



## Welcome to Ag@School!

Class sets of this magazine, aimed primarily at 4th grade level, are FREE to subscribing Washington teachers. Instructions for subscribing are on page 3. This is the second of three issues for 2013-2014.

Produced by Washington Ag in the Classroom, Ag@School is designed to help teachers meet student educational goals as well as develop agricultural literacy. The teacher guide connects information to specific standards that will help your students meet state requirements.

This issue is designed to help students understand:

- High-yield agriculture has allowed us to feed the world without bringing more land into production
- Washington's location on the Pacific Rim is advantageous for international trade which fuels our state's economy
- Life on earth depends on plants, especially rice, wheat, corn and potatoes
- Technology is using scientific knowledge to find a better way of doing a job
- Taking responsibility for food choices improves health and well-being

Reproducible activities in the teacher guide expand on concepts covered in the magazine. Included in the guide are instructions for a visual activity (The Earth as an Apple), vocabulary activities, answers to questions in the magazine, and post tests.

## The Earth as an Apple

### Environmental benefits of high-yield agriculture

Agriculture's relationship to the economy and our standard of living is important. But, equally important is the environmental impact of modern agriculture. Food production impacts the global environment more than any other human activity.

World population, land-use, food demand and how extensively high-yield agriculture methods are embraced will determine what happens in the future to the remaining wild lands on the planet.

**We suggest the teacher do the "Earth as an Apple" (page 5 in this guide) prior to handing out this issue.** Please read the background information prior to presenting the activity. The land conservation benefits of high-yield agriculture are too important to be overlooked.

## Vocabulary Words

Each issue introduces several words or word combinations that may be unfamiliar to students. These will appear in bold type the first time they are used. Words in this issue include: agrarian, urban, high-yield agriculture, precision farming, imports, exports, tariffs, egg candling, legumes, symbiotic, and pulses.

## Grant Opportunity

The Washington Ag in the Classroom organization is pleased to offer a grant (up to \$500) to groups or individuals sponsoring programs or projects that promote agricultural literacy. The proposed project must be targeted to young people from 5-18 years of age and should enhance student knowledge of the contribution made by agriculture. The funds will be available to any school-aged students, teachers, and others in the community who are involved with agriculture.

Visit our website,  
<http://www.agclassroom.org/wa>  
for more information and to apply.

## Washington Standards

### Science:

EALR 3 – APPA, APPG, AND APPH  
EALR 4 – ES1A

### Math:

4.1.1 4.2.D TG page 6

### Social Studies:

EALR 2.1, 2.2, 2.4, 3.3, and 4.1

### Health and Fitness:

EALR 1.5

### Reading:

CCSS RI.4.4, and RI.4.7

### Writing:

The post test is designed to help prepare students to write. The prompts include the four modes of writing: expository, narrative, descriptive and persuasive.

## Cover

Corn is truly an amazing crop, one that the world depends upon. For good background information, teachers may want to review the video at: [www.youtube.com/watch?v=LGJ6D3KNJ9E](http://www.youtube.com/watch?v=LGJ6D3KNJ9E)

While students may think of corn on the cob or popcorn (both separate types of corn plants that account for only 1% of the acres grown), the real story is about grain corn. It is basically inedible without processing. We can eat corn flakes, cornmeal muffins, or corn tortillas, but we actually consume more corn via the meat, milk, and eggs that are produced using corn as animal feed. Corn has hundreds of uses for by-products, including corn syrup for sweetener and corn to produce ethanol.

## Discussion Starters

1. What does it mean to be an agrarian society?

Have students discuss the changing US population demographics listed across the top of the cover. There are very few people living and working on farms today, so we have shifted from being agrarian to being urban.

2. What is "high-yield agriculture"? Farmers grow more food on each acre by using technology. They choose improved seeds and plants, add plant food (fertilizer) to the soil, manage pests, and use better equipment and techniques to increase production on fewer acres.

## **Technology is the Key**

There are five outstanding technological developments in the last 60 years that have led US agriculture to its current production levels:

1) Mechanized equipment (tractors and combines rather than horses and mules); 2) widespread use of man-made fertilizers; 3) chemical pesticides; 4) computers and Global Positioning technology; and 5) advances in genetics of crops and animals either through cross breeding or biotechnology.

## **Scientists – Engineers – Specialists:**

Farmers depend upon scientists of all sorts to do research adding to our knowledge of the world around us, engineers to translate that knowledge into new equipment and processes, and specialists that assist farmers with problems in the field. These men and women do not necessarily have farm backgrounds, nor do they live on farms. They are employed by universities and industry and are a huge part of the success of American agriculture.

