Sustainability

Meeting future economic and social needs
while preserving environmental quality

NCGA
1957 - 2007

"Sustainability" is a term coined in United States the late 1980s and early 1990s. Today, we increasingly hear this popular jargon, particularly in discussions related to energy, the environment, population growth and agriculture.

Sustainable agriculture is typically viewed as a term belonging to those who are concerned about the impacts of farming on the environment and greater society. Many think of sustainable agriculture as a term belonging to proponents of organic farming and not applicable to large-scale production agriculture.

But what does sustainability really mean and who defines it? If it is understood to generally include ecological and social aspects, does sustainability also encompass economic concerns? Are sustainability and economic development mutually exclusive? Or, can sustainable agriculture encompass environmental, economic and societal needs?

There are no easy answers to these questions.

As a practice, true farm sustainability in the United States is demonstrated by family farms dating back more than two centuries and is promising to extend to future generations. Farmers' economic stake in good stewardship practices is real: More than 98 percent of America's farms and ranches are operated by individuals or families. Therefore maintaining and improving our nation's natural resources is vital to keeping the business in the family for generations to come (Hoppe 2006).
When sustainability is framed as "organic versus conventional farming practices," we often lose sight of a measurement that includes meeting future economic and social needs balanced with preserving environmental quality—a measurement that encompasses both farming practices.

Patrick Moore, co-founder of the environmental group Greenpeace, has written:

> *"There's a misconception that it would be better to go back to more primitive methods of agriculture because chemicals are bad or genetics is bad. This is not true. We need to use the science and technology we have developed in order to feed the world's population, a growing population. And the more yield we get per acre of land the less nature has to be destroyed to do that…It's simple arithmetic. The more people there are, the more forest has to be cleared to feed them, and the only way to offset that is to have more yield per acre."*

In the case of corn production, farmers increasingly understand that satisfying the demands of a growing world population must not come at the expense of ecological health, human safety, or economic viability. Accordingly, corn growers have for decades adhered to a principle of continuous improvement and an incessant pursuit of greater efficiency. Significant advances in corn production technology during the last 75 years have led to a reduction in corn acres under cultivation and a major increase in bushels produced. For example, in 2006 corn growers produced 372 percent more corn on 28 percent less acreage than in 1931.

Historical Comparison of U.S. Corn Production

U.S. Corn	1931	2006	Percent Change
Acres Planted	109,364,000 acres	78,300,000 acres	-28.4%
Acres Harvested	91,131,000 acres	70,600,000 acres	-22.5%
Yield per Acre	24.5 bushels	149.1 bushels	508.5%
Corn Production	2,229,903,000 bushels	10,535,000,000 bushels	372.4%

Source: USDA, NCGA

To produce an amount of corn equivalent to the 2006 crop using production practices from 1931 would require 430 million acres—an area slightly larger than the state of Alaska.

Corn farmers have demonstrated their ability to satisfy the growing needs for food and fuel. However, it’s not just about growing more corn; it also about how corn is grown. With the likelihood of more acres of continuous corn, farmers’ focus on conservation must not compromise productivity. Conversely, conservation opportunities still exist when planting continuous corn. The benefits of saving soil, toil and oil are as relevant as ever. Fortunately great strides have been made; the growth in agricultural output and productivity has been dramatic as production inputs have declined.

This report examines the agricultural practices and technologies that have enabled corn farmers to make significant efficiency gains and environmental footprint improvements. Corn growers have already forged a sustainable pathway toward greater production and efficiency. And they will not rest on their laurels. As they’ve done for decades, U.S. farmers will continue to seek improvements in efficiency and embrace practices and products that lessen the environmental impacts of crop production.

Conserving and Preserving: Soil Management and Tillage

All regions of the world rely on agriculture, and soil is the primary medium for crop growth. Soil management has a direct impact on crop yield levels, food quality and safety, the environment and climate change.

Soil helps break down or "degrade" agriculture chemicals or other potential pollutants as well as acts as a carbon sink. Soil is the medium where water, nutrients and microbes interact. In short, it's a buffer between production inputs and environment. To maintain long-term productivity, long-term environmental stability and food safety, beneficial soil management is essential.

Some of the beneficial soil management practices farmers are adopting include more efficient use of nutrients, pesticides and irrigation; crop residue management; and field management practices such as terraces and contour farming that act as buffer zones, underground drainage outlets and surface diversion.

Crops cannot be produced without disturbing the soil in some way. Tillage is the farmer's way of preparing the ground for planting by breaking up and smoothing the soil. Tillage also helps control weeds and aerates the soil. Yet there are consequences to tillage. Rain and wind carry loosened soil off of fields, adding silt to waterways and particulate matter in the air. Cultivating with a moldboard plow can lead to greater soil and water erosion.

When tillage is necessary, farmers have adapted from the historical conventional tillage practice of intensive soil disruption to obtain weed control to simple traditional practices to conservation tillage (minimizing soil disturbance). By leaving crop residue for field cover and eliminating tillage trips, farmers are able to protect the soil from water and wind erosion, conserve moisture, reduce nutrient runoff, improve wildlife habitat and limit output of labor, fuel and machinery.

Several crop production systems fall under the heading "conservation tillage" including no-till, ridge-till, low-till and minimum-till. Common to all of these practices is leaving a crop mulch covering on the ground that provides a protective cover to the soil between seasons and improves soil fertility by maintaining nutrient-rich organic matter on the field. Conservation tillage allows organic matter to build up in the soil, absorbing carbon dioxide and helping to reduce a significant amount of greenhouse gas. Better soil quality, increased soil organic mater and greater moisture holding capacity, which also results in improved infiltration, highlight the value of modern tillage practices.

