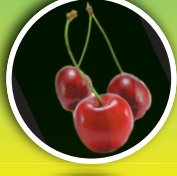




Ag@School

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1790

4 million Americans
90% lived on farms

1850

23 million Americans
64% lived on farms

1950

151 million Americans
12.2% lived on farms

2010

315.5 million Americans
1.8% live on farms

A-"Maize"-ing Corn

Corn is the number one field crop in the United States. Nearly 99% of this crop is grain corn (also called dry corn, field corn, or yellow dent corn). It is used for animal feed, ethanol, corn starch, corn syrup, corn oil, cereal, and hundreds of by-products. Washington leads the nation in yield per acre at 215 bushels. Sweet corn is what we eat fresh, canned, or frozen. It is one of the few crops grown in all 50 states.

6000 B.C.

Parent of corn, a grass called teosinte is farmed in Mexico.

1492

Columbus discovers corn in Cuba, and brings some samples back to Spain.

1621

Native Americans show English settlers how to grow maize.

1779

Seeds of sweet corn are taken from the Iroquois.

1880

62 million acres of corn are grown in US.

1912

US production averages 20 bushels/acre.

1917

US corn acreage reaches peak of 111 million acres.

1930

First mechanical harvester is developed by Gleaner Corp.

1940

Hybrid corn seed becomes readily available to farmers.

1954

The number of tractors on farms exceeds the number of horses and mules.

1966

High fructose corn syrup is patented. The syrup quickly replaces sugar in soft drinks.

1995

US Environmental Protection Agency approves first genetically modified corn for commercial planting.

2006

Ethanol production yields 4.9 billion gallons of renewable fuel.

2006

Walmart begins to switch packaging from petroleum-based to corn-based plastic.

2012

US production averages 152.8 bushels/acre.

2013

On a global scale, the United States produces 32% of the world's supply. GMO varieties account for 90% of the total.



Early corn harvester



From food and feed to fiber and fuel, corn connects us all!

Today's Children... **Tomorrow's Leaders**

tech•nol•o•gy (tek nol 'ə jē), n. using scientific knowledge to find a better way of doing something.



AGRICULTURE IN A CHANGING WORLD

Man has always found better ways of doing things. When people apply what they have learned about science; that's technology!

No industry has made better use of technology than agriculture. Improvements to agriculture have changed America from an **agrarian** to an **urban** society. Less than 2% of our people now work the land. That allows everyone else to live in cities and work in other careers. That means more doctors, more teachers, and more scientists.

Even though less than 2% of the US lives on farms, 17% of our total workforce is employed in agriculture. Growers produce the raw products and others turn them into things we eat and use.

Historically, the early 20th century mechanical revolution put tractors, combines, and other specialized machinery in use rather than horses and mules. Then in the mid-20th century, agriculture experienced a revolution in chemical and genetic knowledge that allowed **high-yield agriculture**. In the late 20th century, agriculture benefited from the electronic revolution, using computers and satellites.

Prior to 1900, nearly all increases in food production came about because more land was brought into production. Now in the 21st century almost all increases must come from higher yields and be based on science and technology.

Think & Discuss

Did You Know?

Hybrid seed corn is produced by crossing two different varieties of corn. To see how this is done go to:

www.youtube.com/watch?v=fkkHvsYXens

hybrid corn miracle

<http://maize.uga.edu/index.php?loc=diversity>

diversity

Horses to Horsepower



For nearly 200 _____, animals (horses, oxen, and mules) provided the "horsepower" on farms. In 1920 two humans and eight horses were needed to care for a 160 acre farm and it took 40 days to do the plowing. One fourth of the acreage of every farm was used just to grow _____ for the horses.

Harvesting 100 bushels of wheat in 1925 required 15 man-hours of labor and a machine pulled by 32 _____. Today, one man and a self-propelled combine can harvest 100 bushels of wheat in 15 _____ or less.

Precision Farming



precision farming method requires technologies like GPS (Global Positioning System). Networks of satellites orbiting the _____ transmit exact locations to the GPS on the ground. GPS can automatically guide huge farm machines to stay along a track hundreds of meters long with only a few centimeters of difference.

