thaddeus Bussard. The Bussard family improved the farm by building a bank barn and modernizing the farmhouse. A generalized farming operation took place during their ownership until the 1960's, when the Maryland National Capital Park and Planning Commission purchased the property.

Agricultural History Farm Park

Situated along Rock Creek in Derwood, Maryland, the Agricultural History Farm Park is a 410 acre complex with a farmhouse, barn, assorted farm buildings and an activity center.

To interpret past farming practices, 70 acres were set aside as an historic area. The farmhouse is currently being furnished to reflect the home of an average turn-of-the-century family. Programs to interpret the typical Montgomery County farmer's lifestyle are planned for the future. Today the Farm Park hosts seasonal festivals depicting farm life both past and present.

B. Maryland Agricultural Statistics

Important Commodities in Maryland

Ranked by $ Value of Receipts

	COMMODITY	REGION PRODUCED
1	Poultry – Broilers	Maryland's Eastern Shore
2	Soybeans	Statewide
3	Dairy	Statewide
4	Nursery & Greenhouse	Baltimore-Washington Metro Areas
5	Corn	Statewide
6	Cattle	Central Maryland
7	Vegetables	Statewide
8	Wheat	Statewide
9	Other livestock	Statewide
10	Tobacco	Southern Maryland
11	Hay	Statewide
12	Swine	Statewide
13	Fruit	Statewide
14	Barley	Statewide
15	Sheep	Statewide

Montgomery County Farm Products

Crops	# of Acres
Corn	12,675
Soybeans	11,688
Hay	10,737
Wheat	4,161
Barley	900

Livestock	# on Farm
Horses	10,000
Cattle	2,423
Milk Cows	703
Sheep	741
Swine	

Rank Among 23 Maryland Counties

Commodity	Rank
Sod	1
Nursery & Greenhouse	1
Horses	2
Barley	2
Hay	6
Cattle	8
Sheep	8
Milk	9
Soybeans	12
Wheat	13
Swine	18
Corn	19

C. Montgomery County Agricultural Statistics

Source: www.montgomerycountymd.gov/agservices

Montgomery County's agricultural reserve is an important environmental resource for future farm enterprises. A strong agricultural heritage provides a diverse business community and a strong economic base. Combining these strengths with the commitment for farmland preservation makes Montgomery County an attractive place to live and work.

Agriculture

Agricultural activities occupy about one-third of Montgomery County's land area. Over three quarters of the 93,000 acre agriculture reserve is preserved through transfer of development rights or easement purchase initiatives. The County's diverse agricultural industry – 561 farms and 350 horticultural enterprises – produce millions of dollars in economic contribution from farm products and operations. The majority of Montgomery County farms are family-run operations, many reaching back several generations, which employ more than 10,000 residents. Cash grain farms are the predominant agricultural use in the County covering over 48,000 acres and farms. There are 217 farms or 38 percent that produce table food crops-products for direct human consumption.

Horticulture

During the past 25 years, the horticultural sector has grown dramatically. The 350 horticultural businesses employ more than 7,000 of the people working in agriculture. Horticulture is one of the largest sectors in agriculture and includes nurseries and landscaping companies, arborists, sod farms and lawn care firms, and green house businesses.

Twenty percent of the horticultural industry in Maryland is in the County and Montgomery County ranks second in the state in total number of horticultural firms.

Equine Industry

Horses have become a major component of the agricultural industry numbering over 10,000 horses. Horses represent a tremendous opportunity for farmers in terms of the

supplies, services and products needed to support the horse population which exceeds the population of cows. The growing hay industry in Montgomery County is directly proportional to the growing number of horses. High quality veterinarians that provide services to horses are now available for other livestock operations in the County.

Agriculture for the Future

Montgomery County is committed to sustaining a viable agricultural industry. The Agriculture Reserve established in 1981 by the Preservation of Agriculture and Rural Open Space Functional Master Plan, provides 93,000 acres for farming. A variety of private organizations assist farmers to prosper in Montgomery County: Montgomery County Farm Bureau, Agricultural Advisory Committee, Agricultural Preservation Advisory Board and Montgomery County Farmers Markets work together with the University of Maryland Extension, Soil Conservation District and Farm Service Agency.

Farmland Preservation

	Acres Protected
Montgomery County Agricultural Easement Program (AEP)	8,382
Montgomery County Transfer of Development Rights (TDR)	52,052
Maryland Environmental Trust (MET)	2,086
Maryland Agricultural Land Preservation Foundation (MALPF)	4,675
Rural Legacy Program (RLP)	4,875
Building Lot Termination Program (BLT)	409
Total	72,479

Economic Contribution to County's Economy

Over 174 county farms have annual sales of $10,000 or more. The average farm size is 121 acres and 35 percent of the farms are greater than 50 acres in size.

Traditional Agriculture	$33,193,000
Horticultural Industry	$125,330,000
Equine Industry	$84,855,896
Total	$243,378,896

Statistics provided by Ag Census 2002/2007 United States, Department of Agriculture, USDA-NASS, University of Maryland Extension.
Prepared by: Montgomery County Department of Economic Development Agricultural Services Division 301-590-2823
July 2013
E:\Publications\agfactsheet2013doc (pub/pres)

Montgomery County Statistics

Total Land in Montgomery County	316,800 Acres
Agriculturally Assessed Lands	77,726 Acres
Land in Farms	67,613 Acres
Percent of Land in Farms	21.3%
Number of Farms	561 Farms
Number of Horticultural Businesses	350
Average Farm Size	121 Acres
Average Market Value of Agricultural Products Sold Per Farm	$59,168 Dollars
Total Cropland	48,563 Acres
Harvested Crop Land	41,599 Acres
Pasture Land	12,922 Acres
Woodland (Public 31,513 and Private 57,487)	89,000 Acres
Average Age of Operator	60 Years
Percentage of Principal Occupation Farmers	43%
Publicly Owned Lands (Federal, State, County, WSSC)	58,500 Acres

Farms by Type of Enterprise

Crop or Livestock	Number of Farms	Output	Amount Produced
Beef	80		2,423 Cows
Horse	783		10,000 Horses
Dairy	5		703 Cows
Sheep	51		741 Sheep
Goats – Milk and Meat	50		912 Goats
Hogs & Pigs	14		
Poultry	59		3,029 Chickens
Corn for Grain	44	1.09 million bushels	12,675 Acres
Corn for Silage	13	9,042 tons	871 Acres
Wheat	30	244,446 bushels	4,161 Acres
Soybeans	35	279,039 bushels	11,688 Acres
Hay	82	23,926 tons	10,737 Acres
Fruits, Vegetables and Nuts	78		677 Acres
Christmas Trees	17		
Greenhouse, Nursery, and Floriculture Production	58		
Sod	7		677 Acres
Landscape, Arborist, Lawn Care Businesses	150		

2. PRODUCTION AGRICULTURE

What factors affect what is raised in a certain section?

- Topography

  Soil and water conservation techniques used by local farmers to protect our rolling, hilly soils include conservation tillage, strip crops, grass waterways and streamside grass or wooded buffers.

- Land Value

  Some farmland has been taken over by development near large cities like Washington, DC.

- Tradition

  In many areas, family farm tradition plays an important role. Farms working through several generations continue raising and growing products of their ancestors.

What are some limiting factors for production of farm products in Montgomery County?

- Land development for residential and commercial uses
- Cost of available farmland with competitive developers
- Concerns of urban neighbors with common farm practices such as the use of pesticides and fertilizers, animal odors and noises, dust, etc.
- Vandalism from ATV's riding through area fields, dumping of garbage and glass, etc.

What are some positive factors for production of farm products in Montgomery County?

- Large consumer market for fruit, vegetables and specialty crops
- Nearby markets and processing facilities for many products
- Aggressive farmland preservation program ensures farming for future generations

- Nearby research, extension and educational agencies for guidance and support in producing a high quality product

Interesting facts about agriculture in Montgomery County:

- 30% of the land in Montgomery County is farmland
- Average size farm is 121 acres
- There are 561 farms in the county
- About 43% of the farmers consider farming their main occupation

There are many products and activities that go into producing the food we eat every day. It is the farmers in Montgomery County, the State of Maryland and across the United States that produce the food for us.

A. Animal Production Agriculture

When you look at animal agriculture and the quantity of products that come from these animals, it is astounding.

DAIRY COWS

- There are approximately 9.2 million dairy cows in the United States
- These cows produce all the milk for every dairy product we buy at the grocery store
- A typical dairy cow will produce 60-120 pounds of milk every day, which equals approximately 9 gallons per day or about 150 ½ pints each day!