Watch for clues in this issue of Ag@School identifying a few of the dozens of science-based careers beyond that of farmer or rancher. Get more information at:

[www.ars.usda.gov/is/kids/scientists/scientistsframe2.htm](http://www.ars.usda.gov/is/kids/scientists/scientistsframe2.htm)

## **Hybrid Corn**

Hybrid corn is a strain produced by fertilizing one variety of corn plant with the pollen from another. The result, if the technique is carried on properly, is a strain that combines desirable features of both parents and is far superior to either. Hybrid corn produces up to 30 per cent more corn for each acre. The ears are consistently larger and better formed than those produced by ordinary methods. Stalks and roots are stronger, allowing the plant to resist toppling by the wind. Hybrid strains have been developed to produce plants adapted to such conditions as drought, dampness, or cold.

Much painstaking work must be done to produce an ear of hybrid corn. For this reason most farmers buy hybrid seed from specialized growers. Kernels from the ears of double-cross hybrid plants cannot be saved for seed. The reason is that the offspring of these plants do not resemble the parents. Each season's supply of hybrid seed must be produced by crossing the original parent strains.

<http://www.ncga.com/upload/files/documents/pdf/WOC%202013.pdf>

<http://videos.howstuffworks.com/discovery/31274-corn-corn-crop-video.htm>

## **Page 2 - Word Fill In**

years, feed, horses, minutes, seed, earth, pipe, circle

## **Name the Big Four**

**Potatoes, wheat, corn, rice**

Why does Idaho produce more potatoes than Washington if Washington has the highest yield/acre in the nation? There were 345,000 acres of potatoes planted in Idaho, and only 164,000 acres in Washington (2012). Rice does not grow in Washington.

## **Page 4/5 - Washington and Trade**

### **Discussion starters:**

1. Discuss imports and exports. How are our lives changed by trade? Examine your classroom for things that were imported (look at clothing labels too). Find the countries on a globe. How does trade with other countries (and states) benefit both partners? (More than 95% of the world's population lives outside the US, but we have enormous resources. Trade is a way of meeting consumer needs and wants not satisfied domestically.)
2. Think of food products that we cannot grow in WA (bananas, coffee, oranges, spices). Why can't we grow these here? (climate, length of growing season, soil type). What about seasonal products (lettuce, grapes) that are grown here during summer but not in winter. How can they be offered in stores all year around? Where do they come from? Why are seasons reversed between the Northern and Southern hemispheres?

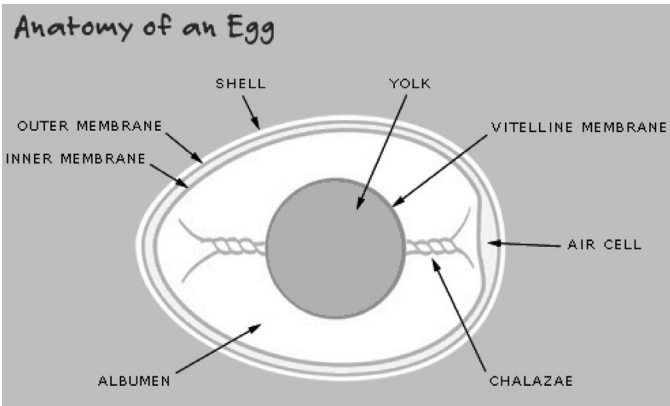
### **Page 5 Activity**

The Pacific Rim refers to all the countries that surround the Pacific Ocean. Bananas are an import because we do not have the tropical climate required to raise them. China and India are the two countries with the most population and would be important trading partners.

## **"Eggs"-actly So**

1. All egg shells are white. The color is only on the shell's outer surface. If you crack open a brown egg, you'll see the inside of the shell is white. Color comes from natural pigments in the bird's bloodstream. They are deposited on the eggshell in the chicken's oviduct. The color of an egg's shell is determined by the genetics of the hen; it has nothing to do with what the hen eats. If you want to predict the amount of pigment from a given hen, the place to look is her "earlobes". A hen's earlobes are a patch of skin on the side of the face; the redder or darker the earlobe, the darker brown the egg.
2. There is no nutritional difference between brown eggs and white eggs. However, unlike the shell, the yolk color is very much influenced by the hen's diet. The darker yellow color comes from carotenoids, which are natural compounds found in plants. The best known carotenoid is beta-carotene. Hens eating green vegetation or diets containing ingredients like marigold petals will have dark orange yolks. The yolk represents about 1/3 of an egg's weight, but it contains all the vitamins, all the fat, almost all of the calories, and about half the protein.
3. The air cell gets larger as the egg is stored longer.
4. The chalazae holds the yolk in the center of the egg. The thicker it is, the fresher the egg.

