



The Nebraska Wheat Board (NWB) was formed in 1955 after the Nebraska Wheat Resources Act was passed. The mission of NWB is to increase both domestic and foreign consumption of wheat and wheat food products through marketing and research, as well as to help develop and maintain both domestic and export markets for the Nebraska wheat producer. All NWB policies are established by a seven member board of directors. The board of directors is composed of wheat producers from across Nebraska who are appointed by the Governor.

Each bushel of wheat marketed in the state is assessed an excise tax of 0.4% of net value of wheat marketed in Nebraska at the point of first sale. These monies are deposited into the State Treasury and are used by NWB to advance Nebraska's wheat industry. To ensure that funds are being spent in the best way, the board of directors oversees all expenditures.



Have you ever been on a wheat farm? Here in Nebraska about 920,000 acres of wheat are grown each year. Nebraska produces three types of wheat: hard red winter wheat, hard white and hard red spring wheat. Most of the wheat is grown in the southern part of the panhandle through southeast Nebraska and along the Kansas-Nebraska border.

How do I know so much about wheat? My name is Jenny Johnson and I live on a Nebraska wheat farm. Besides, I like to eat bread, pasta, cereal, pretzels, tortillas, and a bunch of other goodies made with wheat. Since I like to eat a lot of wheat products, I decided to learn more about wheat.

Do you want to know more about wheat too? Come with me and together we will discover how farmers grow wheat and how this golden crop becomes the foods we love.

Wheat is "Classy"

There are hundreds of varieties of wheat grown in the United States, but they are grouped into six classes based on hardness, color, and the time of year they were planted. The six classes of wheat are: hard red spring, hard red winter, hard white, soft red winter, soft white, and durum.

Millers and bakers need to know what class of wheat they are using, because each type of wheat makes a different type of flour and is used in different types of foods. Hard wheat varieties are used to make breads and rolls. The soft wheat varieties are used in cakes, cereals, pastries, and crackers. Durum, the hardest wheat of all is used in my favorite food, pastamacaroni, spaghetti, lasagna, and more. Hard red spring wheat has the most protein. It is usually blended with other classes of wheat to make all-purpose flour.

Where Wheat is Grown

Color in green the states that grow hard red winter wheat: Montana, Nebraska, Kansas, Colorado, Oklahoma, and Texas.

Color in purple the states that grow soft white wheat: Washington, Oregon, Idaho, Michigan, and New York.



winter wheat are: Missouri, Illinois, Indiana, Ohio, Maryland, Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Arizona, Louisiana, Alabama, Mississippi, and Georgia.

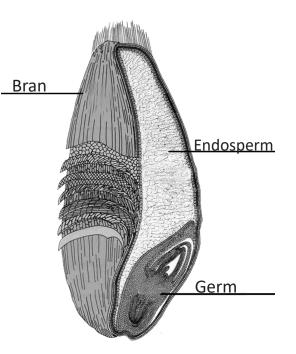
Color in yellow the states that grow hard red spring wheat: Montana, North Dakota, South Dakota, and Minnesota.

Meet the Kernel

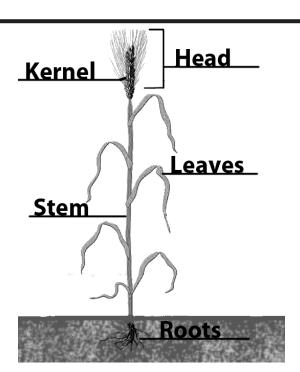
Here is a wheat **kernel**, or seed. It is enlarged so you can see how complex one kernel is. Kernels are very tiny even smaller than our little fingernails! There are about 50 kernels in a head of wheat and 15,000 to 17,000 kernels in just one pound.

The larger inner portion of the kernel is called the **endosperm**. It is the part that is ground to make white flour. The hard outer coating is the **bran**, sometimes used in cereals, muffins, and breads. This portion is made of many layers. Finally, the tiniest part of the kernel is the **germ**. It is the part that grows into a new wheat plant if the kernel is planted in the soil.

Whole-wheat flour is made when the whole kernel is ground or milled. Whole-wheat flour contains all three parts of the kernel.