BEEF CATTLE

- There are approximately 33.5 million beef cattle in the United States
- These cattle provide the steaks, roasts, hamburger and other beef products we eat everyday
- One steer will provide 92 steaks, 30 roasts and 150 pounds of ground beef
- If we were to go to McDonalds, we can get 600 Big Macs out of one steer

HOGS

- There are approximately 53 million market hogs (pigs) in the United States
- These pigs provide the bacon, ham, sausage and pork chops we buy and consume
- When these hogs are shipped to market, they weigh approximately 250 pounds

B. Crop Production Agriculture

Production agriculture provides more than just the meat that we eat. In addition to animal production, there is crop production such as corn, wheat, soybeans, fruits and vegetables.

- In the United States, farmers grow approximately 9.9 billion bushels of corn, 2.2 billion bushels of wheat, and 2.8 billion bushels of soybeans each year
- 1 bushel of wheat will yield approximately 42 pounds of wheat flour or 73 1 lb. loaves of bread
- 1 acre of soybeans will produce enough oil to make 82,368 soy crayons
- 1 bushel of corn will produce enough sweetener to sweeten 325 cans of soda

As we examine crop production further, there are two types of plant that our crops are classified as:

- Grasses: These plants are single narrow leaves or have single narrow leaves branching from its stem. Crops such as corn, wheat, barley and rye are considered grasses.
- Legumes: These plants have broad, round leaves and take nitrogen out of the air, process it in the plant and then release it into the soil as fertilizer for itself and other plants. Crops such as soybeans, green beans and peas are considered legumes.

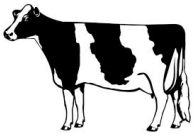
3. AGRICULTURE INDUSTRY

Source: Illinois Department of Agriculture, http://www.agr.state.il.us/kidspage/

What do you think of when you hear the word "**agriculture**"? The image of crops growing in a field or a barnyard full of animals may come to mind. But even if you don't live on a farm, agriculture is all around you. As consumers, we depend on agriculture to provide food, clothes and other things we use every day. As you learn about crops and animals and the ways in which they are used, remember that agriculture is more than farming. Turning crops and animals into products we can use, transporting these products to stores in the United States and around the world, caring for sick animals, manufacturing farming equipment, and protecting our land and water so plants and animals can grow – all of these activities, and many others, are part of the agricultural industry.

AGRICULTURE INDUSTRY QUIZ

1. Cows provide the milk you pour over your cereal at breakfast and drink with your lunch at school. Milk from cows is used to make foods such as cheese and ice cream. Cattle are also raised for their meat, called beef. Which of the following meats come from cattle?



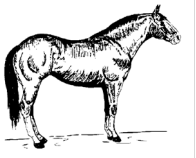
   a) sirloin steak
   b) bacon
   c) pork chops

2. This is a bale of hay. Hay is usually cut grass or plants such as clover or alfalfa gathered into bales or bundles. True or false: Most hay is used as animal feed:

   a) true
   b) false

3. Farmers raise chickens for meat and eggs. Eggs come from female chickens, called hens. How many eggs does the average hen produce in a year?

   a) 100 to 150
   b) 250 to 300
   c) 350 to 400



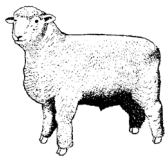
4. Many years ago, some kinds of horses were used to pull wagons or plow fields. Now most people keep horses for the fun of riding them. Other people race horses as a sport. True or false: A pony is a baby horse:

   a) true
   b) false

5. What is the name of this animal?

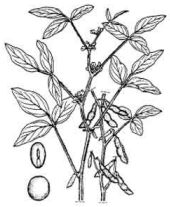
   a) rooster
   b) pullet
   c) gander

6. This animal is a sheep. When a sheep's wool coat grows long enough, it is trimmed off and used to make clothing and other items. Some people eat sheep meat. What is this meat called?



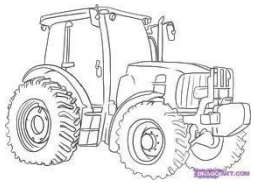
a) pork
b) beef
c) mutton

7. This plant produces soybeans. When processed or added to other ingredients, soybeans are very useful. They turn up in all kinds of places, such as soap, paper and paint. Soybeans are also found in many foods such as tofu, cereal, pizza, bread, cookies and frozen dinners. Which of the following products are made with soybeans?



a) video tapes
b) baby food
c) ink
d) all of the above

8. This is a tractor. Farmers use tractors to prepare the land for planting and to pull may other farm implements. Tractors are just one piece of equipment farmers use to do their jobs. What is the name of the machine used to harvest corn, soybeans and wheat?



a) harrow
b) combine
c) rotary hoe

9. This is a turkey. Turkey meat is especially popular on Thanksgiving. How many turkeys do Americans eat each year on this holiday?

a) 25 million
b) 45 million
c) 75 million

10. The weather is important to farmers because their jobs depend on it. The right mix of sunshine and rain is needed for crops to grow. Too little rain causes a _____. Too much rain at one time causes a _____.

11. Eggs come from chickens. True or false: All chicken eggs have white shells:

a) true
b) false

12. The Fourth of July would be less exciting if it weren't for agriculture. Which crop is found in fireworks?

a) corn
b) soybeans
c) wheat

13. Did you know corn flows through many of the gas pumps across the country? Corn is used to make a type of fuel called ethanol. Mixed with gasoline, ethanol is used to power cars and trucks. Which state produces the most ethanol?

a) Iowa
b) Nebraska
c) Illinois

14. Ham comes from which animal?

a) pig
b) cow
c) chicken

15. Which animal supplies the meat for hamburger?

a) sheep
b) pig
c) cow

16. Soybeans and corn are used to make some kinds of paint. These crops are also found in which of the following products?

a) adhesives (glues)
b) paper
c) ink
d) all of the above

17. If it weren't for agriculture, your pizza probably wouldn't taste very good. Which of the supply ingredients below are used to make pizza?

a) cows
b) vegetables
c) pigs
d) all of the above

18. Which grain is used to make the noodles in spaghetti?

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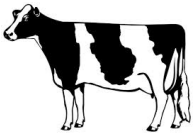

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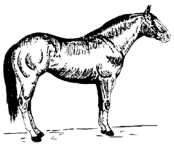

a) true
B) FALSE – THE DIFFERENCE BETWEEN PONIES AND HORSES IS HEIGHT, NOT AGE!

5. What is the name of this animal?

A) ROOSTER
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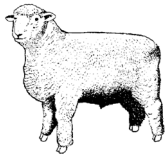

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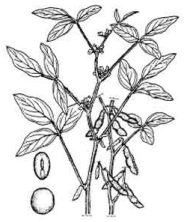

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11. Eggs come from chickens. All chicken eggs have white shells. True or false:

a) true
B) FALSE – EGGS CAN COME IN MANY COLORS DEPENDING ON THE BREED OF CHICKEN.

12. The Fourth of July would be less exciting if it weren't for agriculture. Which crop is found in fireworks?

A) CORN
b) soybeans
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C) ILLINOIS

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D) ALL OF THE ABOVE

17. If it weren't for agriculture, your pizza probably wouldn't taste very good. Which of the supply ingredients below are used to make pizza?

a) cows - cheese
b) vegetables - toppings
c) pigs – bacon, etc.
D) ALL OF THE ABOVE

18. Which grain is used to make the noodles in spaghetti?

A) WHEAT
b) corn
c) soybeans

Horse Facts

Tails

A horse's tail is very important to him. Not only does it act as a fly swatter in summer, it keeps his "bottom" warm in winter! The area between a horse's hind legs is the only part not kept warm by hair, so it loses the greatest amount of warmth if left exposed by too much trimming.

From a horse's point of view, the best tail is a natural tail.

Some horses have thin ragged tails, while others have tails so thick they cannot be braided for formal riding events and shows. To make the best of their appearance, thick or thin, different tails are treated in different ways. Some styles even go in and out of fashion!

Banged Tail

A "banged" tail is cut straight across the bottom to give it a neat appearance. It makes a scraggly tail look thicker.

Natural Tail

The natural tail is left thick and long if possible. **(It's the horse's favorite style!)**

Docked Tail

Often inflicted on harness horses to prevent their tails being caught up in the harness. Tail docking is illegal in many places as it's considered cruel.

Pulled Tail

The hair around the dock area, at the top, is pulled out to give the tail a more refined look. Show horses often have pulled tails.

DID YOU KNOW?

Horses will often stand "tail to tail" and shelter each other from annoying flies by swishing their tails for each other!

Some breeds are renowned for their tails. For example Appys often have sparse (thin), tails while Friesians and Morgans are known for their long luxuriant tails.