<http://www.exploratorium.edu/cooking/eggs/eggcomposition.html>



The Ten Tips Nutrition Education pages are perfect for posting on a refrigerator. They are a starting point to get students and families moving toward a healthy diet (also available in Spanish).

## Plants Need Food Too! Answers TG page 4

Field A: Corn, Potatoes, Wheat  
Field B: Corn  
Field C: Corn, Wheat

## Greenbelts and Breadbaskets TG page 5

1. US
2. South American Pampas
3. Ukraine
4. North China Plain

## Pulse vs. Legume - What's the Difference?

All pulses are legumes, but not all legumes are pulses.

The term "legume" refers to the plants whose fruit is enclosed in a pod and when growing, legumes fix nitrogen into the soil, which reduces the need for chemical fertilizers. Well-known legumes include alfalfa, clover, fresh peas, lupins, mesquite, soy and peanuts.

Pulses are part of the legume family, but the term "pulse" refers only to the dried seed. Dried peas, edible beans, lentils and chickpeas are the most common varieties of pulses. Pulses are very high in protein and fiber, and are low in fat. Like their cousins in the legume family, pulses are nitrogen-fixing crops that improve the environmental sustainability of annual cropping systems.

## Page 8 Eating Healthy

Across: 2. Milk 6. Carrots 7. Plate 10. Protein 11. Wheat

Down: 1. Fiber 3. Eggs 4. Bread 5. Corn 6. Cheese 8. Beans 9. Fruit

## Choices - Choices

The obesity rate in American children has tripled over the past 30 years, and their expected lifespan is now less than their parents! Go to:

<http://www.choosemyplate.gov/healthy-eating-tips/ten-tips.html>

**Visit**  
**[www.waic.net](http://www.waic.net)**

FOR LINKS TO:

- Lessons
- Activities
- Information
- Student Websites
- and more!

**Washington Ag in the Classroom**  
**is your launch pad for information and activities about all fields of agriculture!**

## Publication and Credits

Ag@School is a publication of Washington Agriculture in the Classroom, a non-profit entity created in 1981 to encourage and help teachers increase agricultural literacy in their students. Both public and private groups including the WA Dept. of Agriculture, WSU, commodity commissions, farm organizations, agribusinesses and individuals, support the mission. Teachers may reproduce any pages for use.

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# THINK BEFORE YOU DRINK

## Live Healthy---Drink Water

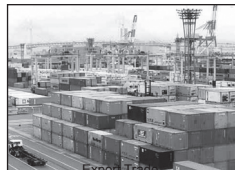
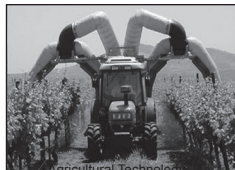


### Soda is a poor choice; it has:

- No nutritional value, but 150 empty calories (12 oz)
- Been linked to obesity, high blood pressure, heart disease, and diabetes
- Ingredients that cause bones to soften (osteoporosis) and decay teeth

### (Post-Test) TELL WHAT YOU LEARNED!

1. HOW HAS TECHNOLOGY CHANGED OR IMPROVED PRODUCTION FOR FARMERS? GIVE TWO EXAMPLES. WHICH INNOVATION DO YOU THINK IS THE MOST VALUABLE? WHY?
2. PERSUADE THE READER THAT EXPORT TRADE IS IMPORTANT TO WASHINGTON. GIVE REASONS TO SUPPORT YOUR POINT OF VIEW.
3. DESCRIBE THE FIVE SECTIONS OF MY WASHINGTON PLATE. WHY IS IT IMPORTANT TO EAT ACCORDING TO THIS PLAN?
4. CHOOSE A JOB THAT AGRICULTURE DEPENDS UPON AND EXPLAIN WHY SCIENCE IS AN IMPORTANT SUBJECT TO INCLUDE IN STUDIES FOR THAT CAREER.

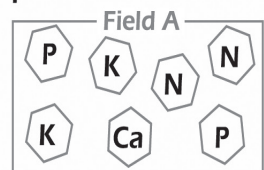


### PLANTS NEED FOOD TOO!

Just as we need vitamins and minerals from our food to grow, plants need nutrients from the soil to grow. Nitrogen, phosphorus, potassium and calcium are some of the nutrients that food crops need. About 50 years ago scientists learned how to test soil to see what was missing. Farmers could then apply the missing nutrients in fertilizer. This increased yields.