Plant Parts



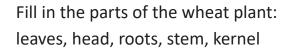
Warm moist days make the wheat plants grow quickly. They usually grow to be 2 to 4 feet tall. A wheat plant has four basic parts: head, stem, leaves, and roots. The head contains the kernels. The stem supports the head. The leaves conduct photosynthesis and the roots hold the plant in the soil and absorb water and nutrients for plant growth.

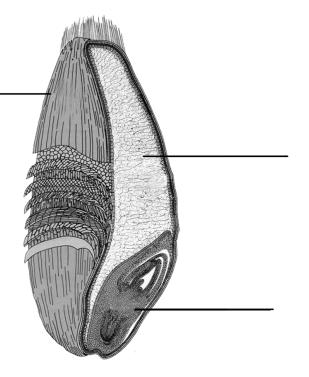
Plant Identification

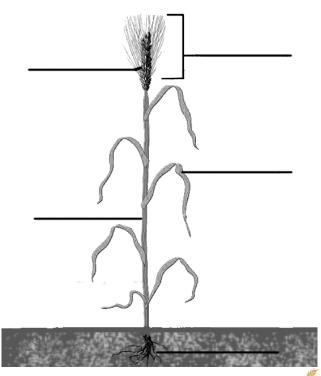
Fill in the blanks with the correct part(s) of the wheat kernel. You will use these words:

bran	endosperm	germ
	_ 1. I am the hard outer	covering of the kernel.
	_ 2. I am the smallest pa	rt of the kernel.
	_ 3. I am the largest part	of the kernel.
	_ 4. I am made of many	thin layers.
	_ 5. I make white flour.	
	_ 6. I am where the new	wheat plant begins to grow.
	_ 7. We make up whole-	wheat flour.
	_ 8. I nourish the young	plant when it starts to grow.
	_ 9. I am used in cereals.	
	10. I am the part you to	buch when you a whole kernel of wheat.

Identify the endosperm, bran, and germ of this wheat kernel.







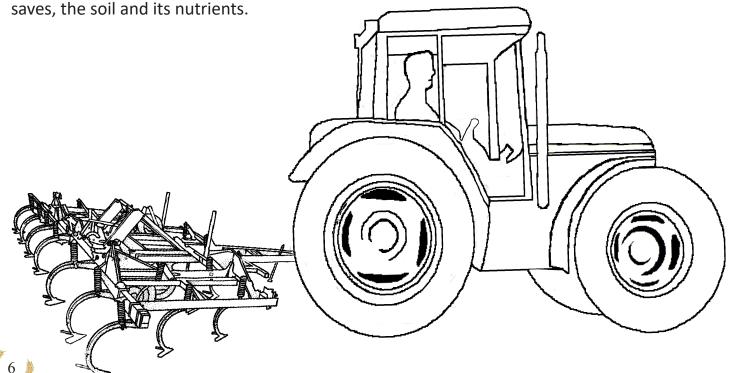
Sowing the Way

Nebraska farmers, like my mom and dad, grow hard red winter wheat, hard white and hard red spring wheat. Nebraska farmers grow about 55 million bushels of wheat each year. The state ranks 11th in overall wheat production. Nebraska is just one of nine states that produce hard white wheat.

In Nebraska, most wheat is **sowed**, or planted in September. This is because the wheat will grow a little bit and then stop growing when it gets cold, but not die. When it begins to get cold the wheat will go through **vernalization**. Vernalization is when the plant has to be in cold temperatures for a certain length of time so that it can continue growing in the spring when it gets warm again.

Long before the wheat can be planted, much work needs to be done to prepare the soil. My mom and dad use a **field cultivator** or **chisel plow** pulled by a tractor to till the soil. A chisel plow looks like the picture below. It is being pulled by a tractor. Tillage is similar to hoeing a garden. It breaks the soil into small pieces and kills weeds that grow early in the spring. After the soil has been broken up, my parents plant wheat with a **grain drill**. The drill creates a furrow or groove in the soil, drops the seed in at an even depth, covers the seed, and packs the soil.

My uncle Joe prepares and plants his fields in a little different way. He uses a **no-till drill** that places the wheat seed in the soil without breaking up the soil into small pieces. This method of planting helps prevent the soil from **eroding**, or wearing away. It **conserves**, or



Growing, Growing...