As well as using them for fly swatters, horses use their tails to send signals to each other about how they are feeling.

Braided Tail

The tail is first thinned at the top and then braided neatly around the dock for showing. Both manes and tails are usually braided for hunter classes.

Horse Facts

Markings

Many horses have white markings on their faces.

All these markings all have special names. These names are used by horse people to identify different horses which may otherwise appear the same in color.

The markings themselves may vary in shape, but bear a similarity on most horses.

See how many of these markings you can remember!

Star

- found high up between the eyes - often a diamond shape.

Snip

- small mark on the muzzle

Stripe

- long straight marking down the horse's nose.

Race

- long wavy or irregular stripe.

Bald Face

- marking that covers most of the horse's face.

Blaze

- broad marking down the front of the horse's face.

Star and Stripe

- star which continues down to join a stripe.

Star, Stripe & Snip

- marking which extends all the way down to the horse's muzzle.

Horse Facts

Foals

Have you ever wondered why foals all seem to be born around the same time?

Everyone knows that baby horses are called foals.

Boy foals are called colts, while girl foals are called fillies. Young horses are called colts and fillies up until the age of 3.
Yearlings are colts or fillies that are a year old.

When a horse is born, its legs are almost their full adult length! - giving them that extremely cute "long-legged look" we all love so much.

Did You Know...

Most foals are born at night under cover of darkness and away from prying eyes and possible danger.

The best time of year for a foal to be born is in the spring, when the weather is at its kindest and the lush

Horse Birthdays

Thoroughbreds all have their birthday on the same day. This makes it easier for keeping racing, breeding and showing records.

In the Northern Hemisphere, (which includes the USA, Canada and Europe),

grass is at its best for the mares.

A newborn foal can stand up within an hour of being born and can keep up with the rest of the herd within 24 hours!

When first born, foals cannot eat grass because their legs are too long to reach it!

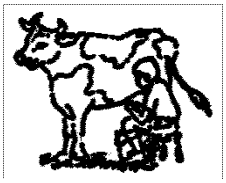
their birthday is January1st.

In the Southern Hemisphere (which includes Australia, New Zealand and Japan), horses have their birthday on August 1st.

4. THE STORY OF MILK – FROM COW TO YOU

The Story of Milk – from Cow to You

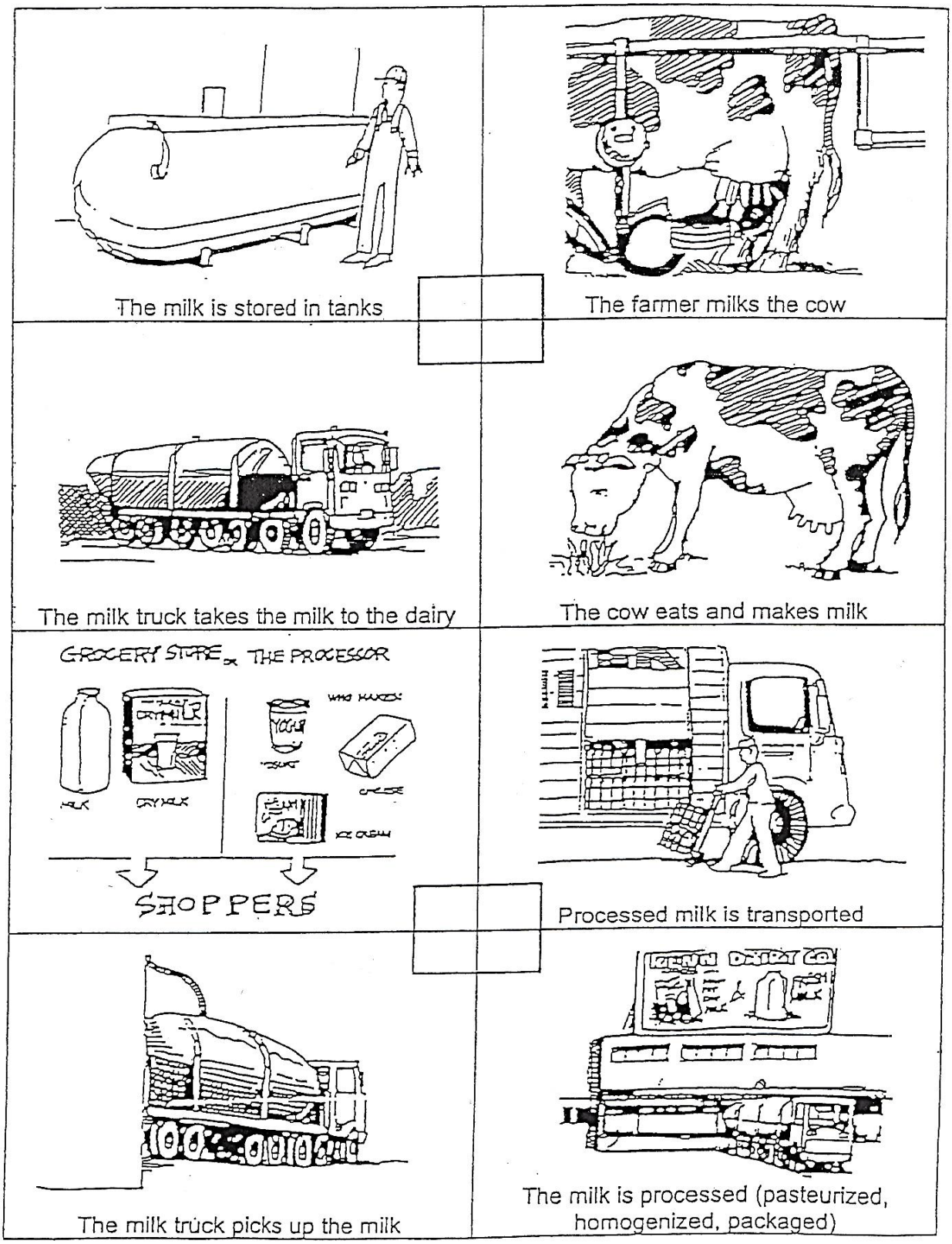
Every day, dairy farmers give their cows water to drink and a mixture of hay and grains to eat. Cows' bodies turn this food and water into milk. Two or three times a day, farmers milk their cows, using a special machine attached to the cows' udders. Milk is then stored in a refrigerated tank on the farm. Farmers test the milk to make sure it is wholesome. Every other day or so, trucks visit each dairy farm to pick up the milk and take it to a factory.

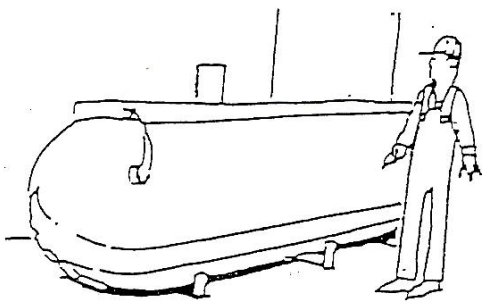


At the factory, workers test the milk again. Milk is pasteurized, which means it is heated up to kill any germs it may contain. Milk is also poured through tiny holes to break up solid particles. This process is called homogenization. Workers then put the milk into containers. Cartons and jugs of milk are sent to restaurants, schools and stores, where you can buy it to drink.

Milk Processing Sequence

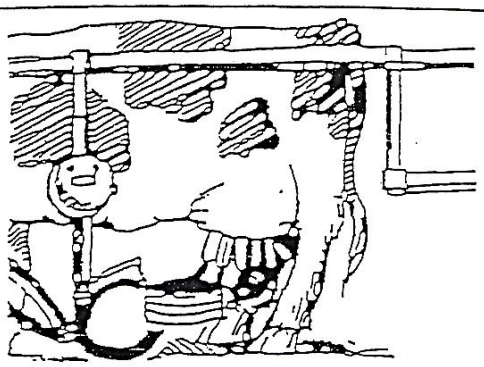
Describe the milk production/processing sequence by numbering the food cards in the correct order:



