



# Wheat Kernels (fun wheat facts)



Wheat is Oklahoma's number one crop and is very important to our state's economy. Nearly half the state's cropland is planted in wheat.



In 2003, Oklahoma ranked number two in the nation in the production of winter wheat.



In 2003, Oklahoma's winter wheat crop was worth \$443 million to the Oklahoma economy.



Wheat needs an average amount of rainfall and cool weather when it first starts to grow. Then it needs bright, sunny days late in the spring that gradually turn dry when it is time to harvest in May or June. Wheat grows all over Oklahoma but does best in north central Oklahoma. The wind that sweeps across the prairie helps the wheat dry in time for harvest.



Wheat is grown in nearly every state. Because it is such a versatile crop, it is being harvested somewhere in the world every month of the year.



Much of the wheat grown is produced on land that is marginal for other crops.



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A bushel of wheat weighs about 60 pounds and yields about 42 pounds of white flour or 60 pounds of whole wheat flour.



Hard red winter wheat is grown in the Great Plains region of the US and California. It is used in pan breads, Asian noodles, hard rolls, flat breads and general-purpose flour.



Durum wheat is grown in the North Central and desert Southwest regions of the US. It is used to make pasta, couscous and some Mediterranean breads. (Couscous is pasta that is shaped like rice.)



Soft red winter wheat is grown in the eastern third of the US and is used to make pastries, cakes, cookies, crackers, pretzels and flat breads.



Bread, pasta, cereal, pretzels and licorice all are foods made with wheat. Cosmetics, pet foods, paper, soap and trash bags also contain wheat.



Average production is about 30 bushels per acre. An acre will produce enough wheat for about 2,500 loaves of wheat bread.



A kernel is a wheat seed. There are about 50 kernels in a head of wheat and 15,000 to 17,000 kernels in a pound.



# The Farmer Tills the Field

Have students sit in one big circle, representing seeds and wheat. One student should sit in the center to represent the sun. Several students, representing raindrops and clouds, should stand outside the circle, and several students, representing farmers, should stand inside the circle.

Sing the following, to the tune of “The Farmer in the Dell,” and follow instructions in parentheses:

1. The farmer tills the fields. . . . (“Farmers” make plowing motion.)
2. The farmer plants the seeds . . . . (“Farmers” tap “Seeds.”)
3. The rain begins to fall. . . . (“Raindrops” run around the outside of the circle.)
4. The clouds roll away. . . . (“Clouds” back away from the circle.)
5. The sun begins to shine. . . . (“Sun” stands, raises and waves arms in “shining” motion inside the circle.)
6. The seeds begin to grow. . . . (“Seeds” stand up and become “Wheat”.)
7. The farmer cuts the wheat. . . . (“Seeds/Wheat” stoop down as “Farmers” pretend to cut.)
8. The farmer combines the wheat. . . . (“Farmers” place “Seed/Wheat” back to back.)
9. The farmer’s work is done. . . . (“Farmers” skip between the combined “Seed/Wheat.”)
10. We all jump for joy . . . . (All dance.)



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**W**hen wheat is ripe and ready for harvest the wheat producer must race with the weather to get it out of the fields. Heavy rains, wind or hail may break all the heads, or a lightening storm may start a range fire. Rain also makes the fields too muddy for the farmer's heavy equipment.

When the weather cooperates, and the wheat is ripe, the farmer must move fast. He checks the wheat by rubbing a wheat head between his hands, blowing the chaff away and then chewing some of the grain. If the kernels crack easily and get soft as they are chewed, the wheat is ready to harvest.

The farmer drives a combine across the fields to harvest the grain. When the storage bin of the combine is full, he empties it into a truck. Someone else drives the truck to the grain elevator in town.

Workers at the grain elevator help empty the wheat into a very deep pit. Machinery in the grain elevator raises, or elevates, the wheat into a tall bin.

The wheat stays in the grain elevator until the farmer is ready to sell it. Workers keep an eye on the wheat kernels to make sure they stay cool and dry. If the wheat kernels get wet or too hot they will spoil.