Photosynthesis is the most effective natural method of absorbing atmospheric carbon dioxide. During photosynthesis plants convert carbon dioxide into plant tissue. When a plant dies, decomposing plant residue leaves a portion of the stored carbon in the soil and a larger portion is emitted back into the atmosphere. Plants are the primary vehicle for maintaining organic carbon in soils. When organic matter in the soil is enhanced, for example by shifting from conventional tillage to conservation tillage practices and increasing the amount of crop residue returned to the soil, over time a higher Carbon-Stock Equilibrium (CSE) can be gained. Continuous use of no-till will increase soil carbon thus reaching a higher CSE reached (Brookes, Barfoot).

As competition for water resources intensifies, agriculture producers must make the most of irrigation water and soil moisture. Crop residue slows evaporation by shading the ground. Reduced tillage improves the soil structure, thereby increasing water movement through the soil following irrigation or rain and holds it there.

According to USDA, a producer can save at least 3.5 gallons of fuel per acre by going from conservation tillage to no-till (USDA/NRCS). At April 2007 diesel prices, this amounted to $9.80 per acre in production cost savings. On a farm with 1,000 acres of cropland, these savings add up to 3,500 gallons of diesel fuel per year, valued at $9,800.

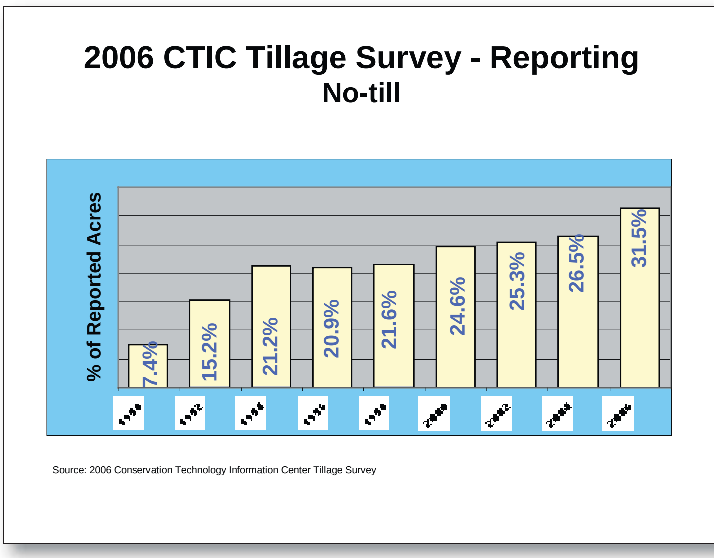
No-till corn production can reduce the use of diesel fuel per acre by nearly 74 percent compared to conventional tillaged (FAWCETT). Other studies have shown conservation tillage practices can conserve 160 to 280 million gallons of diesel fuel a year.

Adoption of conservation tillage is growing, according to a Conservation Tillage Information Center (CTIC) 2006 report examining voluntary data on tillage practices. The report notes that tillage with crop residue management has increased in the same reporting counties since 1990. According to the survey results, of the 46.8 million acres reported in 2006, 76.5 percent are using conservation tillage. In 2004, those same counties reported on 46.3million acres, of which 74.5 percent were employing conservation tillage practices.

The National Corn Growers Association's annual yield contest demonstrates the acceptance of conservation till practices. Of the 3,154 entries in the 2006 contest, only 2 percent of entrants completed soil preparations with conventional tillage.

No-till planting is the most cost-effective practice to reduce tillage trips to protect and enhance the environment. Long-term or continuous no-till significantly reduces soil erosion by retaining a cover of crop residue on the soil surface.

No-till practices also benefit the soil by rebuilding soil composition through the slow decomposition of crop residue. Better soil quality and greater moisture holding capacity also resulting in improved infiltration, and increased soil organic matter highlight the value of modern tillage practices. Conservation tillage also reduces pesticide and fertilizer runoff.



Elimination of tillage means farmers must rely on herbicides to control weeds. Without herbicide use, no-till agriculture becomes impossible, resulting in increased erosion estimated to be more than 300 billion pounds of soil annually or a 15 percent increase. Much of this soil erosion would enter waterways and significantly reduce the quality of the nation's surface water.

Conservation tillage practices reduce rainfall runoff by more than 60 percent and soil loss by more than 90 percent. The impact energy of falling raindrops is also minimized by crop residue or cover crops thereby reducing erosion. The soil benefits as the physical, chemical and biological properties are enhanced. Residues located on or near the ground surface act as small dams to reduce the speed water runs across the surface of the field resulting in reduced soil erosion.

The Natural Resources Conservation Service's National Resources Inventory (NRI) report states soil erosion resulting from rainfall and runoff (sheet and rill erosion) has declined 42 percent between 1982 and 2003. Likewise, soil erosion from high winds has declined 44 percent during the same timeframe.

As a result of increasing adoption of conservation tillage and other soil conservation practices, soil erosion from U.S. cropland has steadily declined, as illustrated in the chart below.

Between 1982 and 2003, soil erosion on U.S. cropland decreased 43 percent, according to the National Resource Conservation Service.

The "most significant reductions," according to the NRI report, occurred in two major river basins, the Missouri and Souris-Red-Rainy/Upper Mississippi, where approximately half of the nation's cropland is located (National Resources Inventory).

Much of this decline in erosion has occurred by reducing tillage. However, other conservation measures have been used on corn acres. Between 1982 and 1997 approximately 25 million acres of corn were farmed on contour, approximately 21.5 million acres were treated with grass waterways, and approximately 12 million acres with terraces.