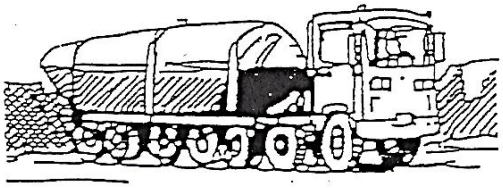


The milk is stored in tanks

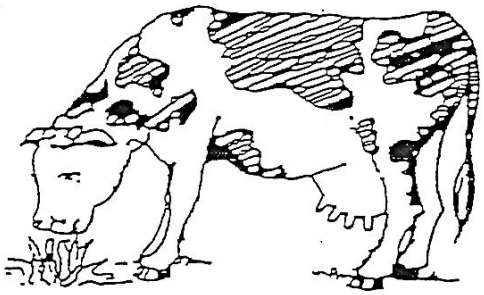
3	2
5	1



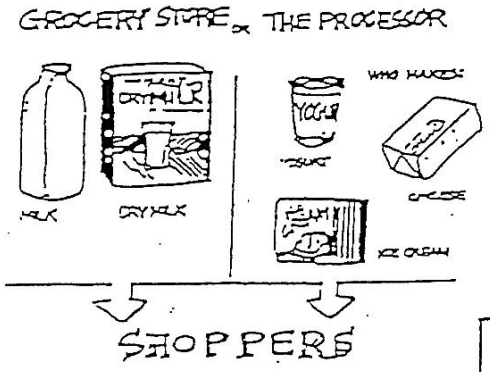
The farmer milks the cow

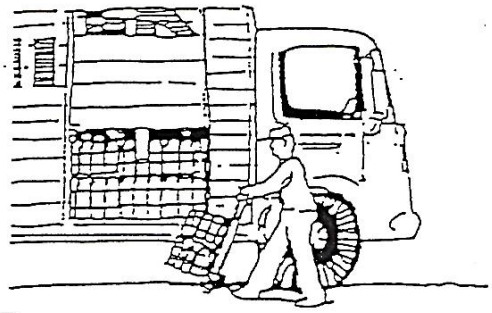


The milk truck takes the milk to the dairy



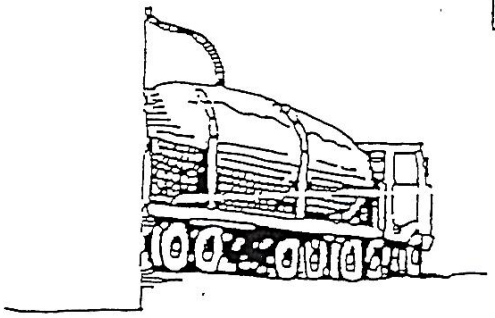
The cow eats and makes milk



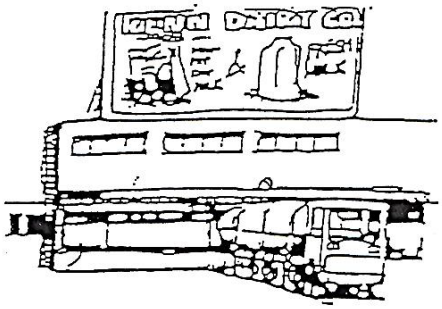


Processed milk is transported

8	7
4	6



The milk truck picks up the milk



The milk is processed (pasteurized, homogenized, packaged)

5) BEEF ACTIVITIES

History

The introduction of cattle to North America mirrors the exploration and settlement of the continent by Europeans. Columbus introduced cattle to the Western Hemisphere on his second voyage to the new World in 1493. Spanish explorers Hernando Cortez took offspring of those same cattle to Mexico in 1519.

Nutritional Value

Beef is a nutritionally dense food that is an excellent or good source of nine essentials nutrients. A 3-ounce serving of lean beef contributes less than 10 percent of the Daily Value for protein, zinc, Vitamin B12, selenium, phosphorous, niacin, vitamin B6, iron and riboflavin. Beef is the number one food source of protein, zinc and vitamin B12. Beef can be part of a heart-healthy diet. The U.S. Department of

Agriculture's Nutrient Database shows that 29 cuts of beef meet government standards for lean or extra lean and that many cuts of beef are 20 percent leaner than they were 15 years ago. Half of the fatty acids found in beef are monounsaturated, the same "good fat" found in olive oil.

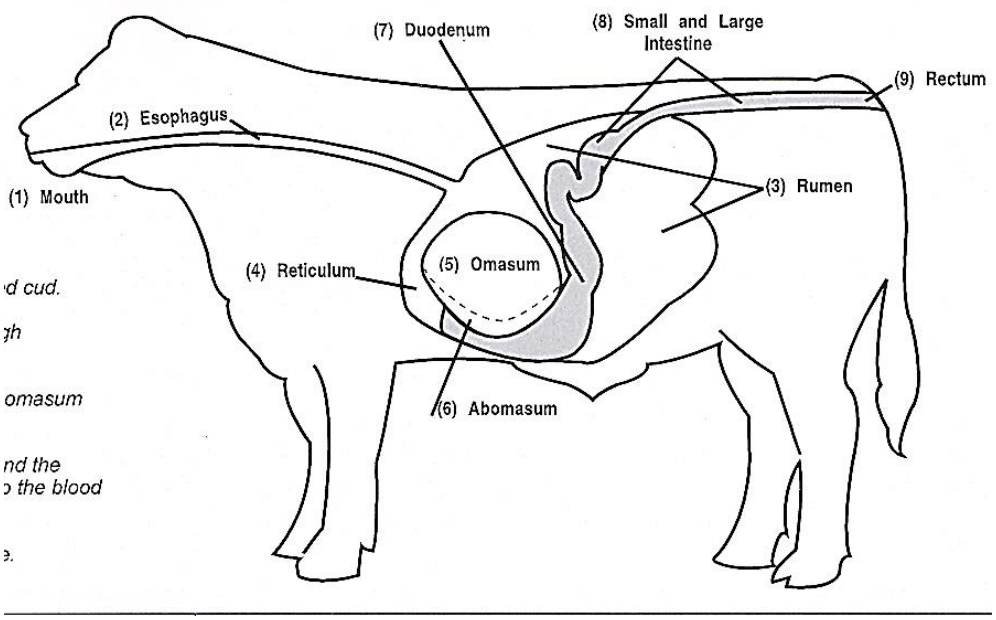
Journey of Food Through A Ruminant Animal

Cattle are ruminants. Ruminants are unique because they have four-chambered stomachs.

1) Cattle chew food in their mouths.
2) After the food is swallowed, it travels down the esophagus to the rumen.
3) In the rumen, the largest chamber of the stomach, the food mixes and softens with the aid of microorganisms.
4) Food travels from the rumen to the reticulum where further digestion occurs. Large food items are returned to the mouth for further chewing. This food is called cud.
5) When the food particles are small enough, they pass through the omasum where water is removed.
6) The food travels to another stomach chamber called the abomasum where stomach juices continue to digest the food.

7-8) From the abomasum, food moves through the duodenum and the small and large intestines where nutrients are absorbed into the bloodstream and utilized by the animal.

9) Waste products are excreted through the rectum as manure.



Beef Cattle Quiz #1

1. How many chambers does a cattle stomach have?
2. What percentage of beef cattle is used in some way?
3. Name two beef by-products that are used to make a wide variety of products.
4. Why did people originally raise cattle?
5. What is the most popular form of beef served?
6. Name one mineral in beef that is readily used by the human body.
7. The five most popular sports in the United States depend on by-products from cattle.

   See if you can name them.