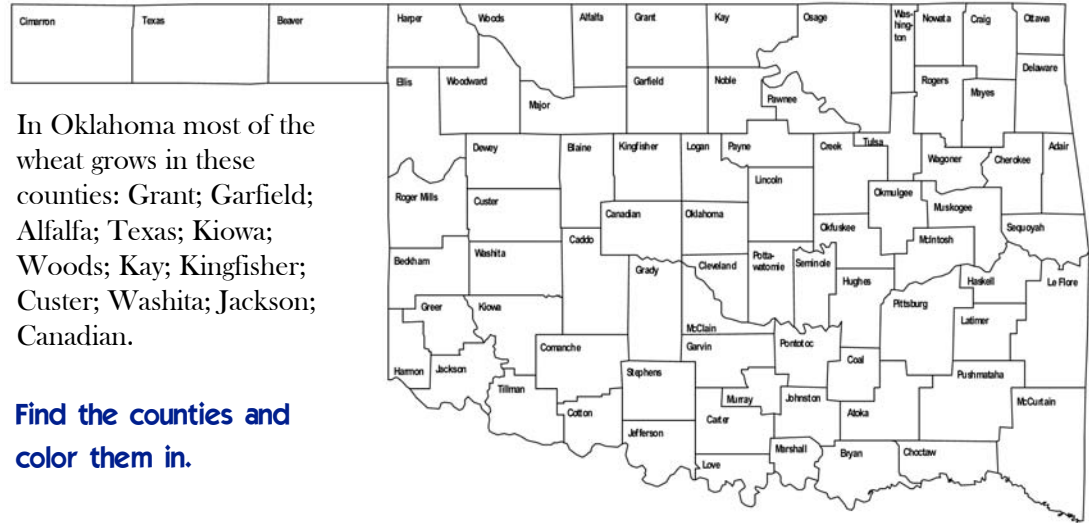
Most of the wheat is sold to people who use it to make food for people and animals. Some is cleaned and saved until it is time to plant again. One kernel of wheat can grow several hundred new kernels next harvest.

Skills: Music (performing); Language Arts (sequencing); Social Studies (careers).

Related Lessons: "Wheat: From Field to Oven;" "Little Red Hen"



# Where Does the Wheat Grow?



In Oklahoma most of the wheat grows in these counties: Grant; Garfield; Alfalfa; Texas; Kiowa; Woods; Kay; Kingfisher; Custer; Washita; Jackson; Canadian.

**Find the counties and color them in.**

A larger map is available on the Web site.





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## Oklahoma's prairie soils and climate are perfect for growing wheat

Before there were people here, Oklahoma was covered with grass that grew taller than most adults. Because there were few trees, early European settlers thought the land was no good. They were wrong. Grasses can withstand environmental extremes that kill trees.

Wheat is a grass, with origins in Asia, that has adapted very well to the Oklahoma landscape. The invention of the steel blade plow made it possible for farmers to cut through the thick thatch of Oklahoma sod and plant wheat. Food shortages in Europe caused by World War I created a huge demand for wheat, so farmers were encouraged to plant wheat "from fencepost to fencepost."

Wheat remains an important crop in Oklahoma today. Our state has 44 million acres of land. More than 11 million acres of that is planted in crops, and nearly half of that is planted in wheat.

Wheat needs an average amount of rainfall and cool weather when it first starts to grow. Then it needs bright, sunny days late in the spring that gradually turn dry when it is time to harvest in June. Wheat grows best in north central Oklahoma. The wind that sweeps across the prairie helps the wheat dry in time for harvest.

Skills: Social Studies (geography, map skills, history, natural resources); Science (weather, earth science)

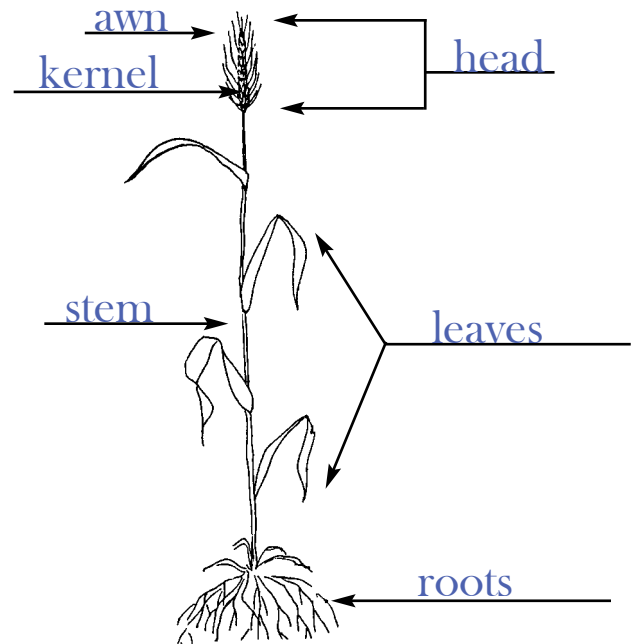
Related lessons on the website: "Oklahoma Grown," "Dirt Babies," "Dark Days on the Prairie," "Dust in the Distance." "Hoboes on Harvest."