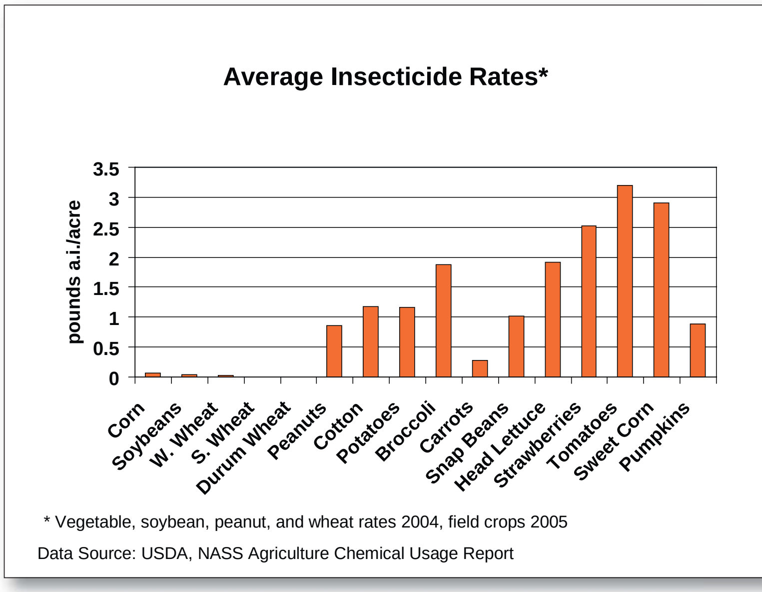
Agriculture is shifting its focus from output growth to a holistic output efficiency that not only increases productivity but reduces labor, pesticides, herbicides, fertilizer and mechanical inputs. The wide-scale adoption of no-till farming with better crop inputs as well as biotechnology has reduced the carbon footprint for the production of a bushel of corn.

For example, the elimination of moldboard plowing saves two gallons of diesel fuel per acre (Eckert) while full no-till practices save 3.5 gallons per acre (USDA/NCRS). This equates to saving 44 to 77 pounds of carbon dioxide emissions (EIA). For example, from 1990 to 2004, no till practices have increased 394 percent, resulting in total carbon emission savings of at least 17 billion pounds of CO_2 over the 14-year period.

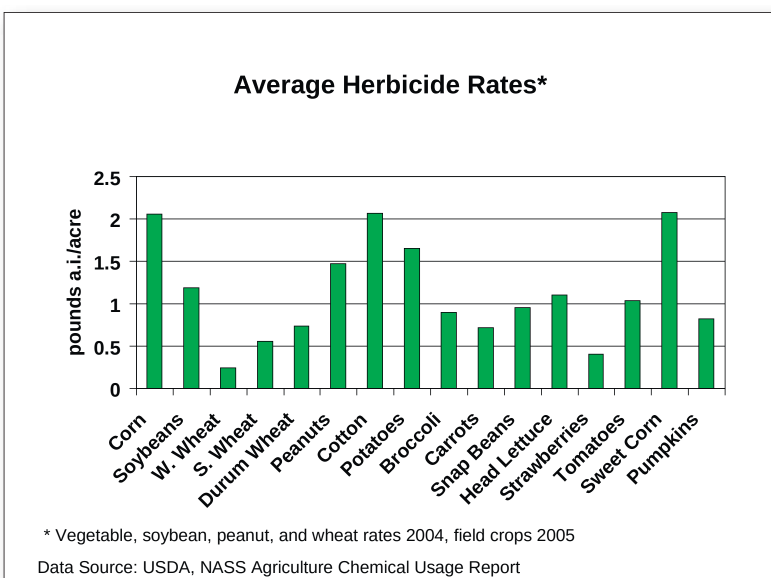
Agriculture production systems offer a wide variety of opportunities to increase carbon storage, or sequestration, in soils and vegetation. Total conservation tillage effects indicate 1,000 pounds of carbon can be sequestered per acre per year (Lal, et al). This equates to a carbon dioxide saving equivalent of burning 75 gallons of gasoline (CTIC). If these effects are translated to full potential, 450 million tons of carbon can be sequestered into the soil per year (Lal, et. al).

Maintaining Crop Integrity with Pesticides

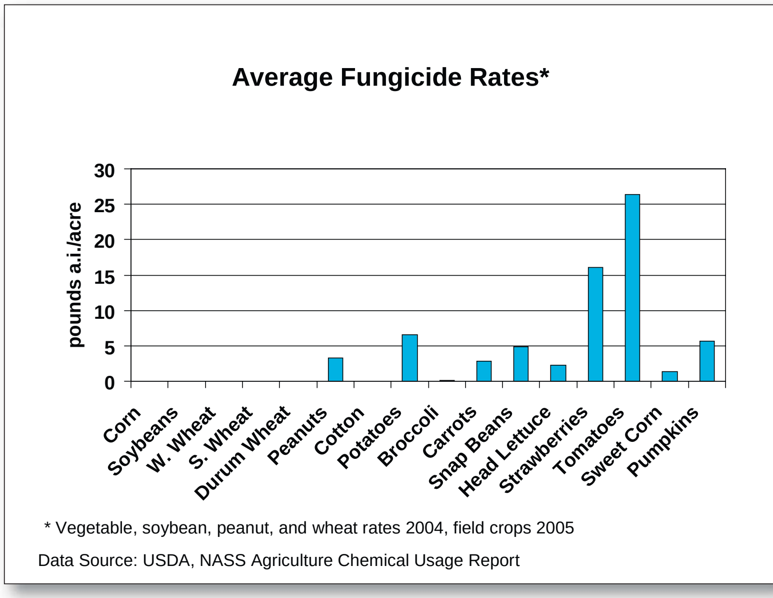
The abundant food and high standard of living in the United States would not be possible without pesticides. Pesticides protect crops such as corn from insects, weeds, rodents, fungi, and other pests. They lead to more efficient production, which in turn leads to less environmental impact. In agriculture, pesticides enable producers to compete profitably in the global marketplace and are a necessary protection for our food production system.