Beef Cattle Quiz #1

1. How many chambers does a cattle stomach have?

   FOUR

2. What percentage of beef cattle is used in some way?

   98% WITH LESS THAN HALF EATEN AS BEEF

3. Name two beef by-products that are used to make a wide variety of products.

   HIDE, TALLOW, FAT, BONES

4. Why did people originally raise cattle?

   FOR THEIR HIDES AND TALLOW

5. What is the most popular form of beef served?

   GROUND BEEF

6. Name one mineral in beef that is readily used by the human body.

   IRON, ZINC

7. The five most popular sports in the United States depend on by-products from cattle.

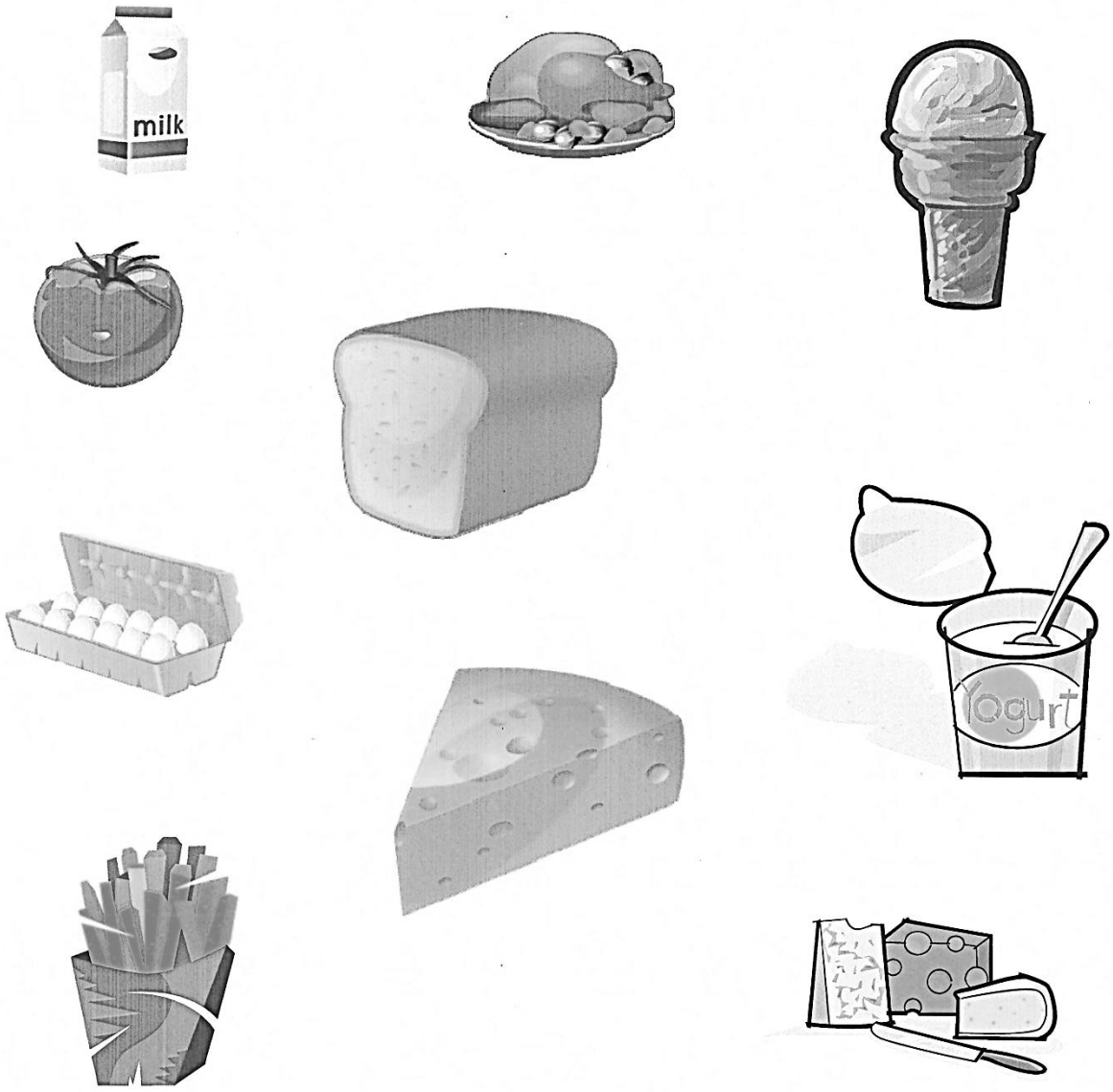
   See if you can name them.

   BASEBALL, FOOTBALL, BASKETBALL, SOCCER AND VOLLEYBALL

6) GOAT ACTIVITIES

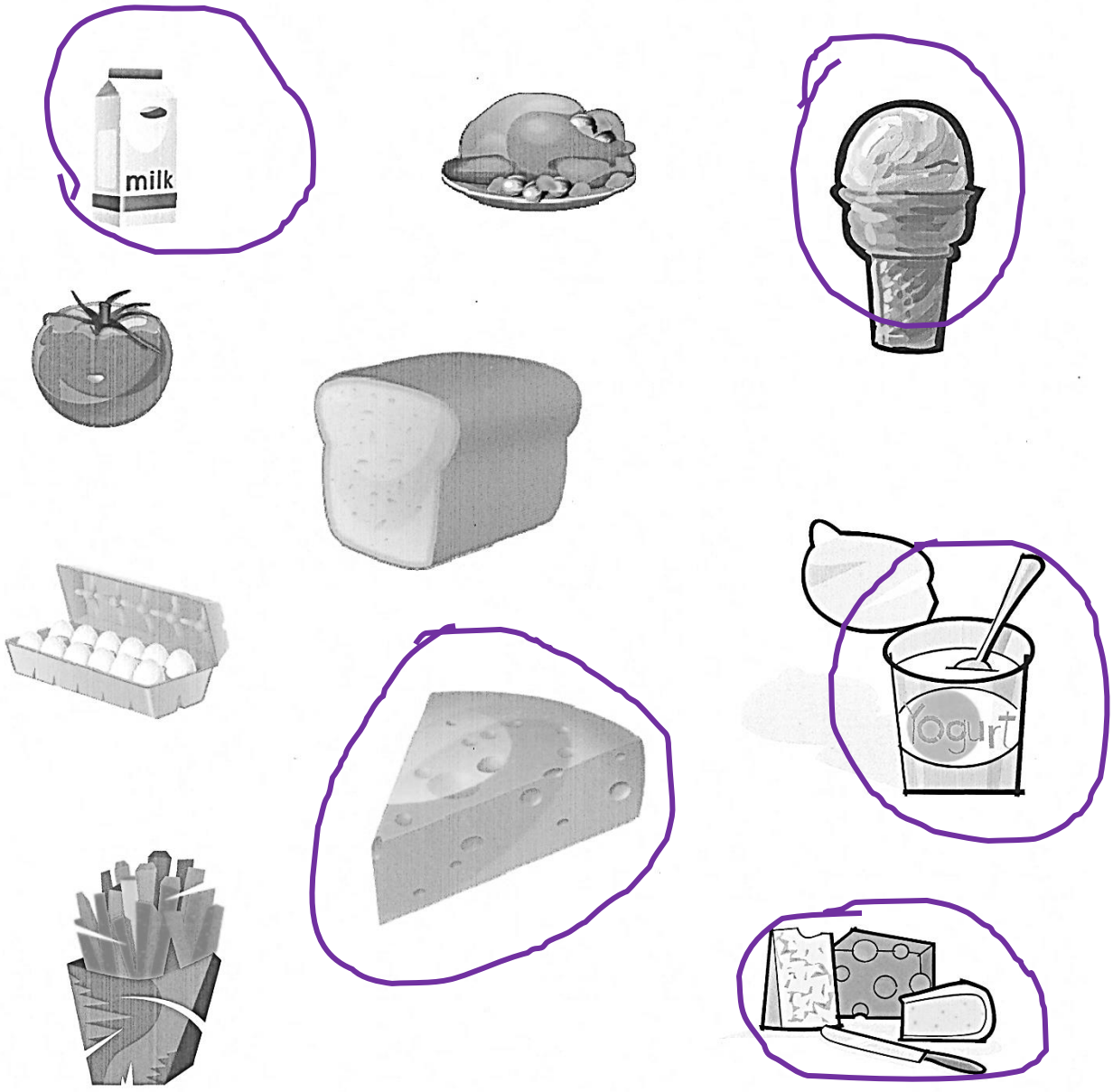
FOODS WE CAN GET FROM GOATS

Circle the foods that could come from a dairy goat



FOODS WE CAN GET FROM GOATS

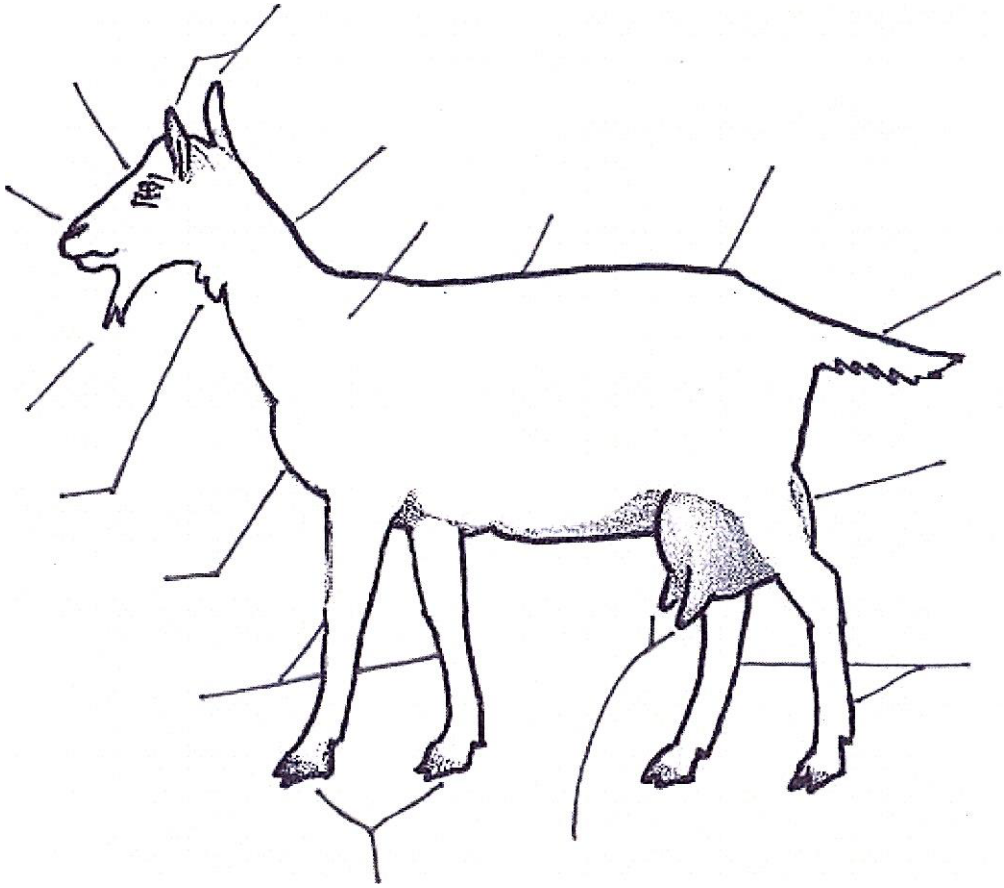
Circle the foods that could come from a dairy goat



