

## Welcome to Ag@School!

Class sets of this magazine, aimed primarily at 5th grade level, are **FREE** to subscribing Washington teachers. Instructions for subscribing are on Page 6. Limited numbers of back issues are still available.

This is the second of three issues for 2003-04. Delivery of the third issue will be mid-March.

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 activities to specific EALR's that will help your students meet state requirements.

This issue is designed to help students understand:

- that agricultural technology brought dramatic changes in where and how we live
- the interdependence of all segments of society
- that our success as a nation is directly related to our successful agriculture
- that agriculture is the nation's largest employer and most agricultural careers are not farmers or ranchers
- how Washington's location on the Pacific Rim relates to international trade

## 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.

Information in this issue will enhance student knowledge about population, land-use, and food demand. These three factors will determine what happens to the remaining wild lands on the planet.

The issues surrounding those three factors are complex. For that reason we suggest the teacher do the "Earth as an Apple" (Page 4 in this Guide) prior to handing out this issue. We have provided some background (long and very small type) on that page and hope that teachers will find time to read it. The land conservation benefits of high-yield agriculture are too important to be overlooked.

## Teacher Guide and Post-Test

- This teacher guide contains discussion starters, EALR connections, and answers. Reproducible activities expand on concepts covered in the magazine.

- The 'Earth as an Apple' activity on page 4 demonstrates how the earth's surface is used and reinforces the environmental importance of modern agriculture.
- The Post Test on Page 6 is designed to help prepare students to write. The writing prompts include the four modes of writing: expository, narrative, descriptive and persuasive.

## Vocabulary Words

Each issue will introduce 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, raw product, interdependent, input, output, export, import, staple food, protein, cereal crop, ruminant, byproducts, supply and demand. Definitions are included in a reproducible student activity on page 5 in this teacher guide.

## Cover – Technological change

### Discussion Starters:

1. Using the definition of technology (bottom right), discuss what it is and how it has affected our lives. Students should understand that technology is not just about mechanization or computers. The shovel is an example of technology. Someone came up with a new idea that sure beats using your hands and a digging stick.
2. Discuss how technology affects the prices of food (less labor costs, higher yields on the same amount of land, and greater efficiency mean lower food costs).
3. Discuss the dramatic drop in manpower required to produce our food. Since far fewer people are needed to feed us, what do these people do now? What effect has that had on the creation of new industries; on leisure time; on pursuit of other careers?



## Page 2 –Employment, economics

### Background:

Technological change has dramatically affected agriculture, perhaps more so than any other industry. The benefits to the American consumer have been tremendous. Not only is our food less expensive, it is cleaner and safer. It is also produced on far less land, with much less environmental impact than the subsistence farming practiced in most of the world.

### Discussion starters:

1. When people were no longer required to work on farms where did they go? (to cities or urban areas). Do urban people work in agriculture? (yes, they manufacture things used by farmers and also provide services used by farmers)
2. Why is our food such a bargain? Why do we spend less of our income on food? (Actual food cost is less in poorer countries but our incomes are higher. For example: In America we might spend 10% of \$30,000 on food and people in India might spend 50% of \$5,000 on food. Their food cost is lower but it is a higher percentage of their income).

### Answers page 2:

How many zeros in 24 million? (24,000,000)

Food Check-Out Day 2003: February 6

Tax Freedom Day 2003: April 18

## Page 3 – Animal Agriculture & Math

### Discussion starters:

1. Discuss the many ways that livestock contribute to agriculture (grazing benefits pasture and controls weeds, manure is important fertilizer for growing food). Then discuss the many ways that cows contribute to everyday life (provide milk, meat and other byproducts).
2. The unique ability of ruminants is a fascinating discussion. Follow up by researching the topic. A good place to start is <http://www.ca.uky.edu/agripedia.com>. Click on the 'Glossary tab' at the top, scroll down to "D" and click on the digestive system you want to learn about.

### Answers page 3:

Answers to "Go Figure!": 1) 1.5 million gallons;  
2) 5.4 billion or 5,400,000,000; 3) 16.67 inches of rain

## Pages 4/5 –Washington and trade

### Discussion starters:

These pages contain a wealth of ideas for discussion. Begin with "Where in the World is Washington" and discuss the three questions at the top. Then, have students read "Trade is a Washington tradition".

Each of the other sub-heads (Who are our customers?, Where do our products go?, etc.) can be read and discussed separately.