Precision farming allows small areas of land within a field to be managed separately so that the best possible crop yield will be reached using the exact amount of _____, fertilizer, and chemical for each small area. This



More Efficient Irrigation

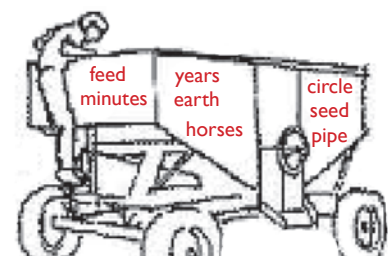
The modern center pivot irrigation system has come a long way from just flooding fields with water. The system uses a long water _____ that is mounted on motorized wheels and has one end connected to the water line at the center of the field. When operating, the irrigation system swings in a _____, sprinkling water as it rotates.



These systems are computer controlled using GIS (Geographic Information System) and can even be operated from the farmer's cell phone. Irrigation is the reason our farmers lead the nation in the yield/acre of corn and potatoes.

Word Bank

Please use these words inside the grain cart to complete the information above.



HAND MILKING TO HIGH-TECH

When the first dairy cow arrived in Washington more than 75% of the US population lived on farms and most of them had a cow or two for fresh milk. Milking was done by hand into a metal bucket. Without refrigeration excess milk had to be sold or traded quickly to neighbors.



Mechanical milking machines were developed about 1930 but even then the average herd size was only 11 cows. The most modern dairies at the time could only milk 30 cows per hour and there was still much hand labor involved. Average yearly production was only 718 gallons per cow.



Today, technology has dramatically changed the dairy industry. Milk is never touched by human hands nor exposed to open air. Closed systems transfer milk directly from the cow through pipes to cooling tanks. Then tank trucks deliver the milk to processing plants. Modern dairies can milk 300 cows per hour and computers record each cow's production. (In fact the largest rotary parlor can milk nearly 700 cows per hour as they take a nine minute ride around the carousel). Advances in animal nutrition and health have increased average production per cow to 2500 gallons per year.



WA Dairy facts at:
www.havemilk.com/article.asp?id=2142

Name the BIG FOUR!

There are about 380,000 kinds of plants. About 100 are regularly grown and eaten as human food.

Amazingly, over half of the world's food comes from only four plants. Three are grains, and one is a tuber vegetable.

Which one does NOT grow in Washington?



First grown by ancient tribes in the mountains of South America, this food is actually an underground storage unit. The roots collect more water and food than the growing plant can use at one time. The plant stores the excess food in oval shapes, called **tubers**. This crop produces more pounds of protein per acre than corn, rice or wheat. Idaho leads US production but **Washington grows more pounds per acre.**



One-seventh of all the farmland in the world is used to grow this grain - far more land than for any other food crop. It is a staple food for 35% of the world's people and is used to make breads, cookies and noodles. Kansas, North Dakota, Montana, Oklahoma, and Washington were the leading production states in 2012.

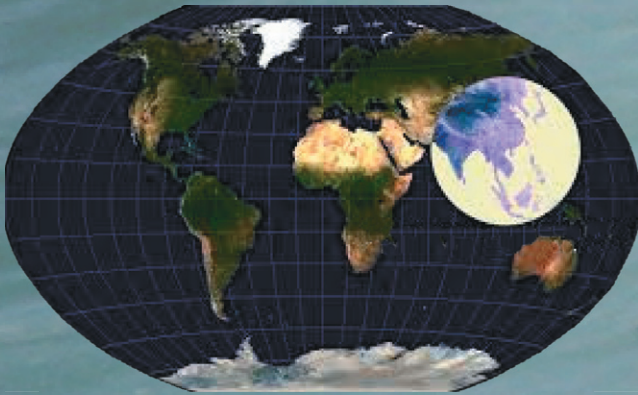


Christopher Columbus found this grain growing in North America in 1492. American Indians helped the Pilgrims survive by teaching them how to plant and cultivate it. Today, it is our country's number one agricultural crop. Iowa, Illinois, Nebraska, Minnesota and Indiana lead US production.