Fungicides, herbicides and insecticides are among the major classes of pesticides employed in crop production. Agriculture uses 75 percent of all pesticides, but 85 percent of all U.S. households have at least one pesticide in storage, and 63 percent have one to five stored (Delaplane 2000). Yet many believe pesticides are dangerous to the



environment or to man and would support a total ban of pesticides. Such a measure would mean elimination of the ability to rely on pesticides to rid homes of ants, fleas or termites; to preserve vegetables from mold; or to prevent food-borne toxins. This could result in food shortages with soaring prices, or outbreaks of long-forgotten diseases. (Delaplane)



As the global population grows and farm acreage shrinks, food production efficiency cannot be jeopardized. Fortunately, through research, education and government oversight the risks associated with pesticides are being reduced and more benign chemicals, pest-specific pesticides, and improved application methods are continually being introduced.

The most recent (2006) U.S. Geological Survey (USGS) report on the quality of the nation's streams and ground water states that "pesticides were commonly detected at concentrations far below Federal or State standards and guidelines for protecting water quality" (Gilliom). Pesticides registered in the last 20 years are less toxic and degrade more rapidly. Furthermore, the USGS data show, when detected, the concentrations are miniscule and do not affect water quality. Even older pesticides that are no longer in use are declining in the environment, according to the USGS data.

The Environmental Protection Agency regulates pesticides and increasingly has established stricter tolerance levels. In the 1950s, trace amounts of substances could be detected at one part per million; anything below this level was considered zero. By 1965, trace amounts could be detected at one part per billion. Ten years later, in 1975, that number was one part per trillion, and in the 1990s it was nearing toward one part per quadrillion. (To put this in perspective, one grain of salt in an Olympic-sized swimming pool equals one part per trillion.) (Delaplane)

Additionally, advanced detection systems enable trace amounts of pesticide residues in the air, soil and water to be detected. Often lost to the casual observer is the toxic relevance when a trace amount is so miniscule.

Increasingly, farmers have turned to integrated pest management practices (IPM). Producers reduce energy use and environmental risk while maintaining the quality of their agriculture products by incorporating IPM. IPM includes prevention, avoidance, monitoring and suppression of weeds, insects, diseases and other pests. IPM combines biological, cultural and other alternatives to chemical control with the planned use of pesticides to keep pest populations below damaging levels, while minimizing harmful effects of pest control on humans and natural resources.

IPM is site specific in nature, based on approaches suited for the particular crop, pest and location. It can reduce production costs and energy use and also help improve water quality, air quality and soil quality. As part of a conservation management system, IPM contributes to the overall prosperity of the farm and the quality of the environment.

It is important to find solutions that continue to minimize risk exposure, are environmentally wise and economically realistic. Additionally, consistent data for assessing trends is needed for assessing water quality reaction to changes in pesticide usage and pesticide management.

Utilizing Biotechnology for Economic and Environmental Sustainability

The commercial introduction in 1995 of agriculture biotechnology has made a significant contribution to meeting the global needs for food, fuel and feed and to improving farmers' economic and environmental sustainability. Rapid adoption of the technology reflects farmer satisfaction, including more convenient and flexible crop management, lower cost of production, higher productivity and/or net returns per acre, health and social benefits, and environmental benefits including decreased use of pesticides (Brookes, Barfoot).

According to an International Service for the Acquisition of Agri-biotech Applications (ISAAA) 2006 status update on biotechnology, 10.3 million farmers from 22 countries planted biotech crops in 2006, up from 8.5 million farmers in 2005. Farm size has not been a factor in deciding to plant biotech crops. Of the 10.3 million farmers, 90 percent were small, resource-poor farmers from developing countries whose increased income from biotech crops helped alleviate their poverty. In 2005 the United States was the principle grower of biotechnology crops at 55 percent. Soybeans and corn accounted for 57 percent and 33 percent, respectively, of biotech plantings in the United States (James).

More than half of the 6.5 billion global population live in the 22 countries where biotech crops were planted in 2006.