1. Follow a product from a Washington county to an export destination. Talk about the likely modes of transportation that might be used. What problems might be encountered on the journey and how would they resolve them?
2. 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 from which they came.
3. 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 that are grown here during summer (lettuce, grapes) but not in winter. How can they be offered in stores all year around? Where do they come from? How does trade with other countries (and states) benefit both of us?

### Answers pages 4-5:

#### Pacific Rim trading partners:

- |                |           |                |
|----------------|-----------|----------------|
| 1) Philippines | 5) Japan  | 9) New Zealand |
| 2) Taiwan      | 6) Canada | 10) Australia  |
| 3) China       | 7) Mexico | 11) Singapore  |
| 4) South Korea | 8) Peru   |                |

**Supply and Demand:** 1) price of juice will go up;  
2) price of wheat will go down; 3) Boeing is laying off workers

## Page 6 – People depend on plants

### Discussion starters:

1. People in wealthier countries live longer and have less disease than people in poor countries. Much of this difference is due to what foods are available and what foods people can afford. Healthy diets include a variety of foods. Use a food pyramid and have students discuss components of a healthy diet. Ask if they make healthy food choices. Why or why not?
2. What do population trends – more people in cities and in underdeveloped countries – mean for agriculture? (production must keep increasing to feed everyone; transportation and distribution will be even more important. Conservation of land and water will depend on new technologies to increase production without using more land)

### Answers page 6

**The Big Four:** rice, wheat, corn, potatoes  
**Name the food:** rice, wheat, corn, potatoes



## Page 7 – Growing more on less land

### Discussion starters:

1. Why is it better environmentally to plant crops in areas where they grow best? (can grow more on less land) Have class discuss conditions that determine which crops grow best. (soil type, rainfall, temperature, length of daylight hours and growing season)
2. Have students find exactly where the US is in relation to the northern greenbelt. (entirely within) How does this help explain why the US produces more food than any one else?
3. Have students find the Ukraine on a map (formerly part of the Soviet Union). Discuss why, with so much good land, millions of their people do not have enough food (political system, lack of roads and transportation for crops, land ownership). What is different in the US? (secure property rights, good transportation systems, freedom to innovate)

### Answers page 7:

**Plants Need Food Too!** Field A will grow corn, potatoes or wheat; Field B will grow only corn; Field C will grow corn or wheat

**Greenbelts:** 1) Too cold above and below belts; 2) Too hot and humid between the belts (fungi that cause plant diseases grow well in humidity); 3) Areas within belts that don't grow well might be high, rocky ground, too dry, too cold, or poor soil

**Great Grain Scramble:** oats, wheat, barley, sorghum, rice, corn, rye and soybeans

## Page 8 – The 'Udder' Page

### Dairy fun:

Go to [www.dairymax.com/puzzles.htm](http://www.dairymax.com/puzzles.htm). Scroll to bottom and download Dairy Jeopardy. This fun and challenging game stresses the importance of dairy products in a healthy diet.

### Answers page 8:

**Milk is special!** And, so is honey!

**Moo Math:** 1) 40 centuries; 2) 300 days x 90 cups = 27,000 cups; 3) 90 cups x 8 oz = 720 oz = 5.625 gal.; 4) Using 8.57 minutes/cow it would take 2,116,790 minutes or 35,279.8 hours. Milking 24 hrs./day, this is about 1,470 days or over 4 years!

**True or False:** All are true except #5 (eggs are not dairy)

## EALR Connections

### Geography:

- Standard 1 (using maps and other geographic tools) – p. 2, 4, 5, 7, Apple activity in teacher guide.  
Standard 2 (natural and physical characteristics) – p. 2, 4, 5, 7, 8. Apple activity in teacher guide.

Standard 3 (interaction between people and the environment) – p. 1, 2, 3, 4, 5, 6, 7, 8, Apple activity in teacher guide.

### Economics:

Standard 1 (economic concepts) – p.1, 2, 3, 4, 5, 7, 8.

### History:

Standards 1, 2 and 3 – p. 1, 2, 4, 5, 6, 8, teacher guide activities.

### Reading:

The articles and activities throughout the magazine link to most reading standards. They can be used to build skills in outlining, vocabulary, comprehending important ideas, reading factual material, or reading to learn new information.

### Writing:

The post test includes the four modes of writing: expository, narrative, descriptive and persuasive.

### Communication:

Standard 1 (listening and observation skills) – p. 1, 2, 3, 4, 5, 6, 7, 8.

