Science TODAY™ Challenge
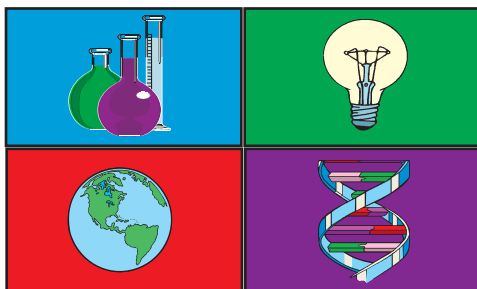## Teacher Edition

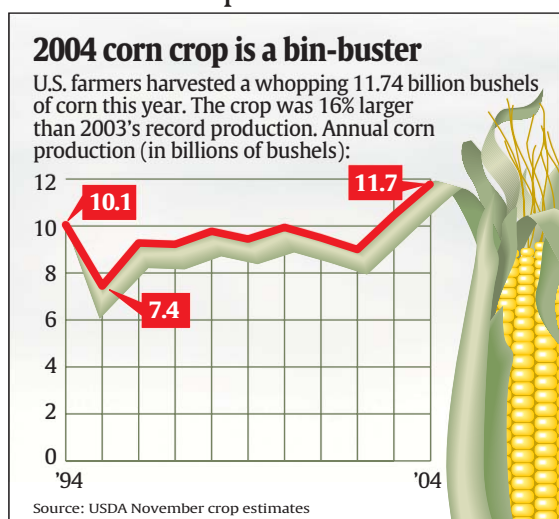**USA TODAY**

NO. 1 IN THE USA

2004 Corn Crop is a bin-buster

By: Jeff Lukens

USA TODAY Snapshots™

2004 corn crop is a bin-buster

U.S. farmers harvested a whopping 11.74 billion bushels of corn this year. The crop was 16% larger than 2003's record production. Annual corn production (in billions of bushels):

Source: USDA November crop estimates

By Shannon Reilly and Marcy Mullins, USA TODAY

Activity Overview:

Students will examine and evaluate data on the corn harvest in the United States over the past several years. Using the USA TODAY Snapshot "2004 corn crop is a bin-buster," data from the USDA Statistics Service website, and information from the USA TODAY article, "EPA approves corn modified to eliminate No. 1 crop pest" students will be asked to calculate percent change, do summations of data, observe trends and offer explanations as to the reasons for those trends in agricultural production.

Concepts:

- Crop production
- Land use issues
- Data analysis
- Calculating percent change
- Biotechnology in agriculture

Activity at a Glance:

- Grade level: 9-12
- Subject: Agricultural Science, Environmental Science
- Estimated time required: 50-60 minutes

Materials:

- TI-83 Plus family or TI-84 Plus family
- TI-ViewScreen™ calculator for instruction/ demonstration
- Student handout
- Transparency
- TI-Navigator™ Learning System, if available
- Internet access
- USA TODAY newspapers

Prerequisites:

Students should be able to:

- Use the graphing calculator to calculate percent change from tabular data.
- Do unit conversions using the SciTools Application on the graph ing calculator.
- Enter data into the Lists of the graphing calculator and generate a graph
- Manipulate Lists on the graphing calculator.

This activity works with

TI navigator
A Classroom Learning System

This activity was created for use with Texas Instruments handheld technology.

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Objectives:

The students will:

- observe and analyze corn production data in the United States.
- successfully calculate year-to-year variations, including percent changes.
- offer explanations for the causes of crop production variations from year-to-year.
- observe and analyze corn production trends in their own states.

Background:

The United States is the corn production capital of the world. There are more acres of cropland devoted to the growing of corn than there are for any other grain. Worldwide, corn or maize, ranks second only to wheat in production acreage, making it an extremely valuable crop. Corn provides the human population with countless products, from corn meal to corn syrup to corn oil. In many regions, corn provides THE true food staple not only for people, but also for animals. In addition to using the actual kernels of corn to make products for humans, the stalks and leaves, or "silage," of the corn plant provide a valuable food source for livestock. Much of the U.S. economy revolves around the yearly production of corn, so learning about its value is important for students to understand.

Preparation:

- Provide one graphing calculator for each student.
- Each student should have a copy of the corresponding student activity sheet.
- Introduce students to the use of biotechnology in agriculture.