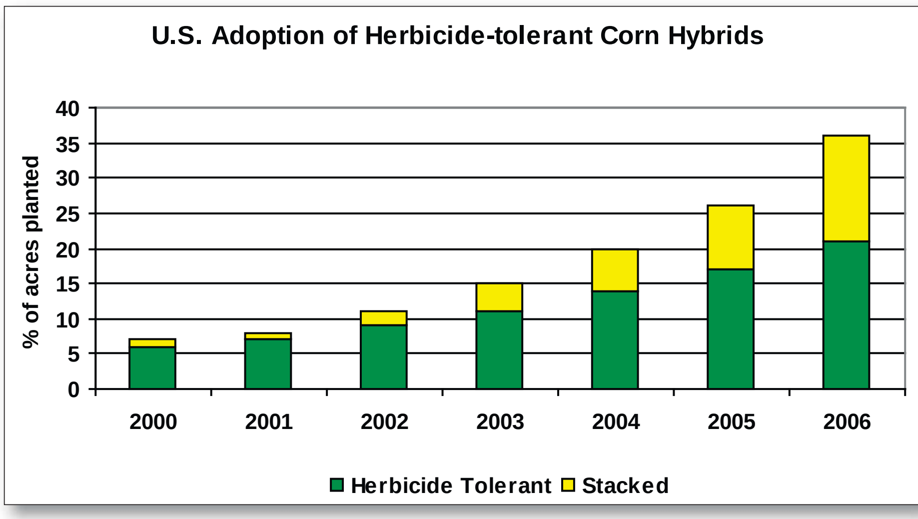
Economically, farm income in 2005 was estimated to be about $5 billion more than would have been the case if farmers had planted conventional crops. Since 1996, farm incomes have benefited from biotechnology by $24.2 billion. The majority of farmers reaping these economic benefits are in developing countries. The greatest gains in farm income have been in the soybean and cotton sectors. Biotech corn plantings boosted farm incomes by more than $3.1 billion since 1996 (Brookes, Barfoot vii-xi).

Insect resistance and herbicide tolerance are the dominant biotech traits opted for by farmers, followed by stacked genes for both traits. Now in its second decade of use, biotechnology crops have demonstrated important environmental benefits, including reduced use of insecticides and herbicides and cut greenhouse gas emissions associated with mechanized farming (Brookes, Barfoot xii). According to Sujatha, in a report on the impacts of biotechnology on U.S. agriculture, the 2005 biotechnology-derived crops lowered crop production costs $1.4 billion and reduced pesticide usage by 69.7 million pounds.

Herbicides

Herbicides are the most widely used pesticide. Prior to the introduction of herbicides the primary weed control measure was clean plowing (completely turning over soil) followed by multiple passes of mechanical cultivation. The effectiveness of this process was limited, at best, and consumed considerable amounts of fossil fuels and increased the likelihood of soil erosion. During the last 20 years nearly all corn acres were treated with herbicides to control weeds.

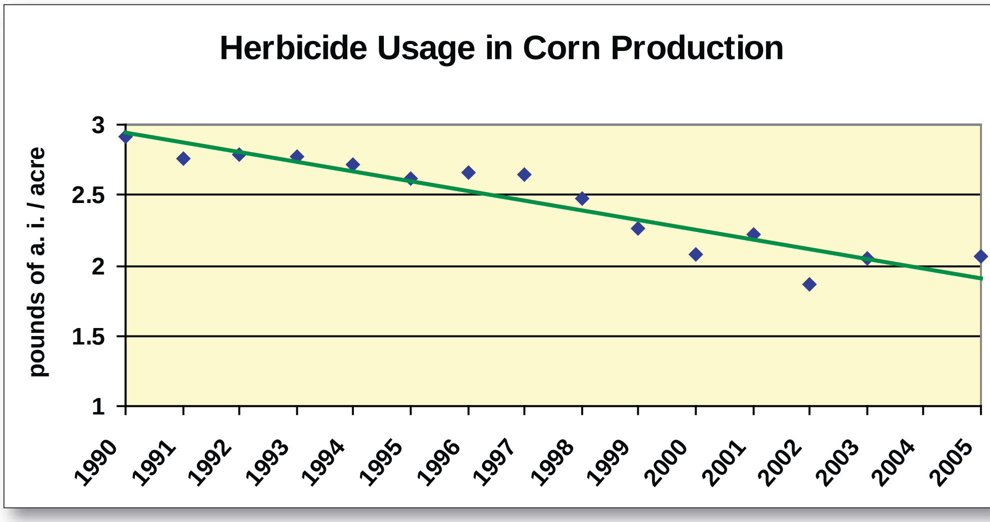
The introduction of herbicide-tolerant corn hybrids in the late 1990s has resulted in better weed control, higher yields, and the introduction of minimum and no-till practices. Farmers choosing to plant herbicide tolerant crops derive several important intangible benefits, including increased management flexibility from a combination of ease associated with broad-spectrum, post-emergent herbicides such as glyphosate and the increased window of time for spraying; reduced harvesting costs associated with cleaner crops, resulting in improved harvest quality and higher prices; and elimination of potential damage caused by soil incorporated residual herbicides in follow-on crops.



Source: USDA, NASS "Acreage"

U.S. corn growers are rapidly adopting herbicide-tolerant corn and stacked traits. Advances in the technology are resulting in more effective weed control and reduction in active ingredient (a.i.) per acre over conventional herbicides. The National Center for Food and Agricultural Policy estimates the use of herbicide-tolerant corn can reduce a.i. by 0.73 pounds to 1.23 pounds per acre over conventional herbicides. This both benefits the environment and reduces farmers' production costs by $9.49 to $10.72 per acre (Sankula).

The chart below demonstrates the reduction in pounds of a.i. used per acre of corn production. Between 1990 and 2005 U.S. corn growers reduced pounds of a.i. by 29 percent.