# The Wheat Plant

Fill in the parts of the wheat plant.

- leaves
- head
- roots
- awn
- stem
- kernel



(Answers in blue.)



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Most Oklahoma farmers grow a kind of wheat called **winter wheat**. Winter wheat is planted and starts growing in the fall. It rests during the winter and begins to grow again in the spring.

Before planting, the farmer must prepare the soil for the seed by spending many hours on a tractor turning the soil and breaking it into fine **particles**. At last the soil is ready, the weather is right, and it is time to plant. The farmer puts the seed in the ground, using a machine called a **grain drill**.

The moisture in the soil is what causes the wheat plant to start growing. A **shoot** grows up through the soil. As the plant gets bigger, it draws water and **nutrients** up through the roots and produces **chlorophyll** (food) in the leaves. A good supply of water, nutrients and food will allow the plants to grow tall and develop green leaves. Wheat planted in the fall will grow about six inches tall before the first freeze. After that the plants stop growing, or become **dormant**, until spring. While the plant is dormant, the farmer may let cattle into the fields to eat the tender first leaves. This does not harm the plants. In the spring they will produce new leaves.

The warmth of spring encourages the plants to grow again. Soon people driving along country roads can see lush green carpets, between two and four feet tall. Slowly, as the weather turns warmer, the wheat will produce heads of grain which **mature** and turn the green from tan to yellow and finally to a golden color that tells the farmer **harvest** is just ahead.

**Skills:** Science (parts of the plant), Language Arts (writing, vocabulary)

**Related lessons on the website:** “Wheat: From Field to Oven,” “Plant Parts We Eat,” “The Wheat Plant.”





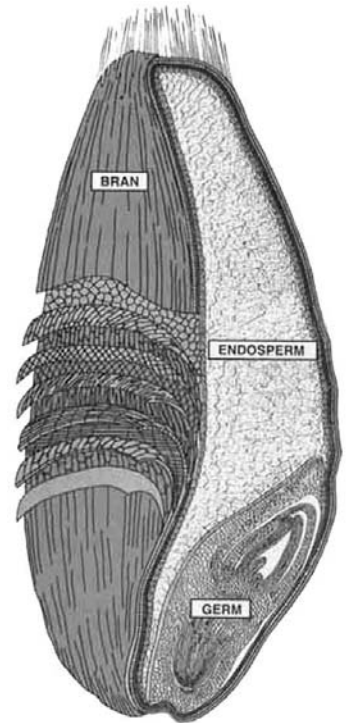
# The Whole Kernel

## Materials:

**whole wheat flour**  
**wheat germ**

**white flour**  
**wheat bran**

1. Pour samples of each in small clear plastic bowls for students to see, smell and touch.
2. Show students the diagram at left and explain which part of the kernel is used to produce each substance. Discuss the nutritional value of each.
3. White flour is made of just the endosperm of the kernel. The entire kernel is used to make whole wheat flour. The endosperm is 83 percent of a kernel; the bran is 14 1/2 percent, and the germ is 2 1/2 percent. Have students figure out how much wheat germ and wheat bran to add to a cup of white flour to make it whole wheat flour.
4. Provide an assortment of products made with whole wheat and white flour. Have students taste each product and explain why they like or dislike them.





# It's All in the Berry

A **kernel** of wheat is sometimes called the **wheat berry**. The kernel is the seed from which the wheat plant grows. Each tiny seed contains three distinct parts that are separated during the **milling** process to produce flour. The kernel of wheat is a storehouse of **nutrients** essential to the human diet.