Using the key decide what crops you could plant in each field.

**Key:**  
**Ca** = Calcium  
**N** = Nitrogen  
**P** = Phosphorus  
**K** = Potassium



Crops I could plant:

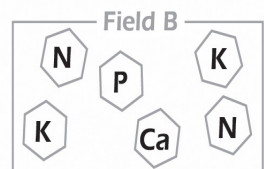
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**Corn needs:**

2 N's  
 1 P  
 1 K



Crops I could plant:

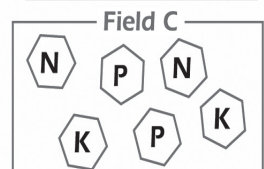
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**Potatoes need:**

2 P's  
 2 N's  
 1 Ca  
 2 K's



Crops I could plant:

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**Wheat needs:**

1 N  
 1K  
 1-1/2 P

### FEEDING PEOPLE – THE BIG FOUR

List foods you've seen or eaten this week.  
 Which of them - plain or processed - came from  
**THE BIG FOUR?**

#### RICE

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#### WHEAT

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#### CORN

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#### POTATOES

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# Earth as an Apple

**MATERIALS REQUIRED:** Large apple and paring knife

**OVERVIEW:** Cut an apple into smaller and smaller fractions to visually demonstrate how the earth's surface is used. All the people on earth, nearly 7 billion, live on 1/8th of the surface. Only 1/32 of the surface is now used for growing food.

**OBJECTIVE:** Understanding why high-yield agriculture (growing more on less land) is necessary to avoid plowing more land to feed a growing population demanding better food.

## Explain that the apple represents the earth

### Cut apple into four quarters:

- Three of those represent the oceans. Set those 3 quarters aside
- Remaining quarter represents total land area of planet.

### Cut the land quarter into two pieces:

- One piece (1/8) is inhospitable to people. People can't live there. It includes polar regions, deserts, swamps, and very high or rocky mountains. Set it aside.
- Remaining 1/8 is land where all the people live, nearly 7 billion.

### Cut the 1/8 where people live into four pieces (4/32nds):

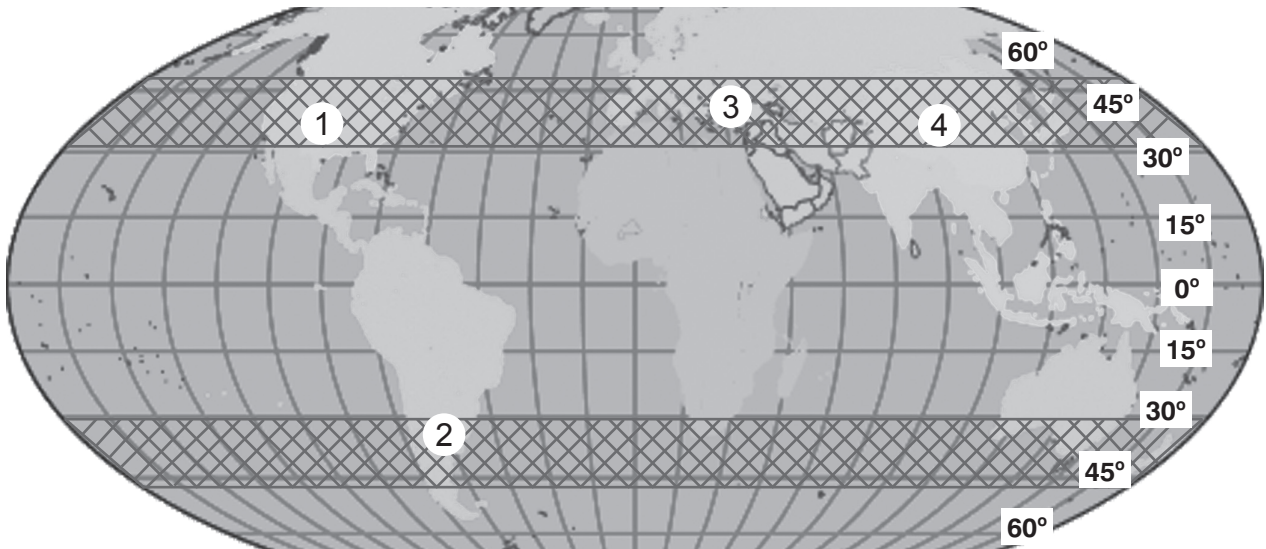
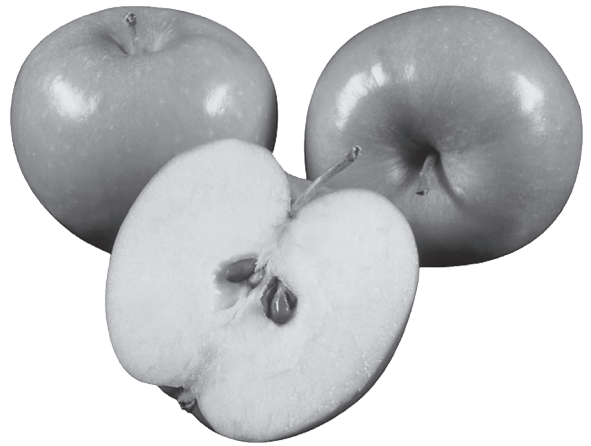
Three of these are land that does not grow food.