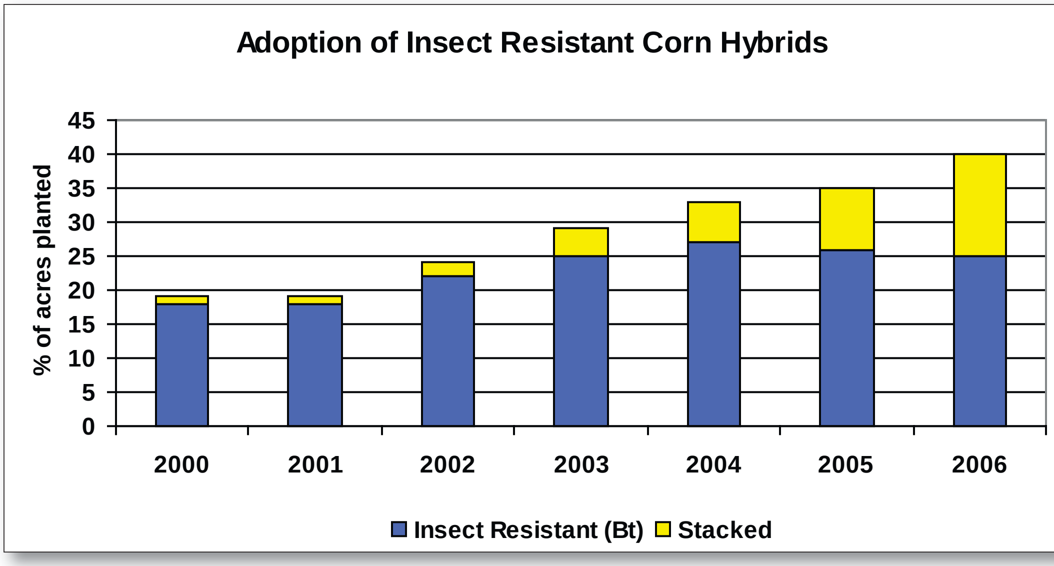
Data Source: USDA, NASS Agricultural Chemical Usage Report

Insecticides

Nearly 30 percent of all corn acres have been treated with insecticides during the past 15 years. However, the advent of insect-resistant crops in the 1990s has enabled growers to treat for European Corn Borers and/or several other soil-borne pests while at the same time reduce usage of insecticides to combat these pests. Insect-resistant crops are infused with proteins from the common soil bacteria *Bacillus thuringiensis* (Bt), the same protein used by organic gardeners for years. Bt proteins only affect the targeted pest like European Corn Borers or Corn Rootworm larvae and are completely benign to beneficial insects and wildlife.

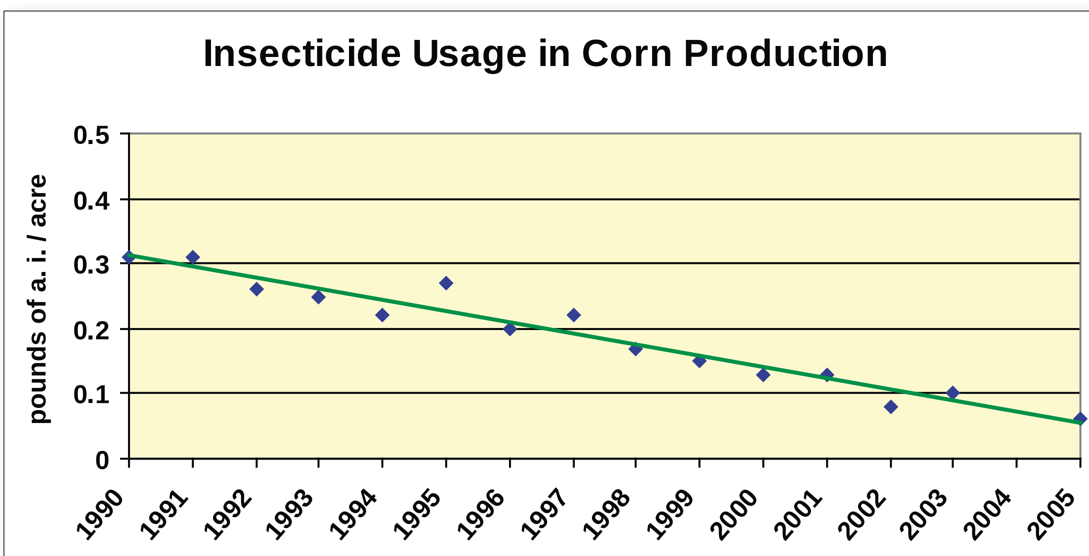
Prior to the introduction of synthetic insecticides, farmers had little control over insects other than crop rotations. Although farmers still incorporate crop rotation as part of an Integrated Pest Management system, rotation alone has limited impact.

Bt corn has been widely adopted by farmers. The technology reduces the amount of a.i. used per acre of corn production and cuts back on the number of trips a farmer makes over the field for tillage and pesticide application. In many cases, farmers can reduce those trips from five or more to as few as two, saving a tremendous amount of time and diesel fuel. Less fuel means lower cost of production and lower fuel emissions.



Data Source: USDA, NASS "Acreage"

In addition to new technologies such as Bt, life sciences companies have introduced more effective insecticides and better delivery systems to control targeted pests; adoption of these innovations have further softened farmers' environmental footprint. The chart below demonstrates how farmers have reduced pounds of a.i. used per acre of corn production. U.S. corn growers have reduced pounds of a.i. insecticides by 81 percent. (USDA/NASS)