A GOAT'S ANATOMY

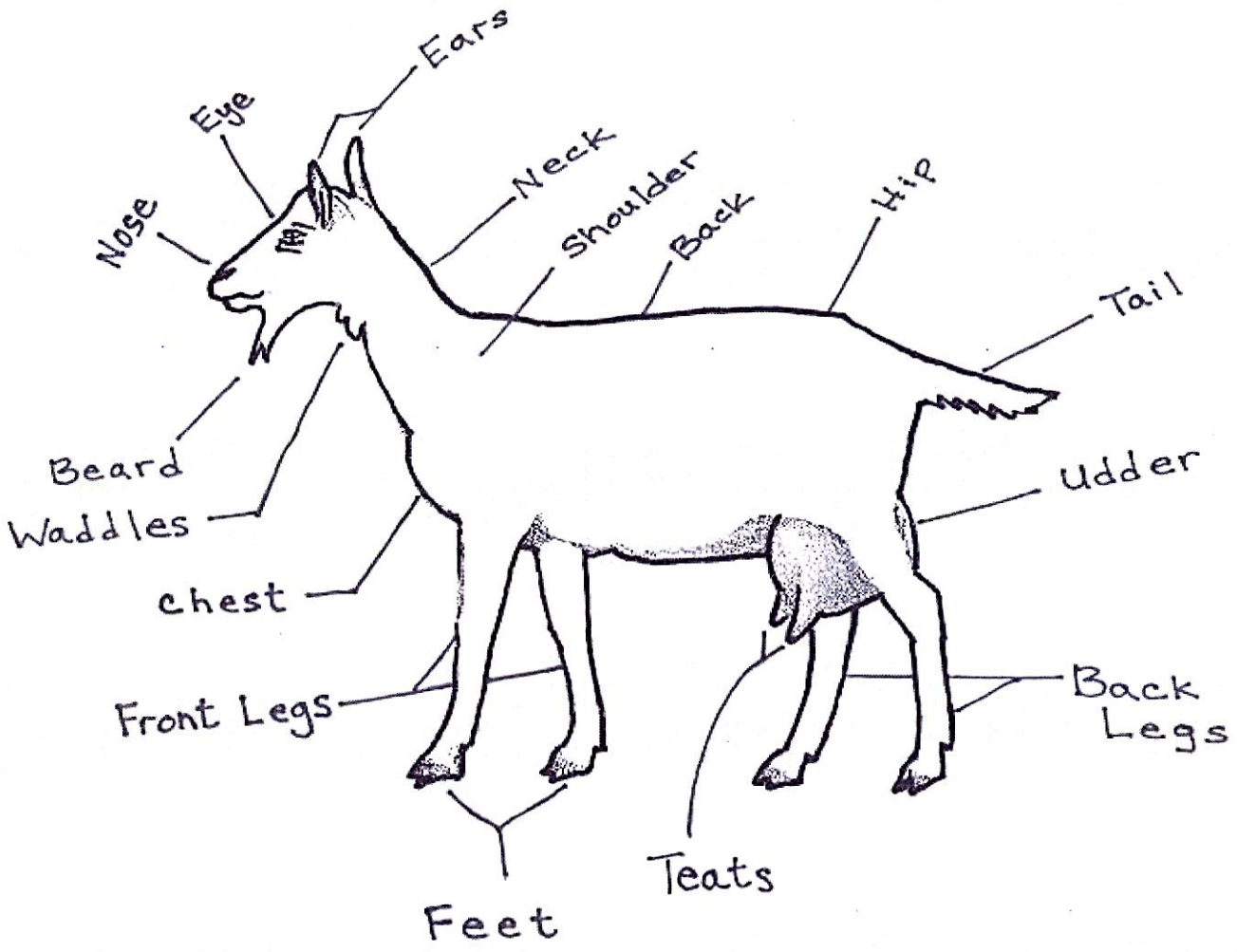
Label the parts below

Waddles	Front legs	Tail
Beard	Chest	Eye
Nose	Teats	Back legs
Udder	Feet	Neck
Shoulder	Hip	Back
Ears	Tail	



A GOAT'S ANATOMY

Label the parts below



7) BIODEGRADABLE PLASTICS

Sounds Corny but…Plants are Turning into Plastic

A. Making Plastic from a Common Agricultural Product: Corn!

Plastics are major problems in our rapidly filling landfills. Plastics made from petroleum do not decompose quickly. That's why Ohio's corn growers are supporting an environmentally safe product. A new plastic product is being made from cornstarch. Cornstarch based biodegradable bags contain 10% cornstarch and will degrade 20 times faster than other plastic bags. These biodegradable plastic products have many benefits:

- Plastic bottles can be made stronger and lighter when made from 15% cornstarch.
- Biodegradable plastics are not expensive.
- Biodegradable plastics can be composted and used as carbon-rich soil supplement.

Cornstarch…Kinda Like Plastic, Used as Biodegradable Packaging

Source: Field Guide to Utah Agriculture in the Classroom, www.agclassroom.org/ut

Corn is a versatile crop, used not only in food but in manufacturing. One use for corn is packaging – you know those loose fill packing peanuts that go all over when you open a package? Well some of those packing peanuts are made of polystyrene (Styrofoam™). Biodegradable loose fill is manufactured by extrusion, similar to breakfast cereals and pastas. Extrusion uses steam and pressure to "cook" raw materials, and then force the "melt" through small dies to atmospheric conditions. The release of pressure and steam causes the material to expand rapidly or "foam."

Perhaps you have been using packaging peanuts in your class to demonstrate what biodegradable means, but now you can tell your students the rest of the story…corn is the renewable resource that we can use to make biodegradable materials and not harm the environment. ECO-FOAM ™ loose fill is comprised of over 99% cornstarch and a very small percentage of food grade oil.

EXPERIMENT

Materials:

10 regular packing peanuts
10 ECO-FOAM packing peanuts
2 Ziploc bags
Water

In two separate bags, place 10 Styrofoam packing peanuts and 10 ECO-FOAM packing peanuts. To determine whether or not your packing peanuts are the biodegradable type, touch your tongue to a piece. If it starts to dissolve, you have a cornstarch-based product. Add one cup of water to each bag, close tight and shake. The ECO-FOAM packaging will dissolve in less than 10 seconds. The styrofoam will remain in the bag, maybe forever, just like they exist in the environment. If you want to eat a piece to show your students the benign nature of the product, go ahead. Hey, while you're at it, your students may want to crunch on half a peanut!

The Center of Science and Industry of Ohio developed an "ECO-FUN" series of investigations and experiments, designed to appeal to students (and educators) of all ages, abilities, and interests. The ECO-FUN educational package includes a brochure outlining all the experiments and a bag of ECO-FOAM loose fill (all other required materials are simple household items) and is available from National Starch and Chemical Co. Just contact them at their website to obtain your kit, http://www.eco-foam.com.