The **endosperm** is about 83 percent of the kernel's weight. It is the source of white flour. The endosperm contains the greatest share of protein, carbohydrates and iron, as well as many **B-complex vitamins**, such as **riboflavin**, **niacin** and **thiamine**. It is also a source of **soluble** fiber.

The **bran** is about 14 1/2 percent of the kernel weight. Bran is included in whole wheat flour and can also be purchased separately. The bran contains a small amount of protein, larger quantities of the three major **B-complex vitamins**, trace minerals and dietary fiber that is primarily **insoluble**.

The **germ** is about 2 1/2 percent of the kernel weight. The germ is the **embryo**, or sprouting section, of the seed. It is often separated from flour in the milling because the fat content limits the keeping quality of the flour. The germ contains high quality protein, a greater share of **B-complex vitamins** and trace minerals. Wheat germ can be purchased separately and is part of whole wheat flour. (Source: Wheat Foods Council)

Question: What is the difference between soluble and insoluble fiber? Which is better for you?

Skills: Science (nutrition); Language Arts (vocabulary); Math (measuring, percentages)

Related lessons online: "Food for Keeps;" "Picture Perfect Pyramid;" "Snack Sack."



# Breads Around the World

**pita    wonton    bagel    tortilla    pizza crust    fry bread    croissant**

1. \_\_\_\_\_ Asian noodle dough dumplings filled with spiced meat. They are boiled in soup or fried and eaten as a side dish.
2. \_\_\_\_\_ Corn or wheat dough patted into thin, flat rounds and fried on a hot griddle. They are daily bread in a country on the same continent as the US.
3. \_\_\_\_\_ Chewy baked rolls with a hole. They are often eaten with cream cheese or other tasty toppings. Polish immigrants brought them to the US.
4. \_\_\_\_\_ Pocket breads from the Middle East that are round, flat and hollow on the inside.
5. \_\_\_\_\_ Flaky, tender, crescent-shaped rolls from the land of the Eiffel Tower.
6. \_\_\_\_\_ Popular Italian pie that began as a leftover created from extra bread dough.
7. \_\_\_\_\_ Small round breads fried in hot oil. They are made by the thousands for powwows.

Answers: 1. wonton; 2. tortilla; 3. bagel; 4. pita; 5. croissant; 6. pizza crust; 7. fry bread



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**B**read may be the ancestor of all prepared foods. The first bread was made in Neolithic times, nearly 12,000 years ago. It was probably made by crushing grain and mixing it with water. The dough was then baked in the sun or laid on heated stones and covered with hot ashes. The Hopi of New Mexico still make a traditional bread, called *piki* bread, by mixing juniper ash with cornmeal and spreading it on a hot stone. Then they lift the paper-thin layer from the stone by rolling it like a jelly roll.

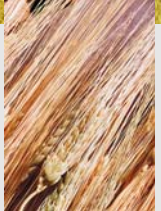
Bread can be unleavened or leavened with yeast. When flour comes in contact with water and remains idle for some time, it begins to rise. In modern processes, yeast is added to aid in the rising, but even without yeast, dough will begin to ferment, and the resulting gases will cause the dough to rise. The Egyptians were the first to discover that this process would produce a light, expanded loaf.

Most bread is made from whatever grain grows best in the area where it is produced. Wheat, rye, corn, barley, millet, kamut and spelt are some of the grains used around the world. Wheat flour is preferred because of its gluten content. Gluten is a protein which holds the bread together. For centuries highly-refined white bread was only available to rich people. Poor people ate coarse-grained brown breads. Today whole grain dark breads have become more popular because of their high fiber content.

Bread is such a powerful food that ancient Egyptian governments controlled its production and distribution as a means of controlling the populace. In France the shortage of bread helped start the French Revolution.