Whatever method farmers use, they work hard to fight insects, plant diseases, and weeds. Their goal is to provide you and your family with a tasty, safe, and abundant food supply.

The **moisture**, or water, in the soil is what makes the wheat plant start to grow. At first, the germ, or the growing part of the seed, gets its food from the endosperm. As the wheat grows taller, it gets food from the soil and through its roots. The wheat plant's green leaves also make food from the sunshine through a process called **photosynthesis**.

Farmers have to move fast when the wheat is **ripe**, or ready to harvest. While Mother Nature usually cooperates, my parents race to harvest the crop, because a ripe wheat field can be destroyed by wind, rain, hail, and even fire. Wheat can't be harvested if it's rainy. Wheat needs to be dry to be stored without spoiling.

Scrambled Terms

 1. tproxe- selling products to another country
 2.ceosnrev- saving the soil
 3. htsnhsspooytei- the way wheat plants make food using sunshine
 4. drah dre sgrnip- the class of wheat highest in protein & used to
make yeast breads
 5. asniemol- the coarsely ground durum endosperm used to make
pasta
 6. obnmeci- cuts, separates, and cleans grain all at the same time
 7. erac- a piece of land more than half as large as a football field
 8. draeg- the price farmers receive for their wheat at the elevator
depends on this
 9. mdruu- the class of wheat used to make pasta
 10. lubshe- wheat is often bought and sold by this unit of
measurement for dry goods

Pickin' Time

How do farmers know when the wheat is "just right" for harvest? Many farmers take a sample of wheat to the local elevator. There the wheat is tested to see if it is dry enough to harvest. Other farmers, like my dad, check their wheat the "old-fashioned" way. They rub the wheat head in their hands, blow away the **chaff**, or the straw like outer covering of the kernel, and chew some of the grain. If the kernels are hard and make a gummy substance as they are chewed the farmers know the wheat is ready to be cut.

Because of all the different climates, wheat doesn't ripen at the same time everywhere in the United States. Harvest begins in May in hot southern states like Texas and Oklahoma. As summer continues harvest moves north up to North Dakota and Minnesota. In Nebraska, harvest usually begins in early July and lasts until mid-August, about the time we start a new school year.

Wheat is harvested with a giant machine called a **combine**. It cuts, separates, and cleans grain all at the same time. Before the combine was invented, my grandparents had to use two separate machines for harvest- a reaper, or binder, to cut the grain and a threshing machine to separate the kernels from the chaff and stems. The combine got its name, because it "combines" the jobs of both machines.

Combines have made wheat harvesting much faster and easier. It used to take three whole days to cut and thresh an **acre** of wheat. An acre is a piece of land that is more than half the size of a football field! Today with a large combine, my parents can harvest an acre in less than six minutes.

What exactly does "harvesting" mean? It means the wheat kernels are removed from the wheat plant and placed into a hopper which is like a big bowl that will hold the wheat on the combine. When the hopper gets full, the wheat is unloaded into a truck. At our farm, the truck or semi is usually driven by my older brother or sister. Then, the grain is hauled to a storage bin on the farm or to the grain elevator in town.

To Market, To Market

The storage bins at a grain elevator are usually really tall white cylinder shaped buildings. The grain is emptied into a pit, and then gets raised or "elevated" into one of the tall bins. In my hometown of Wheaton, the grain elevator is the tallest building around.

At the elevator, each load of wheat is sampled and graded for quality. The price a farmer gets for the wheat depends on its grade. Just like some of my friends' allowances depend on the grades they get in school, the better the grade the more money the farmer receives.

From the elevator, the wheat is sent by train or truck to a mill. The mill is where the wheat is ground up to make flour for our food. The type of flour produced depends upon the class of wheat it was made from.

Bushels of Fun

Wheat is often bought and sold by the **bushel**, a unit of measurement for dry goods. A bushel of wheat weighs 60 pounds. From one bushel, a flour mill can make about 59 pounds of whole-wheat flour or 42 pounds of white flour. A bakery then can make 64 one and a half pound loaves of whole-wheat bread or 42 one and a half pound loaves of white bread.