8) EXTRA ACTIVITIES

A. Clues to Farm Products

B. Follow the Stairs

C. Word Search

D. Sounds Corny Decomposition Comparison

E. Make Your Own Bio-Plastic Stuff

CLUES TO FARM PRODUCTS

Steer	Flowers	Forest	Hamburger
Soybeans	Tomatoes	Carrots	Corn
Grapes	Shrub	Potatoes	Poultry
Apples	Wheat	Grass	Christmas Trees
Popcorn	Dairy Cow	Sheep	Sunflowers
Peaches	Pigs	Celery	Coffee
Strawberries	Peas		

CLUE — FARM PRODUCT

1. I am grown as ears and am used in oils. _____
2. I am a favorite at movies and pop when heated. _____
3. You walk on me barefoot in the summer and tickle me with a rake in the fall. _____
4. I have a doll named after me and am a favorite ice cream flavor. _____
5. I eat grain and produce a white liquid for kids to drink. _____
6. I grow in pods and am used to make ink. _____
7. When you cut my hair, it is made into something to wear. _____
8. I grow on vines and am made into sauce. _____
9. We are grown in a house and provide a rainbow of color for those that are special. _____
10. I am the alarm clock on the farm and a favorite for Sunday dinner. _____
11. I turn golden in the fields and am used to make a favorite Italian food. _____
12. We have needles that can't be used for sewing and cones that won't hold ice cream. _____
13. I come in the colors of red, purple and white and am used in juices, jellies and wines. _____
14. I produce America's favorite meat-hamburger and am used in rodeos. _____
15. I grow on a tree and one of me a day will keep the doctor away. _____
16. Footballs are often named after my skin and smoked; my meat is a favorite with eggs. _____
17. I provide a hiding place for wildlife and make a great trim for around the home. _____

CLUES TO FARM PRODUCTS

Steer	Flowers	Forest	Hamburger
Soybeans	Tomatoes	Carrots	Corn
Grapes	Shrub	Potatoes	Poultry
Apples	Wheat	Grass	Christmas Trees
Popcorn	Dairy Cow	Sheep	Sunflowers
Peaches	Pigs	Celery	Coffee
Strawberries	Peas		

CLUE	FARM PRODUCT
1. I am grown as ears and am used in oils.	Corn
2. I am a favorite at movies and pop when heated.	Popcorn
3. You walk on me barefoot in the summer and tickle me with a rake in the fall.	Grass
4. I have a doll named after me and am a favorite ice cream flavor.	Strawberry
5. I eat grain and produce a white liquid for kids to drink.	Dairy cow
6. I grow in pods and am used to make ink.	Soybeans
7. When you cut my hair, it is made into something to wear.	Sheep
8. I grow on vines and am made into sauce.	Tomatoes
9. We are grown in a house and provide a rainbow of color for those that are special.	Flowers
10. I am the alarm clock on the farm and a favorite for Sunday dinner.	Poultry
11. I turn golden in the fields and am used to make a favorite Italian food.	Wheat
12. We have needles that can't be used for sewing and cones that won't hold ice cream.	Christmas Tree
13. I come in the colors of red, purple and white and am used in juices, jellies and wines.	Grapes
14. I produce America's favorite meat-hamburger and am used in rodeos.	Steer
15. I grow on a tree and one of me a day will keep the doctor away.	Apples
16. Footballs are often named after my skin and smoked; my meat is a favorite with eggs.	Pigs
17. I provide a hiding place for wildlife and make a great trim for around the home.	Shrubs

FOLLOW THE STAIRS FROM FARM LANDS TO SHOPPER HANDS

Match items in box to where they fit on the stairs.

Pizza	Wheat
Farmer	Food Server
Feed Store	Ethanol Plant
Grocery	Dairy Cows
Milk Truck	Cheese Plant
Furniture Store	Greenhouse
Roadside Market	Apple Picker
Sawmill	Pilot
Railroad Engineer	Export Ship
Meat Packing Company	Sod
Refrigeration Truck	Clothing Store
Tomato Juice Refinery	Driver

RETAILING

_____
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_____
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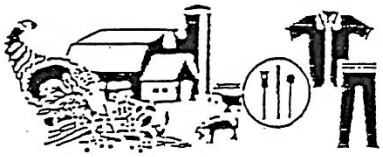
_____



DISTRIBUTING

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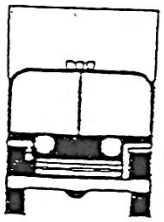
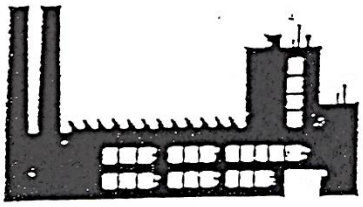


PROCESSING



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FARMING

_____
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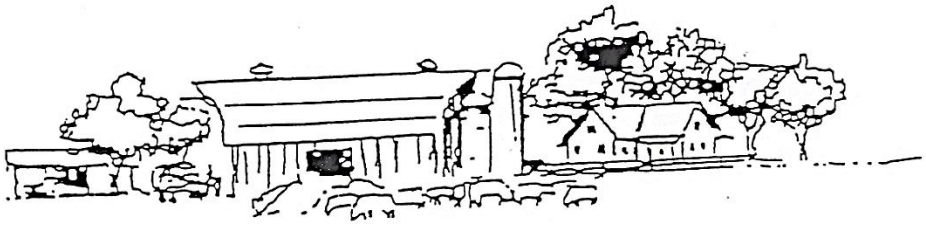


Source: Franklin County Cooperative Extension

FOLLOW THE STAIRS FROM FARM LANDS TO SHOPPER HANDS

Match items in box to where they fit on the stairs.

Pizza	Wheat
Farmer	Food Server
Feed Store	Ethanol Plant
Grocery	Dairy Cows
Milk Truck	Cheese Plant
Furniture Store	Greenhouse
Roadside Market	Apple Picker
Sawmill	Pilot
Railroad Engineer	Export Ship
Meat Packing Company	Sod
Refrigeration Truck	Clothing Store
Tomato Juice Refinery	Driver