Classroom Management Tips:

- Use the transparency to assist students in understanding how to read the graphic BEFORE you start working on the activity.
- Reinforce with the students the importance of READING the activity carefully.
- Students can work individually or in small groups on this activity. Working in groups is especially helpful as they learn the various features of the calulator.

Additional Resources:

- TI Technology Guide, for information on the following:
  TI-83 Plus family, TI-84 Plus family, List Editor
- TI-Navigator™ Basic Skills Guide for information on using the TI-Navigator Classroom Learning System
- USA TODAY article entitled "Biotech Corn Grows in Popularity" (July 9, 2001)

Data Source:

- USDA November Crop Estimate

National Science Education Standards

Grades 9-12: Science in Personal and Social Perspectives

Science and Technology in Local, National and Global Challenges

Science and technology are essential social enterprises, but alone they can only indicate what can happen, not what should happen. The latter involves human decisions about the use of knowledge.

Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics and ethics of various science- and technology-related challenges. However, understanding science alone will not resolve local, national or global challenges.

Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them. Students should understand the appropriateness and value of basic questions--"What can happen?"--"What are the odds?"--And "How do scientists and engineers know what will happen?"

Humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use--which decreases space available to other species--and pollution--which changes the chemical composition of air, soil and water.

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Activity Extension:

● Have students use USA TODAY to track the prices of various commodities such as corn, soybeans, alfalfa hay, cotton, etc. Use these prices to calcu late the value of the crops that are being produced.

● Ask students to research the most important agricultural products grown in your particular region. Make year-to-year comparisons of the harvest yields. Which, if any, biotechnology techniques are being used with these products?

● Find articles in USA TODAY that relate to the issues of land use, crop production and biotechnology in other areas of agriculture.

● Discuss with students the impacts that agriculture has on your community, your region and your state.

● Have students research the economic importance of agriculture to your area.

● Have students find out the fate of each year's corn harvest. Most students believe that it goes into making corn flakes, and such. They will be surprised to find that many common products are manufactured from corn. Check out products like ethanol, corn syrup, corn oil, etc.

Curriculum Connections:

● Algebra I
● Genetics and Biotechnology
● Earth Science
● Economics

2004 Corn Crop is a bin-buster

Activity - Part I:

Have students review the USA TODAY Snapshot "2004 corn crop is a bin-buster" and in the table provided, calculate the percent change in the corn harvest from one year to the next during 1994 through 2004. For example, the percent change for 1995 would be calculated as [(7.40 - 10.05)/10.05] x 100% = -26.37%.

Year	Corn Harvest (billions of bushels)	Percent Change from Previous Year
1994	10.05	NA
1995	7.40	-26.37%
1996	9.23	24.73
1997	9.21	-0.22%
1998	9.76	5.97%
1999	9.43	-3.38%
2000	9.92	5.20%
2001	9.50	-4.23%
2002	8.97	-5.58%
2003	10.11	12.71%
2004	11.74	16.12%

Assessment and Evaluation for Activity - Part I:

1. Q. Between which two consecutive years was there the greatest percent increase in corn production?
   A. 1995 and 1996

2. Q. Between which two consecutive years was there the greatest increase in the number of bushels of corn produced?
   A. 1995 and 1996

3. Q. Between which two consecutive years was there the greatest percent decrease in corn production?
   A. 1994 and 1995

4. Q. Between which two consecutive years was there the greatest decrease in the number of bushels of corn produced?
   A. 1994 and 1995

5. Q. What was the percent difference in corn production from 1995 to 2000?
   A   34.05%

6. Q. What was the percent difference in corn production from 1995 to 2004?
   A. 58.65%

7. Q. From 1994 to 2004, what has been the number of bushels of corn harvested in the United States?
   A. 105.32 billion bushels (1.05 x 1011 bushels)

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Assessment and Evaluation for Activity - Part I (continued):

8. Q. A "bushel" has a volume of 1.25 ft3. Using the 2004 corn harvest, calculate the volume of the harvest in ft3.

A. 14.68 billion ft3. (1.47 x 1010 ft3)

9. Q. The Louisiana Superdome in New Orleans is a huge sports stadium that can seat about 70,000 people. It encompasses 13 acres of land and is 27 stories tall. A story is about 10 ft in height. Using the SciTools App's Unit Converter program on the graphing calculator, calculate the volume of the Superdome in ft3.