- One bushel of wheat yields 42 loaves of white bread. The average one and a half pound loaf (the size we usually find in the supermarket) has 24 slices.
- 24 slices X 42 loaves = 1,008 slices of bread. That's enough to make 504 sandwiches! If you ate a sandwich for breakfast, lunch, and dinner it would take about 168 days to eat all the white bread from one bushel of wheat!

Who Gets the Dough?

While wheat flour is the main ingredient in bread, the price of wheat has little to do with the price of bread. Did you ever wonder where the money goes when your family buys a loaf of bread at the supermarket?

A one and a half pound loaf of white bread costs about \$3.00. Of that amount, the farmer gets only 10 to 20 cents. The rest of the money provides jobs for other people who help make wheat into bread. It pays people who work at the elevator, flour mill, bakery, railroad, trucking companies, and the supermarket. It also pays for packaging costs.



World Class Traveler

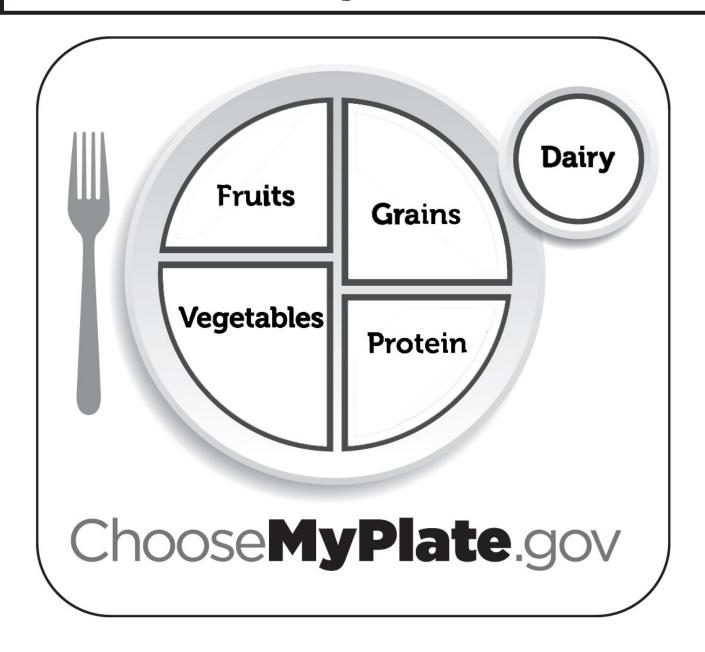
The wheat grown here and in the rest of the United States travels to other counties so people there can eat wheat foods too. Not all children grow up eating bread like you and me. Instead, some eat mostly rice foods. Wheat farmers in the United States send people to foreign countries to teach people there how to make and use breads, cereals, and other wheat foods in their daily diets. When people from other countries realize wheat foods are good for them and taste good too, their countries buy wheat from American farmers.

Wheat farmers **export** their wheat, or sell it to other countries, because they raise more than we Americans can eat. In fact, the United States sells about half the wheat we grow to about 100 different nations around the world- everywhere from Japan to Venezuela.

Bread Around the World

PITA	WONTON	BAGEL	TORTILLA	SCONE	FRY BREAD	CROISSANT
	n a country in Asia iled in soup or fric	•	•	. •	•	d meat. Then they
	le from corn or flor read in a country					not griddle. It is a
•	/ little pocket brea great sandwiches.				, and hollow in	the inside. They
4. Flak	y, tender, crescen	t-shaped rolls	s from the lan	d of the Eiffe	l Tower	
	ught to America b with cream chees	=	_			
	ll round breads fr her special occasi		-	-	the thousands	for pow-wows
	n a country on the es and baked. The				ke breads are c	ut into big, thick

Wheat-the *Energizer*



Do you see the plate divided into sections above? The plate reminds us of the kinds of foods and how much of each food we should eat. Some sections of the plate are bigger than others to show that you should eat more foods from those groups and fewer foods from groups in the smaller sections. The grain and vegetable groups are the largest.

The part of the plate on the upper right is for the grain group. *Color the grain section orange.* Wheat is the most common grain eaten in the United States. Other common grains include barley, oats, corn, and rice. We need to include grains in our diet for the energy and other nutrients that they provide.