Skills: Social Studies (world cultures, geography, natural resources), Reading (vocabulary); Science (changes in matter, physical properties)

Related lessons on the website: "Bread in a Bag;" "Yam and Eggs;" "Picture Perfect Pyramid"



# Tortillas in a Bag

## Ingredients:

1-qt storage bag

1 1/2 c flour

1/4 t baking powder

3 T shortening

1/2 c hot tap water

1/4 t salt

1. Place flour, salt and baking powder in bag. Close and shake just a few shakes to mix.
2. Add shortening and reclose the bag. Work bag with hands until the mixture looks crumbly and there are no large pieces of shortening visible.
3. Open the bag and add the hot tap water. Knead in the bag until the dough is one large piece and the sides of the bag come clean.
4. Take the dough out of the bag, and divide into four pieces. Put the pieces of dough on the table, and lay the bag on top of them. Let the dough rest for 15 minutes.
5. After resting time, roll or pat the dough into eight- to 10-inch circles. Place the circles on a griddle or frying pan heated to medium or medium high, and cook until dark brown spots appear. Turn and cook on the other side until brown.
6. Fill tortillas with ground beef, beans, salsa, cheese and lettuce to make burritos.





# You Can Eat Your Meat with Your Hands —

— but only if you roll it up in a tortilla.

Among native Mexicans, tortillas are commonly used as eating utensils. In the Old West, cowpokes realized the versatility of tortillas and used tortillas filled with meat or other foods as a convenient way to eat around the campfire.

Tortillas are a flat bread made from either corn or wheat. According to Mayan legend, tortillas were invented by a peasant for his hungry king. The first tortillas were made of the dried kernels of native corn.

The average American eats 199 tortillas each year. In 2000, Americans consumed about 85 billion tortillas (not including tortilla chips).

Flour tortillas are a low-fat food and contain iron along with other B vitamins. They have about 115 calories with 2-3 grams of fat per serving. Corn tortillas are a low-fat, low-sodium food and contain calcium, potassium and fiber. An average serving contains about 60 calories, with 1 gram of fat.

Science/math (changes in matter, safety, observing and measuring), Social Studies (history, world cultures), Reading (comprehension).





# Wheat Flour Farm Animals

## Materials:

masking tape

flour

water

newspaper

paper towel tubes

balloons (one large and one small)

1. Mix one cup flour and one cup water until you have a creamy paste. If the paste is too thick, add a bit more water.
2. Blow up and tie off a large balloon for the animal's body and a small one for the head.
3. Rip (don't cut) newspaper into strips.
4. Dip the big newspaper strips one at a time into the flour paste on both sides. Rub the strip along the edge of the bowl to take off the extra paste. Paste strips over each balloon until the balloon is completely covered. Smooth each strip of papier mache as you put it on. Let the balloons dry.
5. After the balloons are completely dry, tape the head to the body.
6. Make legs from paper towel tubes and tape them to the body. Cover the legs and tape with a fresh batch of papier-mache. Cut ears, nose and horns, if desired, from cardboard, tape them to your animal and cover with paper mache. Let dry.
7. Pop the balloons with a pin.
8. Later, cover the entire animal with another layer of papier-mache. Let dry.
9. When completely dry, paint the entire animal with poster paint. Glue on yarn or other material for tail, mane, etc.



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**M**ore foods are made from wheat than from any other cereal grain. It is the main ingredient for many of our favorite treats—hot rolls, cookies, noodles and cakes. But wheat, like most agricultural products, can be used for more than just food. Agricultural researchers spend long hours experimenting with additional uses for wheat and other products. Wheat straw is a byproduct of wheat used to make concrete and other building materials stronger. Like corn, wheat can be used to make a renewable vehicle fuel. It can also be used to make biodegradable plastic. For a list of more items made from wheat, go to the OAITC website.

Papier mache is French for “chewed paper.” In the 16th Century, French women bought paper waste from publishers and bookbinders and processed it by chewing on it. In the 19th Century papier mache was a popular process for making dolls. Early papier mache was bound together with glue made from animal hide or with resin.

**Skills:** Art (visual art expression, composition); Social Studies (careers, natural resources, interaction of environment and people, economic elements in community, history)

**Related lessons online:** “Made From Animals,” “The Peanut Wizard,” “Corn Cob Dolls.”



# More Fun with Wheat



A kernel is a wheat seed. Place a folded paper towel on a paper plate, and lay 100 wheat kernels on top. Sprinkle daily with water. Soon the kernels will begin to sprout. After several days, have students count the seeds that have sprouted. Have students pretend they are farmers and decide if they want to plant this type of wheat, based on the number of seeds that germinated. Plant some kernels of wheat in the classroom so students can watch the growth and development. Have students record the plant's progress on a calendar posted near the growing plant.