### Mathematics:

- Standard 1 (understands and applies concepts and procedures) – p. 2, 3, 5, 7, 8.  
Standard 2 (uses math to define and solve problems) – p. 2, 3, 5, 7, 8.  
Standard 3 (uses mathematical reasoning) – p. 2, 3, 5, 7, 8.  
Standard 5 (connecting math to real-life situations) – p. 2, 3, 5, 7, 8.

### Science:

- Standard 3 (applying skills of science) – p. 1, 3, 6, 7, 8.  
Standard 5 (understanding how science and skills are connected to other subject areas and real-life situations) - p. 1, 3, 6, 7, 8

## Learn More About Agriculture

### Teacher workshops:

In addition to producing Ag@School, Washington Ag in the Classroom conducts summer workshops for teachers. These five-day, three-credit, classes can be held on request in any area of the state but do require a minimum enrollment of 20. Watch our website for dates and locations: [www.waic.net](http://www.waic.net).

## 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.

Content editing is by Colleen Tigges and graphic design is by Ritz Publishing & Design.



# 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, 6 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, six 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.

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## Discussion Ideas and Background

### **1) Is earth's population going up or down? Why?**

World wide birth rates are dropping but death rates are also dropping. Population is rising because more babies live to grow up and they are living longer – better medicines, improved sanitation and disease control.

### **2) Is the amount of land available for growing food increasing or decreasing?**

In developed countries agricultural land is decreasing as ecologically sensitive land is taken out of production and more land is used for urbanization. However, production has increased more than enough to offset the difference. The US has tripled production on the same amount of farmland.

In poor countries, agricultural land is expanding as populations grow and people can afford better diets. Lacking modern technology, their only way to increase production is to use more land. Since the best land was already being farmed, the additional land is coming from marginal, mostly tropical areas that contain most of the planet's biodiversity.

### **3) Brainstorm ideas for growing more food without increasing land use? (diets must also improve)**

High-yield agriculture (growing more food on less land) is very successful in developed countries due to use of chemical fertilizers, pesticides, biotechnology, and irrigation. Exports by US farmers

save millions of acres of land from being plowed someplace else.

In spite of this success, modern farming inputs are often controversial in wealthy nations. They are not controversial in poor countries because the increased yields are so desperately needed. But, due to cost, they are rarely available to poor subsistence farmers.

**Biotechnology:** genetically improved crops can be engineered to grow in harsh conditions. These might include crops that require less water, crops that will grow in saline (salty) soils, or crops that are resistant to fungi that cause plant diseases.

**Pest and plant disease control:** Without pest control, an estimated 70% of the world's crops would be lost each year. To offset the loss in production, at least 90% more cropland would be required (the additional land will have lower production). Pesticides do occasionally show up in places they aren't supposed to be. However, without chemicals, those places would likely not even exist. They would already be farmed for food. Perhaps in the future, genetic engineering will replace the need for pesticides. But, at this point in time, the world can not spare enough land to farm without them.

**More efficient use of water:** Water for agriculture is a problem for some aquatic species. However, irrigation triples the productivity of the land. If irrigation were stopped, another 1,310,000,000 (1.31 billion) acres of land would have to be farmed to make up the lost production. The solution is not to quit irrigating; it is to make better use of the water.



# FARMING THEN AND NOW



Match the following to see how technology has improved farming.

- In 1920 two humans and eight horses were needed to care for a 160 acre farm.
- Farmers depended on Mother Nature to provide all the nutrients and water for their crops.
- Farmers lost many animals to poor nutrition and disease.
- Farmers grew most of the food for their own family plus raised products to sell for cash.
- Each farmer grew enough food to feed 3 to 5 people each year.
- Farmers milked one cow at a time by hand, about 7 cows per hour.
- Annual milk production per cow was about 700 gallons.
- Farmers learned how to farm from only their parents and neighbors.

- \_\_\_\_\_ Better nutrition and health has increased yearly milk production to 2500 gallons per cow.
- \_\_\_\_\_ Most farmers raise only a few specific crops to sell. They buy the rest of their food at the grocery store just like city residents.
- \_\_\_\_\_ Most farmers today attend college to keep up with advances in agricultural science.
- \_\_\_\_\_ Using milking machines, farmers can milk six or more cows at once. One person can easily milk 35 cows per hour.
- \_\_\_\_\_ Each farmer grows enough food to feed about 129 people per year.
- \_\_\_\_\_ Today a farmer can handle over 400 acres by himself using modern machinery.
- \_\_\_\_\_ Advanced soil testing allows farmers to apply both plant nutrients and water only when they are needed.
- \_\_\_\_\_ Farmers feed high nutrition diets to animals and hire veterinarians to treat sickness and disease.