Wheat foods provide **complex carbohydrates** that give our bodies energy to run, play, and work. Complex carbohydrates help our brains think so we can get good grades in school. **Fiber** in wheat foods keeps our digestive systems moving on schedule. Wheat also has **B-vitamins** and **iron** that our bodies use to turn food into energy, muscles, and healthy nerves. Athletes eat a lot of wheat products for these reasons. They know wheat foods give them energy without many **calories**.

The vegetable section is next on the bottom left side of the plate. *Color it green.* Some kids don't eat enough vegetables. It is important to eat dark green and orange vegetables. I like broccoli, carrots, spinach, and sweet potatoes.

Color the next section in the upper left of the plate red for fruits. I always put fresh fruit in my backpack. A piece of fruit is my snack every day. I like dried, frozen, and canned fruits.

The last section on the plate on the bottom right is for protein. *Color it purple*. Beef, pork, chicken, turkey, fish, nuts, beans, peanut butter, and eggs are all from this group. They provide iron and **protein**, which is important in building muscles.

The circle next to the plate is for the dairy group. *Color it blue*. Dairy foods are made from milk which includes yogurt and cheese. **Calcium** from milk is important for building strong bones and teeth.

Now with your plate colored orange, greed, red, purple, and the circle colored blue, remember to eat every color every day. The different colors remind us to eat foods from all the food groups.

Some food groups have larger sections on the plate. That shows us that we need to eat these food groups most often. Foods with added sugar and fat should be eaten less often. Candy, chips, and soda are for eating once in a while, in small amounts, as long as we exercise.

For example in the grains group, pasta is a healthy low-fat choice. Cakes, cookies, pies, and donuts are also in the grain group, but are high in fat and added sugar. I eat these foods on special occasions.

Then, I go outside for a walk with my dog or find another fun way to exercise!

Match Your Food to Your Plate

Every food group has a section on MyPlate. Choose the food group in which each of these foods belong.

G=Grains F=Fru	uit D=Dairy V=Vegetables P=Protein
Whole wheat bread	
Broccoli	
Chicken nuggets	Fruits
Yogurt	Grains
Baked Sweet Potato	Vegetables
Peach	Protein
Roast Beef	
Cereal	
Milk	Choose MyPlate.gov
Watermelon	

Whole Grain is Healthy

When you choose whole grains for at least half your grain servings each day, you get all three healthy parts of the wheat kernel. Fiber from the bran is important for good health, and so are the vitamins, minerals, and other nutrients. Just because bread is brown does not mean that the bread is whole grain. You will know a food is made from whole grain if the words "whole" or "whole grain" appear before the grain's name in the ingredient list. Look at the ingredient label on food packages such as bread and tortilla wrappers or pasta and cereal boxes.

The other half of your daily grain servings can come from other grain foods. White flour milled from the endosperm of the wheat kernel is used to make white bread. Regular pasta is made with semolina milled from the endosperm of the durum kernel. White flour and semolina are enriched with iron and four B-vitamins known as **thiamin**, **riboflavin**, **niacin**, and **folic acid**. Enriched grain foods like white bread have twice the folic acid, thiamin, and riboflavin of whole wheat. Folic acid helps moms give birth to healthy babies.

It's Magic!

Nothing tastes as good as a slice of fresh bread right out of the oven! It is soft, fluffy, and chewy-good! Flour can be made from other grains like rye, oats, and barley. Wheat flour is used most often in baking, because it contains a magical protein called **gluten**. Some other grains have gluten too, but not as much as wheat.

I will show you how gluten works, but first you need to know about another ingredient in bread called **yeast**. Yeast is what makes the bread **rise**, or increase in size. When yeast is mixed with warm water and flour to make bread dough, the yeast gets "active" and makes thousands of tiny air bubbles. These bubbles need to be trapped in the dough so it will rise and become light. Gluten helps trap these bubbles.

Gluten is stretchy- sort of like bubble gum! The gluten traps air bubbles from the yeast and keeps them in the dough. All the tiny holes in a slice of bread were formed by gluten bubbles.