It's a staple food for half the world's people. Native to Asia, it has been grown and eaten there for thousands of years. It grows in warm areas and plants must be under water for most of the growing season. In the US, it is grown mostly in Arkansas, California, Louisiana, Mississippi, Missouri and Texas.

Washington - A Pacific



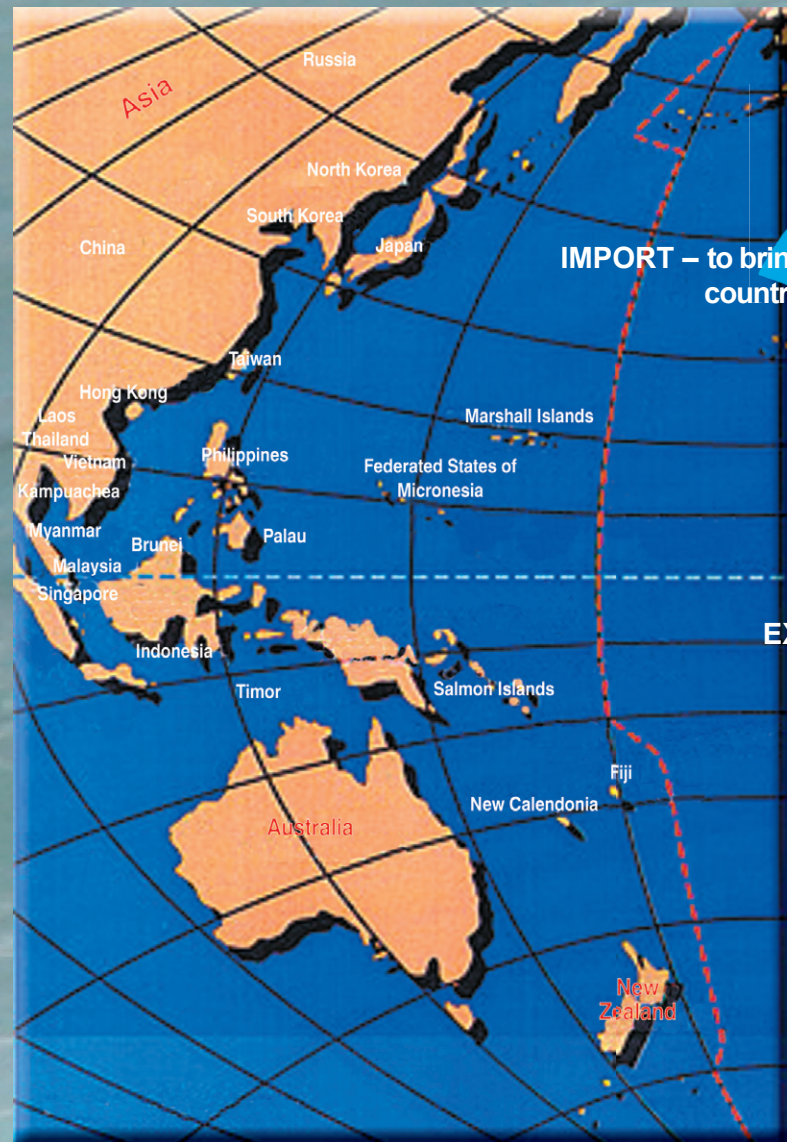
Thanks to our location on the Pacific Rim, Washington has a favorable in about two days closer to Asian markets than California's ports. Our trade because **there are more people living inside the circle on the map** populations—36.5% of the world total. The US has only 4.45% of the world

How do we increase exports?

Trade is not always a simple process. Countries can impose **tariffs** (taxes on imported products). If consumers want to buy the imported products they must pay a higher price to cover the cost of the tariff. Tariffs and other trade barriers can be used to protect producers within a country from foreign competition. Tariffs can lead to trade wars as exporting countries retaliate with their own tariffs on imported goods.

One method of increasing trade is to make trade agreements between countries. **Free Trade Agreements** (FTAs) have proved to be one of the best ways to open up foreign markets to U.S. exports. We currently have agreements with 20 countries (out of approximately 200 nations in the world).