- Land that is too wet, too dry, too cold, too steep, or the soil is too poor.
- Land covered by cities, shopping centers, freeways, and all the things we have built on the earth.
- Land now used for other things – parks, rainforest, wildlife habitat, wetlands and recreation areas.

Set those 3 sections aside.

### Carefully peel the last 1/32 slice:

- This tiny bit of peeling represents the topsoil, the thin skin of the earth's crust upon which man depends.
- Less than 5 feet thick, it is a very fixed amount of food-producing land



## **Greenbelts and Breadbaskets**

In addition to the latest technology, US farmers have something else going for them... good land! The best land grows more food on less acres. That leaves more land for wildlife, parks and forests.
















Look at the map above. There are two "greenbelts" that run around the earth midway between the equator and the poles where growing conditions are best. These include soil type, rainfall, temperature, frost-free days, daylight hours and length of growing season.

Within these two greenbelts are four regions that are perfect for growing cereal crops. These regions are called the "breadbaskets" of the world. They are the US, the Ukraine, the North China Plain, and the pampas of South America.

Fill in the 'breadbasket' that corresponds to that number on the map.

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_

# FEBRUARY 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<p>National Potato Lovers Month</p> 	<p>National Cherry Month</p> 	<p>US consumers spend less than 10% of their income for food; people in India spend 53%.</p>	<p>Bake for Family Fun Month <a href="http://www.homebaking.org/familyfun/">www.homebaking.org/familyfun/</a></p>	<p>National Hot Breakfast Month</p> 	<p>Canned Food Month</p> 	<p>The first cows came to Washington in 1838.</p>
<p>Super Bowl Can you see your shadow?</p> 	<p>Washington leads the nation in production of processing carrots.</p>	<p>Read Stone Soup What ingredients are grown in Washington?</p>	<p>Baby corn is an import, mostly from Thailand.</p>	<p>The average WA dairy cow gives 2760 gallons of milk each year.</p> 	<p>Peanuts grow underground, and are legumes, not nuts.</p>	<p>One acre is about the size of a football field.</p> 
<p>Pizza Day</p> 	<p>The human body is 66% water and needs 2.5 quarts of water a day (from eating and drinking).</p>	<p>Make a Friend Day Don't Cry over Spilled Milk Day</p> 	<p>Lincoln's Birthday</p> 	<p>Soft white wheat is the type of wheat grown most in Washington.</p>	<p>Valentine's Day</p> 	<p>It would be impossible to feed everyone in the world if only organic methods were used.</p>
<p>Eat a variety of fruits and vegetables – the more color the better.</p>	<p>Presidents' Day</p> 	<p>Hard boiled eggs are difficult to peel if they are very fresh.</p> 	<p>Legumes increase nitrogen in the soil for future crops to use.</p>	<p>An acre of corn will give off 4,000 gallons of water a day in evaporation.</p> 	<p>Humans and plants need many of the same nutrients.</p>	<p>Washington's Birthday</p> 
<p>National Pancake Week</p>	<p>Read Pancakes, Pancakes</p>	<p>Aquaculture includes clams, oysters, mussels, and geoducks. Nat. Clam Chowder Day.</p>	<p>Yolk color in eggs is directly linked to the diet of the hens.</p>	<p>National Strawberry Day National Chili Day</p>	<p>Farms and ranches provide 75% of the habitat for US wildlife.</p>	<p>When is the next leap year?</p> 