Since other grains don't have as much gluten as wheat, bread made from other grains is heavier. Therefore, wheat flour is usually combined with other flours to make rye, pumpernickel, barley, and other multi-grain breads.

Thirsty Experiment

Gluten is a "thirsty protein" that soaks up a lot of water. You can see how much gluten is in different kinds of flour with a simple experiment. You will need 1 cup of wheat flour and 1 cup of rye or barley flour First, mix enough water with the wheat flour to make a smooth, clay-like dough. Next, mix the same amount of water with the rye or barley flour and stir. What do you discover? Because there isn't enough gluten in the other grain flour to soak up the moisture it stays sticky and wet.

Nutrition Cross-Out

Cross out the letters G, J, K, Q, U, and Z to reveal good things wheat foods provide for your growing body.

Let's Bake Pretzels!

1 ½ cups warm water (105°F-115°F)

2 packages active dry yeast

¼ cup sugar

½ teaspoon salt

¼ cup vegetable oil

4 – 4 ½ cups bread or all-purpose flour, divided*

1 egg white

1 tablespoon water

Sesame seeds or poppy seeds

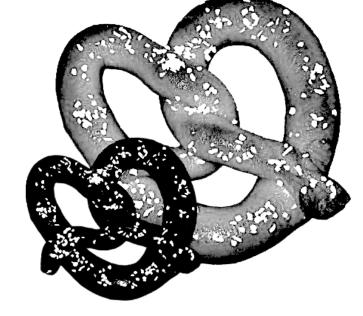
*Up to two cups of whole-wheat flour may be substituted for an equal amount of all-purpose flour

Measure warm water into large bowl. Sprinkle in yeast; stir until dissolved. Add sugar, salt, oil, and 3 cups of flour; beat until smooth. Gradually, add remaining flour to make a soft dough.

Knead dough by hand for 10 minutes on a lightly floured surface. Cover bowl and let rest for 30 minutes. Divide dough into 24 pieces; cover and let rest for 5 minutes. Roll each piece into a uniform 18-inch rope. Shape into a pretzel by making a circle, overlapping the two ends, twisting the ends once, and then pressing them onto the bottom curve of the circle. Dough may also be shaped into 8-inch breadsticks.

Place on greased baking sheets. Beat egg white and water together; brush pretzel tops. Sprinkle with sesame or poppy seeds. Bake in a preheated, 425°F oven for 12 to 15 minutes or until golden brown. Remove from baking sheets; cool on wire rack. Eat when cool and enjoy!

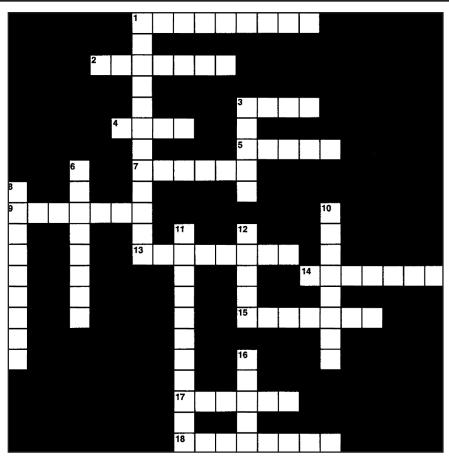
Makes 24 pretzels.



Nutritional Analysis:

Each pretzel provides 108 calories (21 percent from fat), 2.4 grams of protein, 2.5 grams of fat, 19 grams of carbohydrates, 0.7 grams fiber, and 134 milligrams sodium.

Wheat Foods Crossword Puzzle



WORD BANK

GRAVY **SANDWICH SPAGHETTI RAVIOLI PRETZEL BREAD LICORICE** PANCAKE **BUNS FLOUR MACARONI ROLL BAGEL** WAFFLE **LASAGNA** CEREAL **TORTILLA** CREAM OF WHEAT **CROISSANT BREADSTICKS**

Across

- 1. A flaky, rich, crescent-shaped roll.
- 2. A salted snack food shaped like folded arms.
- 3. Hamburgers and hot dogs are served on this bread.
- 4. A small round loaf of bread eaten with a meal.
- 5. Eaten on mashed potatoes.
- 7. A breakfast food with square-shaped dents all over it.
- 9. Round and flat, this breakfast food is served with syrup.
- 13. The outer covering of tacos.
- 14. A baked dish made of layers of broad flat pasta, cheese, tomatoes, and meat.
- 15. Small pockets of pasta filled with meat or cheese.
- 17. A breakfast food served in a bowl and covered with milk.
- 18. A peanut butter and jelly ______.