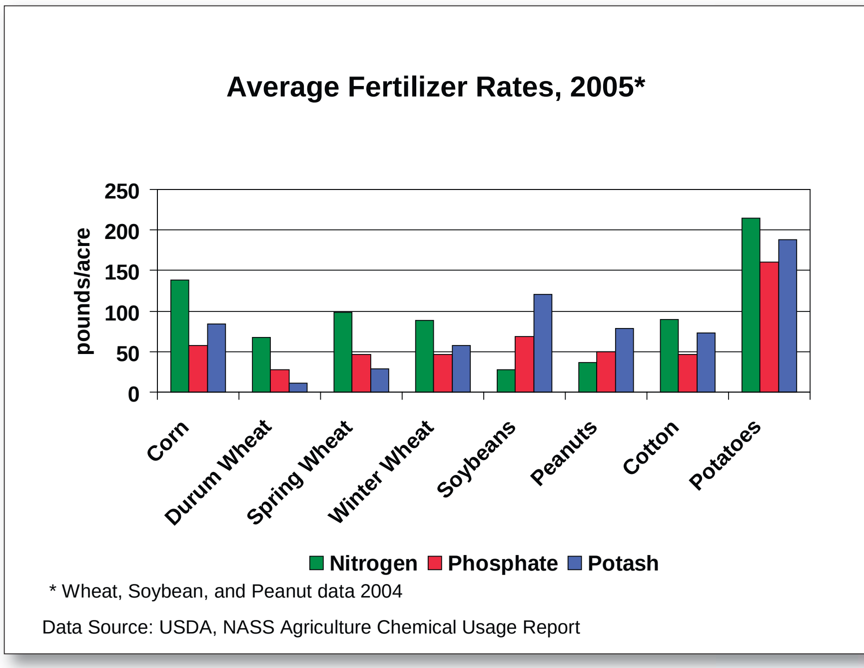


Data Source: USDA, NASS Agricultural Chemical Usage Report

The National Center for Food and Agricultural Policy estimates the use of biotech corn for control of Corn Borers reduced total insecticide use by up to 4.7 million pounds of a.i. with a net savings to growers of $196 million (USDA/NASS).

Nutrient Management

Fertilizer is the food plants need to produce a healthy crop and replace the soil nutrients used in crop production. When crops head to market so do most of the nutrients that were once in the ground. Therefore farmers must replenish the soil's nitrogen, phosphate and potash after each harvest.



Corn, like all plants, is dependent upon three macro-nutrients: nitrogen (N), phosphorus (P) and potassium (K). On average, the earth's soil contains approximately 20 percent of the nutrients food production requires ("Fertilizer Fundamentals"). Conventional fertilizers and use of animal manure make up the difference, most notably in N, P and K.

One common myth is that N, P and K are "chemicals." Fertilizer is frequently mislabled as "chemical" and inaccurately lumps together fertilizer and pesticides. Like the micro nutrient elements iron, zinc and copper that plants need in smaller amounts, these natural elements are not chemicals (“Fertilizer Fundamentals”).

Corn is incapable of fixing atmospheric nitrogen in the way leguminous plants such as soybeans, peanuts and alfalfa can. Therefore, corn must take up this nutrient through the soil.

Since the introduction of the use of conventional fertilizers in the mid 20th century America’s corn farmers have adopted this technology to continually produce a safe and reliable crop to meet global food, feed and fuel demands. Dr. Norman Borlaug, a Nobel Prize Laureate, has calculated that in America alone, an additional 450 million acres of farmland would be required to maintain our current food production if we stopped using fertilizer (“Fertilizer Facts”).

The Macro-nutrients of N, P and K

N: Plant growth and chlorophyll production need nitrogen. N is the most used nutrient for corn and many other crops, and it is the building block for many fertilizers. Nitrogen makes up approximately 78 percent of the atmosphere and is renewable and sustainable. Ammonia fertilizer is processed by combining nitrogen from the air and combining it with natural gas.

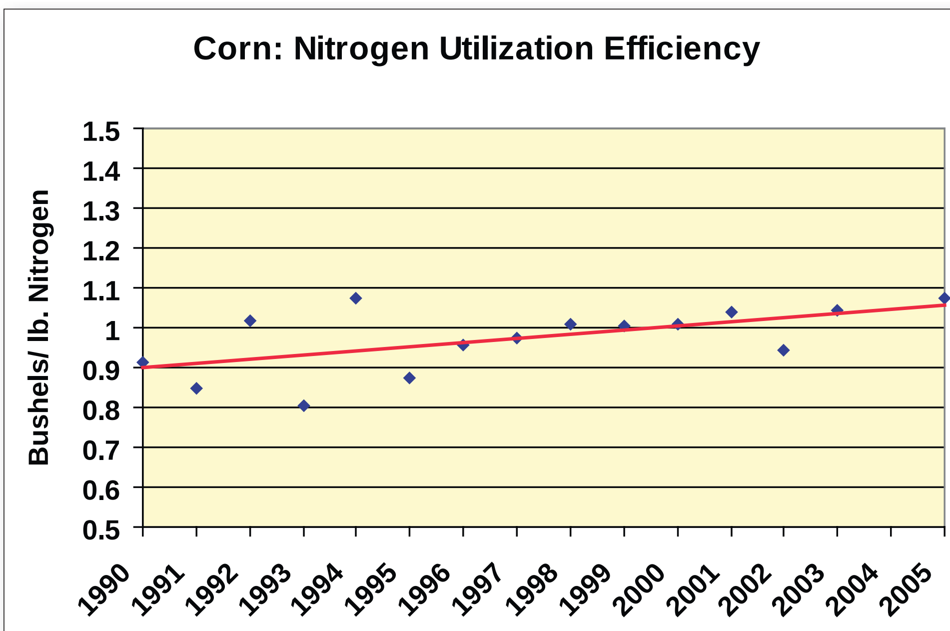
P: Plant root uptake is dependent on an adequate supply of soil phosphorus/ phosphate. Phosphorus is involved in seed germination and helps plants use water efficiently. Phosphorus occurs in natural geological deposits that can be found plentifully in the United States and other parts of the world.