A. About 152,895,600 ft3 (1.53 x 108 ft3)

10. Q. Using your calculations for questions 8 and 9, write a statement that describes the volume of the corn harvest in 2004 when compared with the volume of the Superdome.

A. It would take about 96 Louisiana Superdomes to hold the 2004 corn harvest

11 Q. The average weight of a bushel of corn is 56 pounds. What was the weight of the 2004 corn harvest?

A. About 657 billion pounds (6.57 x 1011 pounds)

12. Q. A mature African bull (male) elephant can have a weight of 13,000 pounds. Write a statement that describes the weight of the 2004 corn harvest when compared with the weight of bull elephants.

A. The 2004 corn harvest weighed as much as about 51 million African bull elephants

Activity - Part II:

In this part of the activity, students will research the issue of land use in agriculture. Have them access the USDA Statistics Service website at (www.nass.usda.gov) and explore the area that provides data about the amount of land devoted to the production of corn in the United States.

Have them click on "Crops and Plants" in the window on the left. Then click on "Field Crops." Then select "Corn Field" from the menu and click on "Search."

From this page, they can explore historical data about the corn harvest in the U.S. They should make note of the number of bushels of corn harvested each year and the number of acres that were actually planted in corn. Remind them to carefully examine the column headings to note the units for each column.

Students should then convert the corn harvest in the table provided from "billions of bushels" to "thousands of bushels." This will make their next calculations easier. Once they have found and recorded the data in the table, have them calculate the "yield" for each year. To do this, have them enter the "Year" in L1 of the graphing calculator, then enter the "Corn Harvest in thousands of bushels" in L2 and then enter "Acres Planted" in L3. They should then divide L2 by L3 to calculate the "Yield" in L4. Have them record these yields in the table. Then, using their graphing calculator ask them to plot the corn yield (L4) spanning the years 1994-2004.

If you are using the TI-Navigator Classroom Learning System, send the provided LearningCheck assessment to your class to gauge student understanding of the concepts presented in the activity. See the TI-Navigator Basic Skills Guide for additional information on how this classroom learning system may be integrated into the activity.

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Assessment and Evaluation for Part II:

Year	Corn Harvest (in billions of bushels)	Corn Harvest (in thousands of bushels)	Acres Planted (in thousands of acres)	Yield (in bushels/acre)
1994	10.05	10,050,520	78,921	127.35
1995	7.40	7,400,051	71,479	103.53
1996	9.23	9,232,557	79,229	116.53
1997	9.21	9,206,832	79,537	115.76
1998	9.76	9,758,685	80,165	121.73
1999	9.43	9,430,612	77,386	121.86
2000	9.92	9,915,051	79,551	124.64
2001	9.50	9,502,580	75,702	125.53
2002	8.97	8,966,787	78,894	113.66
2003	10.11	10,113,887	78,736	128.45
2004	11.74	11,740,920	80,968	145.01

1. Q. **In which year was the corn yield the largest?**
   A. 2004

2. Q. **In which year was the corn yield the smallest?**
   A. 1995

3. Q. **When you graph the data (year and yield), which should be the independent variable?**
   A. Year

4. Q. **Which should be the dependent variable?**
   A. Yield

5. Q. **Using your graphing calculator, calculate the average yield (in bushels/acre) from 1994-2004.**
   A. 122.2 bushels/acre

6. Q. **Why might the corn yields fluctuate so much from year to year?**
   A. Suggestions: rainfall, temperature, farming methods, etc.

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Activity - Article:

Have students read the USA TODAY article, ""EPA approves corn modified to eliminate No. 1 crop pest" and then respond to the questions related to the article .

Questions Pertaining to the Article:

1. Q. **There were approximately 75,702,000 (7.57 x 107) acres of land that were planted in corn in 2003. According to the USA TODAY article, what percentage of these acres was planted in biotech corn?**
A.   About 26%

2. Q. **Use your calculator to determine how many acres were planted in biotech corn.**
A.   About 19,682,520 acres (1.97 x 107 acres)

3. Q. **Most biotech corn is able to make its own "bug killer." What is the general name for a chemical that kills bugs?**
A.   Pesticide