## WHAT NEW WORDS DID YOU LEARN?



These words were used in this issue of Ag@School .  
Can you match the words to the definition?

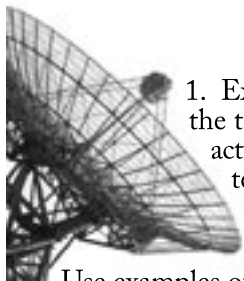


- |             |           |           |                    |                |
|-------------|-----------|-----------|--------------------|----------------|
| 1. cereal   | 4. output | 7. supply | 10. interdependent | 13. ruminant   |
| 2. agrarian | 5. export | 8. demand | 11. raw product    | 14. protein    |
| 3. urban    | 6. import | 9. input  | 12. staple food    | 15. byproducts |

- \_\_\_\_\_ to send to another country for sale or trade
- \_\_\_\_\_ the amount of something available for use or for sale at a certain price
- \_\_\_\_\_ not processed or changed; as it comes from the ground or from the plant
- \_\_\_\_\_ edible seeds of plants in the grass family
- \_\_\_\_\_ an animal class that has a four-part stomach that allows them to digest grass and other plants
- \_\_\_\_\_ a main food in a diet; an important food that most need and use
- \_\_\_\_\_ the quantity of material produced or manufactured
- \_\_\_\_\_ of agriculture; having to do with the cultivation or ownership of land
- \_\_\_\_\_ secondary products that are produced during the making of something else
- \_\_\_\_\_ the quantity of work and materials needed to produce something
- \_\_\_\_\_ to bring in from another country for sale or trade
- \_\_\_\_\_ the amount of something that people will buy or use at a certain price
- \_\_\_\_\_ of cities; having to do with a city or city life
- \_\_\_\_\_ a nutrient consisting of a series of amino acids used to build body tissue
- \_\_\_\_\_ dependence on each other



# TELL WHAT YOU LEARNED!



1. Explain how technology helps you do your homework. Please include details such as the tools you use (paper, calculators, computers) and the improvements to the place you actually do the homework (think of ways your home or school has improved). Remember, technology is finding a better way to do something. A shovel is an example of technology because it's better than using your hands.
2. In both general and specific terms explain how technology has affected agriculture in the past 150 years. Use examples of the improvements in farming or ranching, transportation, and processing.
3. Persuade the reader that export trade is important to Washington. Give reasons to support your answer.
4. Write a 3-part narrative describing your work as a potato farmer in the 1800's; the early 1900's; and the present. Detail the differences in how your work is done, how your farm has changed, and how the industry has changed.
5. Using food as the product or commodity sold, please explain what is meant in the marketplace by "supply and demand".
6. Write a letter to a friend, persuading him or her that your favorite food is best. In your letter you must include at least three reasons (criteria) for your choice. Examples of criteria might be nutrition, cost or taste. You may think of others.



## CHECK OUT THAT DIRT! IDENTIFY DIFFERENCES IN PLANT GROWTH RATE IN SOILS THAT VARY IN ORGANIC MATTER



- Materials :
1. good topsoil from a garden or flowerbed
  2. soil that has eroded from a hillside or an eroded road bank
  3. subsoil from a depth of 3 or 4 feet from an excavation site
- a.) Break class into groups and give each group 2 or 3 seeds, paper cups, and a different soil.
  - b.) Write soil types on outside of cup.
  - c.) Fill cups about  $\frac{3}{4}$  full with soil, poke a 1" hole in soil with pencil, and drop in seeds.
  - d.) Keep watered and place in a sunny location (windowsill).
  - e.) Compare rates of growth of different soils.

(For more variety you can use different watering solutions, for example: salt solution, vinegar solution, liquid fertilizer, distilled water and plain tap water.)

Plants take nutrients from the soil. Soils that are above average in organic matter are more productive than soils low in organic matter. Organic material in soil increases water-holding capacity, serves as a reservoir for nutrients such as nitrogen, and provides food for the living things in the soil.



*Don't be shy about asking the FFA (Future Farmers of America) advisor at your school, or another school in your town, if his students would do a presentation on soils for your class. The Ag or Horticulture Department can point you to the right person. Most FFA groups work with younger students as one of their projects.*

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