Can you find US FTA partners on the map above?
(Australia, Bahrain, Chili, Columbia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Israel, Jordan, Morocco, Canada, Mexico, Oman, Korea, Panama, Peru, and Singapore)



Our Next Challenge

A regional Free Trade Agreement called the Trans-Pacific Partnership is being negotiated. This would be a pact between 12 countries of the Pacific Rim. The US already has FTA's with six of the countries, but this new agreement will open many markets to producers in all 12 countries.

Pacific Rim Powerhouse

le international trade advantage. By ship, our ports are
trade advantage to Asian markets is especially important
map than live outside it! China and India have huge
e world population.



bring in from another
country for trade or sale

EXPORT – to send to another
country for trade or sale

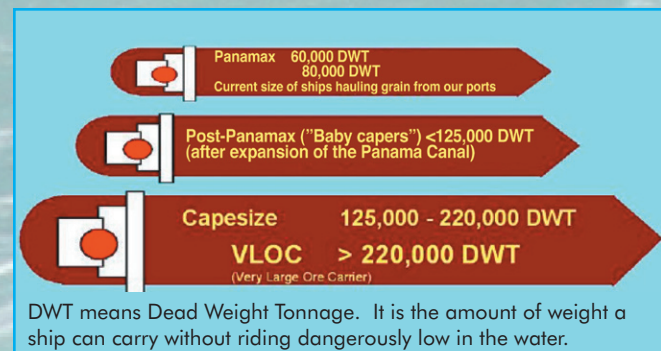
Trade Is Washington's Heritage

Our tradition as a trade state began back in the early nineteenth century with the fur trading activities of Hudson's Bay Company and the Canadian North West Company. Seattle became a major seaport during the Klondike gold rush by selling provisions to miners and transporting prospectors to the Alaskan gold fields. In 1916, William Boeing started building wooden airplanes in a small red barn. Today Boeing Company is the country's largest exporter.

Global demand for the things we produce helped to build our state and drives our economy today. More than 40% of all Washington jobs are linked to trade. The value of Washington exports, per resident, is more than twice the national average. More than \$15 billion in food and agricultural products were exported through Washington ports in 2011, the third largest total in the U.S.

Our Next Opportunity

Although Washington has several "deep water" ports in the Puget Sound and on the Pacific coast, at this time we do not have port facilities that will handle the Capesize ships.



An export facility that will handle dry bulk commodities is being planned at Cherry Point, near Bellingham, that will have a harbor depth of 70-90 feet and can handle Capesize vessels. Currently it costs about 42cents/bushel to ship grain to Japan on a Panamax vessel. That shipping cost would drop to 25 cents/bushel if we were able to ship in Capesize vessels. As the second largest export industry in Washington, agriculture would benefit from this opportunity. Building the facility would also mean more than 4000 construction jobs and 1250 operating jobs.

Activity

1. What is the Pacific Rim?
2. On the map, put an "X" on Washington
3. Are bananas for your lunch an import or an export?
4. Which two countries would be important trade partners? Hint – they have the largest populations

From Hen to Home—It's High Tech!



Hens are fed a healthy diet of specially mixed grain, balanced with vitamins, minerals, and protein. Feeding is computer-controlled to distribute fresh feed evenly. In a modern henhouse computers also control the temperature, humidity levels, and the lighting which triggers egg laying.

Eggs are dropped automatically from the hens' cages to a conveyor belt below. The belt transports eggs out of the house either to the egg processing facility or to a storage cooler. Most eggs are collected within a few hours of being laid.

To clean and sanitize the eggs, a machine washes them in hot water with a special cleaning solution. Once the eggs are washed, they're rotated as they pass by cameras that look for dirt spots. A computer analyzes the images and, if an egg is dirty, the egg is routed back to the washer.

The inside of the egg is examined without having to crack the shell. In the **candling** process, eggs are mechanically rotated several times over a bright light to examine the internal quality of the egg and to find possible cracks. In modern operations, to detect shell cracks, eggs are checked sonically (with sound). In a matter of seconds, tiny probes tap each egg 16 times and 'listen' for the sound it makes. An intact egg has a high pitched ring but a thud indicates a crack in the egg.