Down

- 1. A hot cream-style cereal.
- 2. A hard, glazed, ring shaped roll often spread with cream cheese.
- 6. A candy rope that is usually red or black.
- 8. Long skinny pasta often eaten with meatballs.
- 10. Curved tubular pasta often served with cheese.
- 11. Long narrow strips of bread often served with pasta and pizza.
- 12. Finely ground wheat kernels used to make bread.
- 16. Served toasted for breakfast.

Beyond the Table

When you hear the word "wheat", do you automatically think of bread and pasta? I know I do. Did you know that wheat can be used for things other than food? Wheat and wheat straw have many alternative uses. This makes wheat a valuable crop. All the items listed below can be made from wheat. Place an X beside those that you and your family use each day.



Summary

Well, now you know all about wheat, the crop that my family grows on our farm. Let's see what you remember about this important and versatile grain.

Wheat Quiz

1. What type of wheat is most common in Nebraska?
2. The smallest part of the wheat kernel is called the
3. What is the process called when a wheat plant's leaves make food from the sun?
4. Wheat is taken into the in town for storage.
5. How much does a bushel of wheat weigh? 25 lbs. 60lbs. 100lbs.
6. How many loaves of wheat bread does one bushel of wheat make? 20 64 95
7. Which are NOT parts of a wheat plant: head foot leaves stem trunk kernel roots
8. True or False: Wheat can NOT be harvested if it is too wet.
9. True or False: The United States uses all of the wheat it grows.
10. What machine do farmers use to harvest their wheat?

Answers

FOOD MATCHING

- G Whole-wheat bread
- V Broccoli
- D Yogurt
- V Baked Potato
- F Peach
- P Roast Beef
- G Cereal
- D Milk
- F Watermelon

WHEAT QUIZ

- 1. hard red winter wheat
- 2. germ
- 3. photosynthesis
- 4. grain elevator
- 5. 60 lbs.
- 6.64
- 7. foot and trunk
- 8. True
- 9. False
- 10. combine

SCRAMBLED TERMS

- 1. export
- 2. conserve
- 3. photosynthesis
- 4. hard red spring
- l5. semolina

- 6. combine
- 7. acre
- 8. grade
- 9. durum
- 10. bushel

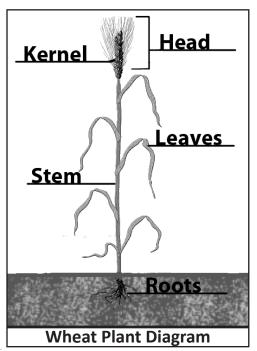


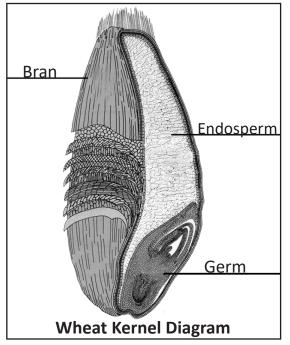
NUTRITION CROSS-OUT

G J C G O Q M P Z L E J X Z C K A K R B K O K H K Y D R G A J T E S Q U G Z K J Q U F K I J B E G R Z Q U J K J L O K W J K F J A T Z J K Q U Z K J G U Q G U V J I Q T A J M I N S K G J Z Q U Z J K Z P Z R J O T K E I J N G Complex Carbohydrates, Fiber, Low-Fat, Vitamins, Protein

BREAD AROUND THE WORLD

1. wonton 2. tortilla 3. pita 4. croissant 5. bagel 6. fry bread 7. scones





PLANT IDENTIFICATION

- 1. bran
- 2. germ
- 3. endosperm
- 4. bran
- 5. endosperm
- 6. germ
- 7. bran, germ, endosperm
- 8. endosperm
- 9. bran
- 10. bran



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