Create a three-dimensional wheat plant on a door or board display. Use string to represent the root system. Make the stem of painted paper straws and the leaves of matching tissue paper. The head can be made of fuzzy pipe cleaners or craft fur rolled into a tube shape. Label the six parts of the plant.



Have students examine whole wheat flour and all-purpose (white) flour and compare the color, texture, nutritional value and fiber content. If a wheat mill is available, grind kernels of wheat into whole wheat flour. Bring samples of white, part whole wheat and 100 percent whole wheat bread to class and let students taste them to see if they can tell the difference in texture. Bring white flour, whole wheat flour, wheat germ and wheat bran to class for students to examine and compare.



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Test the effects of water temperature on the growth of yeast. Place 1 teaspoon of yeast in 1/4 cup ice water, 1 teaspoon in 1/4 cup boiling water and 1 teaspoon in 1/4 cup warm water. Allow the yeast to stand for 10 minutes. Have students describe the appearance of the yeast in each kind of water. How important is water temperature in softening yeast?



Compare naturally leavened dough with yeast dough. In one bowl, place flour, water and yeast. In the other, place flour and water. Have students record observations. How long does it take each to produce the gas bubbles that make it rise. Do they look and smell the same? Which batch expanded the most?



Call your county Extension educator, your nearest agricultural research station or a seed supply company and ask for the names of the most popular seed varieties being planted during the current season. Read the names to your students, and have them discuss how the different seed varieties may have acquired their names.



Have students set up a display in the library or media room showing the different stages of wheat. Students may draw pictures of the different stages or acquire samples of wheat in the different stages of growth (clean wheat, sprouting wheat, stalks with wheat heads still attached, wheat with “trash” still in it). Make the exhibit a self-guided display by having students record messages for each stage.



Visit a grocery store, and have students count the kinds of bread available. Visit a bakery to watch the end process of the wheat cycle.



# Wheat Vocabulary

**auger** - A rotating spiral-shaped shaft used to convey material, as in a grain elevator.

**bran** - The outer coating of the wheat kernel.

**bread** - A staple food made from flour or meal mixed with a liquid, usually combined with a leavening agent and kneaded, shaped into loaves and baked.

**broadcast** - Scatter.

**combine** - A power-operated harvesting machine that cuts, thrashes and cleans grain.

**disk harrow** - A farm implement consisting of a heavy frame with sharp metal disks used to break up and even off plowed ground.

**dormant** - In a condition of biological rest or inactivity in which some processes are slowed down or suspended.

**endosperm** - The substance within a seed that nourishes a plant embryo. The part of the wheat kernel that yields white flour and provides the gluten essential for breadmaking.

**erosion** - Wearing away by wind, water or other forms of abrasion.

**flour** - A soft, fine, powdery substance obtained by grinding and sifting the meal of grain, especially wheat.

**gluten** - A tough elastic protein substance in flour especially from wheat that holds together dough and makes it sticky .

**grain** - A hard small seed or fruit produced by a cereal grass.

**grain drill** - A large machine used for planting seeds in a field.





**grain elevator** - A place for storing grain and other wheat equipped with devices for hoisting and discharging grain.

**harvest** - The act or process of gathering in a ripened crop at the end of a growing season.

**miller** - Someone who works in, operates, or owns a mill, especially a grain mill.

**plow** - A farm implement consisting of a heavy blade at the end of a beam, usually hitched to a draft team or tractor and used for breaking up soil and cutting furrows in preparation for sowing seeds.

**residue** - A deposit of material not used by the plant.

**stubble** - The short, stiff stalks of grain or hay remaining on a field after harvesting.

**thresh** - To beat the stems and husks of grain or cereal plants with a machine to separate the grains and seeds.

**tillage** - Cultivation of land.

**tiller** - An erect shoot arising from the crown of a grass.

**tractor** - A vehicle, powered by gasoline or a diesel motor, having large, heavily treaded tires, and used in farming for pulling machinery.

**wheat** - Any of various cereal grasses widely cultivated for its commercially important edible grain; the grain of a wheat plant is ground to produce flour used in breadstuffs and pasta products such as spaghetti and macaroni.

**wheat germ** - The embryo of the wheat kernel that will develop into a wheat plant.

**wheat kernel** - The seed, sometimes called a wheat berry, from which the wheat plant grows.