Eggs are graded Grade A, AA, or B based on the quality of the shell, white and yolk, and the size of the air cell. Beyond regular grading of each egg, cartons of eggs are pulled randomly to make sure that the eggs meet standards. Eggs are checked for cracks, dirt, and weighed.

Computer-controlled sensors weigh each egg over 60 times in less than a second. Eggs are sorted according to minimum weight per dozen. There is only a three-ounce difference per dozen between the sizes of eggs, so weight accuracy is important.



Machines sort eggs into separate lines by grade and size. Eggs are then packed in fiber or foam cartons to minimize breakage. Once packaged, labels for expiration or sell-by dates are put onto each carton. Robotic arms then pick up the cartons on each line, turn them, and fill a case.

In a warehouse, pallets containing packed cases of eggs are refrigerated. To maintain egg quality, the temperature of the eggs is lowered to 45 degrees Fahrenheit. From there, eggs are loaded into refrigerated trucks to deliver to stores. Most eggs reach stores a few days after being laid.



What do you call a mischievous egg?

A practical yolk!

From www.incredibleegg.org/egg-facts/basic-egg-facts/egg-production/laying

Eat Those Beans!

Dry beans are **legumes**. Legumes are plants that grow pods that contain seeds. They are fascinating plants that have the ability to take nitrogen from the air and convert it into ammonia, a nitrogen compound that plants can use as a fertilizer. Actually it is not the plant that performs this amazing trick, but special *Rhizobia* soil bacteria that invade the root hairs of legumes. The roots form swellings called nodules where the bacterial colonies thrive. This partnership between the legume plant and the bacteria is helpful to both (**sympiotic**).

Dry beans are **pulses**. Pulse is a term that refers to the dried edible seeds of legumes. Pulse crops are allowed to dry in the field before harvest.



Nodules of bacteria on legume roots

There are many different shapes and sizes of dry beans. The most interesting-looking varieties are the color-patterned beans. The photo below shows the dry beans that were grown in a trial at WSU Mount Vernon Northwestern Washington Research and Extension Center. 'Rockwell', the bean being held in the photo below is an heirloom variety that has been grown on Whidbey Island since 1880. Its color

pattern makes it attractive as a niche market variety, and it can sell at farmers' markets in the area for \$12 to \$14 per pound.

Dry beans are a nutritious food grown primarily for humans, although some cull beans go to animal feed. Dry beans are a rich source of protein, low in fat and high in fiber. Dry beans have several times more fiber than fruits and vegetables. Fiber helps people feel full longer and maintain a healthy weight. Fiber also feeds our intestinal bacteria, which help digest food and boost immunity.



Not only are dry beans diverse in their colors and patterns, they are also versatile in the ways that they can be cooked to make a delicious meal. They are most popular when used in refried beans (pinto beans), baked beans (small white/navy beans), burritos (black beans), and soups and casseroles (Great northern beans, red/white kidney beans, etc.).

Washington State grows only 4% (USDA, 2013) of the nation's dry beans, but grows 11.8% of the dry peas, 15.9% of lentils, and 39.7% of garbanzo beans (also called chick peas).

Thanks to Kelly Ann Atterberry at the WSU Mount Vernon Research Center for information

Career Highlight

Name: Krista Roma
Whatcom County

Career: Owner of Backyard Beans & Grains, a one-woman, small seed company, farm business, research, and community education effort.

Job Description: I produce dry legumes and grains for seed and farmers' market sales. I also produce mixed vegetables and storage crops for farmers' market sales and wholesale deliveries. I perform seed variety trials to identify crops best suited for our climate. I teach workshops about growing dry beans and grains using low-tech methods, food preservation/storage topics, and how to eat local year-round. I also manage business finances, statistical data, marketing, my website, and fill mail-orders for seeds.