RETAILING

Pizza

Feed Store

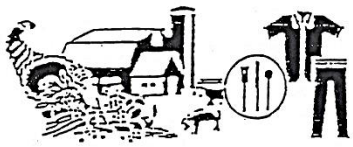
Grocery

Furniture Store

Roadside Market

Restaurant

Clothing Store



DISTRIBUTING

Refrigeration Truck

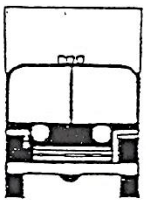
Export Ship

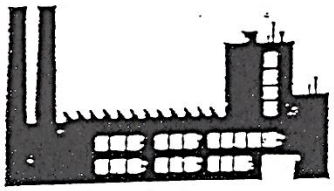
Driver

Pilot

Railroad Engineer

Milk Truck





PROCESSING

Tomato Juice Refinery

Meat Packing Company

Cheese Plant

Ethanol Plant

Sawmill

FARMING

Wheat

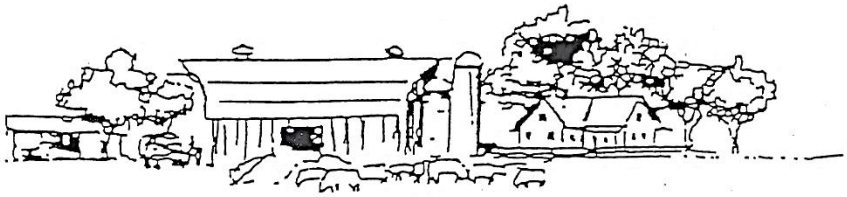
Dairy Cows

Greenhouse

Apple Picker

Sod

Farmer



Source: Franklin County Cooperative Extension

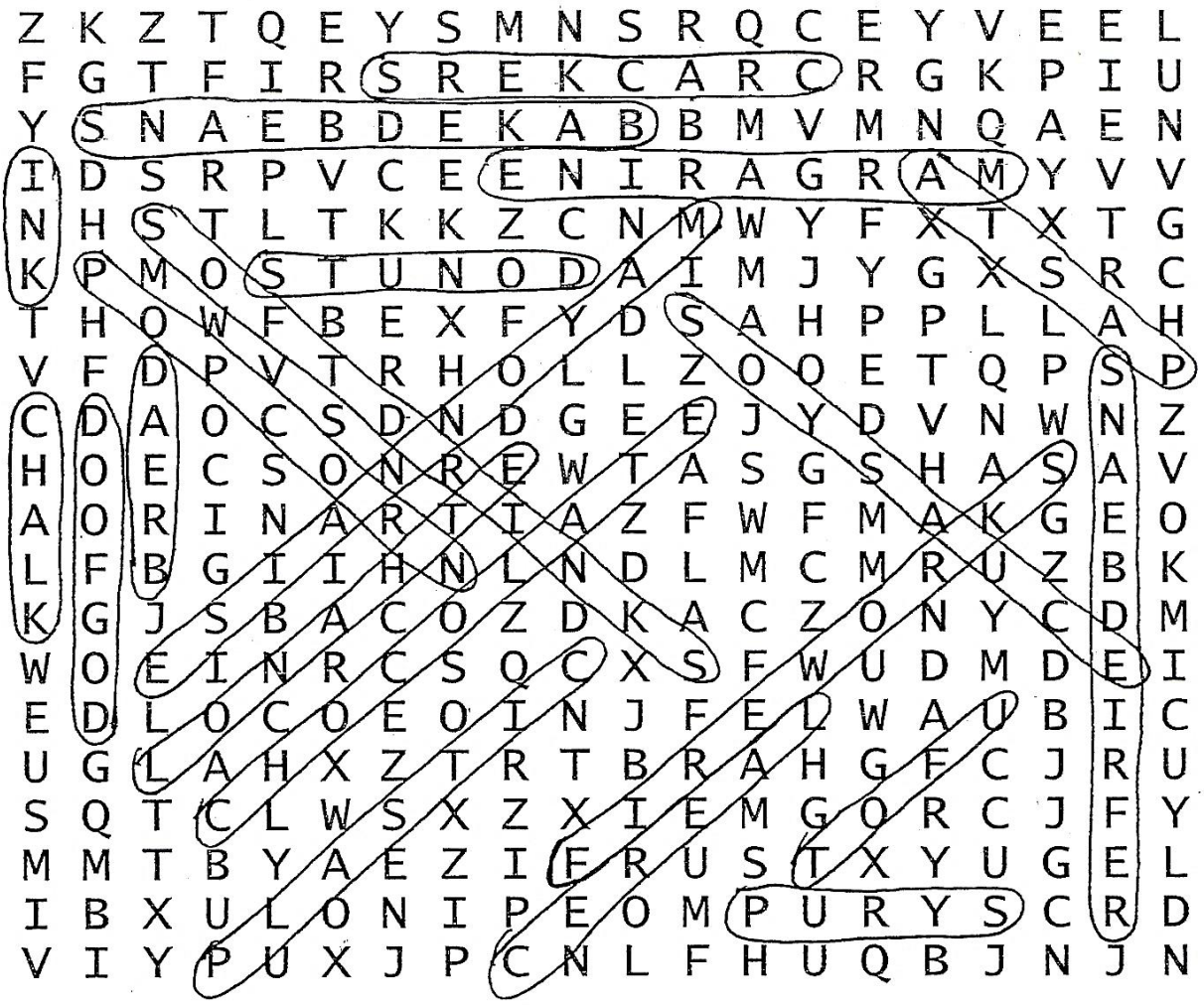
WORD SEARCH

Z K Z T Q E Y S M N S R Q C E Y V E E L
F G T F I R S R E K C A R C R G K P I U
Y S N A E B D E K A B B M V M N Q A E N
I D S R P V C E E N I R A G R A M Y V V
N H S T L T K K Z C N M W Y F X T X T G
K P M O S T U N O D A I M J Y G X S R C
T H O W F B E X F Y D S A H P P L L A H
V F D P V T R H O L L Z O O E T Q P S P
C D A O C S D N D G E E J Y D V N W N Z
H O E C S O N R E W T A S G S H A S A V
A O R I N A R T I A Z F W F M A K G E O
L F B G I I H N L N D L M C M R U Z B K
K G J S B A C O Z D K A C Z O N Y C D M
W O E I N R C S Q C X S F W U D M D E I
E D L O C O E O I N J F E L W A U B I C
U G L A H X Z T R T B R A H G F C J R U
S Q T C L W S X Z X I E M G O R C J F Y
M M T B Y A E Z I F R U S T X Y U G E L
I B X U L O N I P E O M P U R Y S C R D
V I Y P U X J P C N L F H U Q B J N J N

Find and circle the following products made from crops:

margarine
chocolate
ink
soy sauce
tofu
popcorn
cereal
mayonnaise
fireworks
ethanol
chalk
plastic
syrup
pasta
bread
donuts
crackers
baked beans
refried beans
dog food
soft drinks

WORD SEARCH



Find and circle the following products made from crops:

margarine	mayonnaise	bread
chocolate	fireworks	donuts
ink	ethanol	crackers
soy sauce	chalk	baked beans
tofu	plastic	refried beans
popcorn	syrup	dog food
cereal	pasta	soft drinks

Sounds Corny
Decomposition Comparison

Cornstarch-Based Items vs. Other Items

The following statements give approximate decomposition times for various items. Divide the years by 10 to show how much faster they would decompose if they were biodegradable plastic made from cornstarch.

1. Wax paper cup: 5 years vs. _____ years if made from cornstarch

   ☐ A. 0.5 years
   ☐ B. 50 years

2. Foam cup: 20 years vs. _____years if made from cornstarch

   ☐ A. 200 years
   ☐ B. 2 years

3. Tin can: 100 years vs. _____ years if made from cornstarch

   ☐ A. 1,000 years
   ☐ B. 10 years

4. Aluminum can: 500 years vs. _____ years if made from cornstarch

   ☐ A. 50 years
   ☐ B. 5,000 years

A glass container will NEVER decompose!

Sounds Corny
Decomposition Comparison

Cornstarch-Based Items vs. Other Items

The following statements give approximate decomposition times for various items. Divide the years by 10 to show how much faster they would decompose if they were biodegradable plastic made from cornstarch.

1. Wax paper cup: 5 years vs. _____ years if made from cornstarch

   ☐ A. 0.5 years
   ☐ B. 50 years

The correct answer was A. RIGHT ON! Just half a year (six months) and that cup would be gone!

2. Foam cup: 20 years vs. _____years if made from cornstarch

   ☐ A. 200 years
   ☐ B. 2 years

The correct answer was B. TIME FLIES! In a mere 2 years the landfill wouldn't be clogged with styrofoam if we used biodegradable plastic cups.

3. Tin can: 100 years vs. _____ years if made from cornstarch

   ☐ A. 1,000 years
   ☐ B. 10 years

The correct answer was B. If we used cornstarch to make this can, it would be gone the year following your graduation from high school in 10 more years.

4. Aluminum can: 500 years vs. _____ years if made from cornstarch

   ☐ A. 50 years
   ☐ B. 5,000 years

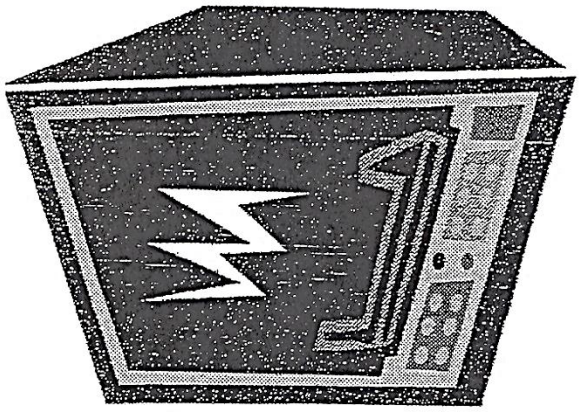
The correct answer was A. 50 years is a long time, but a lot less than 500 years. Imagine if that aluminum can was lying in 1776, when our country began. It would still be lying in a landfill for another 280 years!

Make Your Own
Bio-Plastic Stuff

Materials

- ☑ 1 tablespoon cornstarch
- ☑ 2 drops corn oil
- ☑ Ziploc bag
- ☑ Water
- ☑ Food coloring

1. Place a tablespoon of cornstarch in a plastic Ziploc bag.
2. Add two drops of corn oil to the cornstarch.
3. Add one tablespoon of water to the oil and cornstarch.
4. Mix the cornstarch, corn oil, and water in the plastic bag by rubbing the outside of the bag with your fingers.
5. Add two drops of your favorite food coloring and mix again.
6. Place the bag in a microwave oven on high for 20-25 seconds. DO NOT completely seal the bag. CAREFUL, it's hot!



Observations

1. What do you notice about your biodegradable plastic?
2. Is your biodegradable plastic the same as the other students?
3. What could you make with this biodegradable plastic if you let it harden? Remember it will dissolve eventually.
4. What happens to your plastic?
5. Form your plastic into a ball (while it is still warm) and describe what it does.
6. Compare your biodegradable plastic with the plastic Ziploc bag.

Source: Field Guide to Utah Agriculture in the Classroom, www.agclassroom.org/ut

9) WEBSITES

1. USDA for kids: http://www.usda.gov/news/usdakids/index.html
2. Farm Service Agency for Kids:http://www.fsa.usda.gov/ca/agforkids.htm
3. AgVenture Online Game with Fun Facts on Agriculture:

   http://www.fsa.usda.gov/fsakids/agventure/agventure.html
4. Game Pages: http://www.fsa.usda.gov/ca/FSAgames.htm
5. LINKS TO AG FACTS: http://www.usda.gov/nass/nasskids/links.html
6. US Agricultural History – timelines:

   http://www.agclassroom.org/teacher/history/index.htm