Skills: Farming, research, biology, marketing, computer skills, keeping good records, people relations, food preservation, and multi-tasking!
www.backyardbeansandgrains.com





EATING HEALTHY

Eat whole pieces of **FRUIT**

DAIRY milk, cheese, yogurt

Choose colorful **VEGETABLES**; they have more nutrients

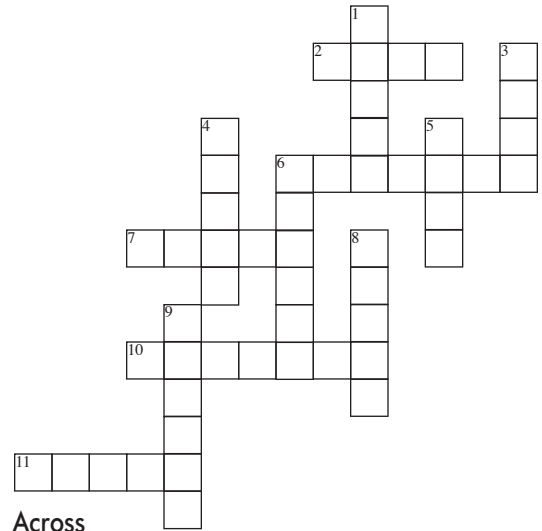
GRAINS
corn, wheat, rice, bread, pasta, tortillas

Drink more **WATER!**

Avoid sugary drinks

PROTEIN meat, fish eggs, dry beans, nuts

My Washington Plate



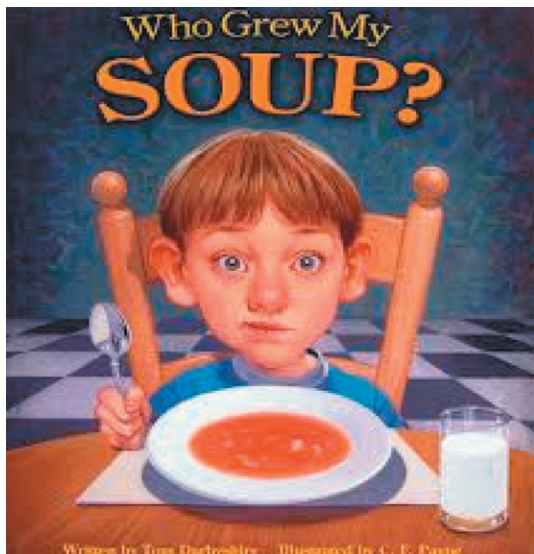
Across

- 2. Drink three servings a day
- 6. Orange root vegetables
- 7. Use My Washington _____ as a menu guide
- 10. Meat and fish are high in this nutrient
- 11. Grain to make pasta

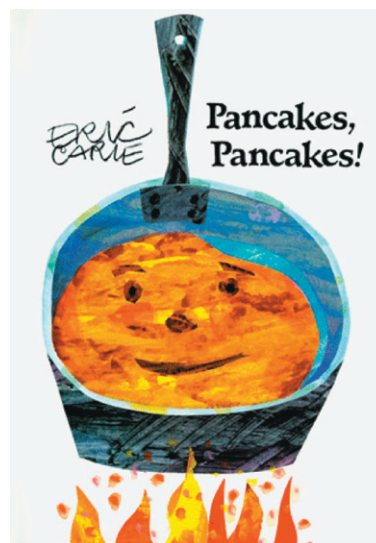
Down

- 1. Helps move food through your gut
- 3. Scrambled, fried, or poached
- 4. Use whole grain _____ for sandwiches
- 5. Grain ground for tortillas and cereal flakes
- 6. Cheddar, pepperjack, and swiss
- 8. Black, pinto, kidney, and navy
- 9. Apples, cherries, and pears

LIBRARY CORNER Check these out...



Tom Darbyshire tells the story of young Phineas Quinn who won't slurp a single spoonful until he knows Who Grew My Soup?



This is the story of Jack, who wants a giant pancake for breakfast. His busy mother says he must gather the ingredients that are located in several different places around the farm. Jack has to spend a lot of time gathering ingredients. This story will really make you think about how important farming is to every meal.

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