K: Potassium, the seventh most abundant element in the earth’s crust, protects plants from cold winter temperatures and helps them resist invasion by weeds and insects. K is necessary for stopping wilting, helping roots stay in place and assists in transferring food. K filters into oceans and seas through natural processes and is left as mineral deposits as these bodies of water eventually evaporate.

Increasing fertilizer costs, environmental concerns and changing agronomic practices are accelerating farm nutrient management efficiencies. Nutrient management is a conservation practice that involves proper timing and placement of the right amounts of nutrients and soil amendments for adequate soil fertility and to minimize potential environmental degradation, particularly water quality. Farmers adopt nutrient management plans to increase fertilizer use efficiencies.

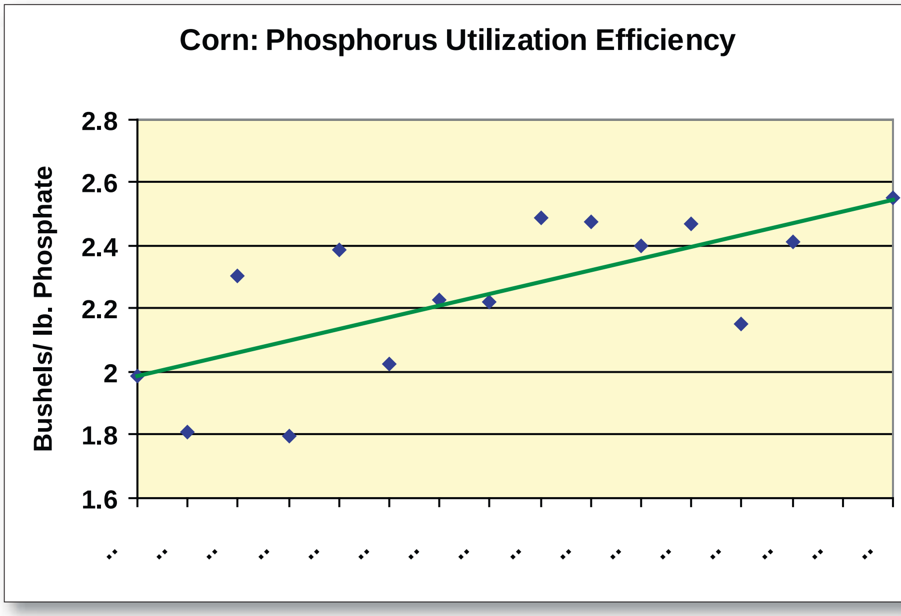
The latest advances in agriculture technology enable farmers to apply fertilizers with pinpoint accuracy, minimizing their impact to soil, water and air. For example, the use of enhanced efficiency fertilizers, such as slow- and controlled-release fertilizers and stabilized nitrogen fertilizers, are helping to protect the environment by reducing nutrient losses and improving nutrient efficiency while improving crop yields.

One of the clearest measures of sustainable agriculture production is increasing efficiency, with the ability to swell output while decreasing inputs. According to USDA, growers useless nitrogen to produce over 50 percent more corn than in 1980. Furthermore, over the past 15 years, farmers experienced a 17 percent increase in nitrogen efficiency as measured by bushels of corn produced per pound of nitrogen applied which in turn means less nutrients lost to runoff.



* 2004 data estimated
Data Source: USDA, NASS "Agricultural Chemical Usage Report"

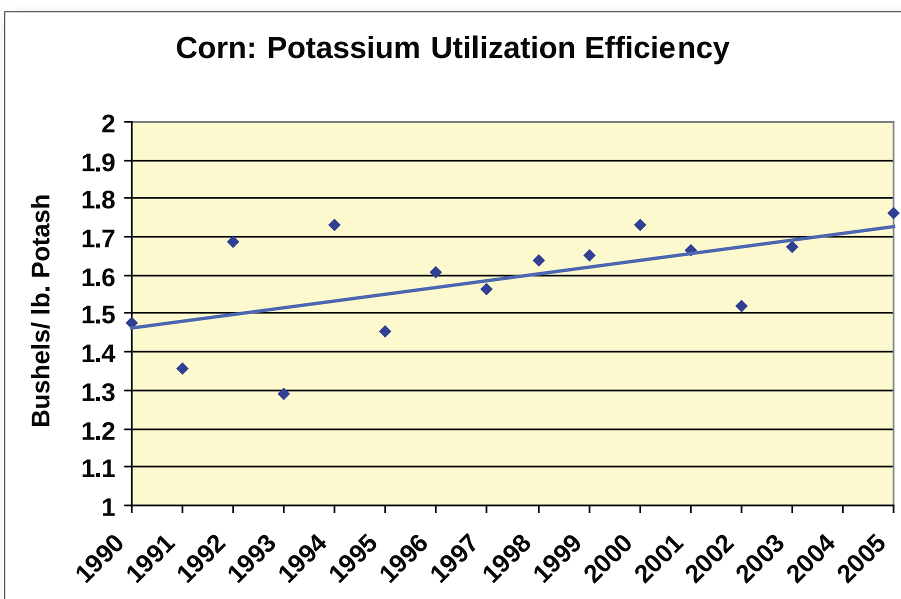
Early in the next decade, life sciences companies are expected to introduce corn hybrids containing biotechnology traits designed to further dramatically increase corn nitrogen utilization efficiency. The chart "Corn Phosphorus Utilization Efficiency" shows a 28 percent increased efficiency of phosphorus fertilizers between 1990 and 2005.



* 2004 data estimated

Data Source: USDA, NASS "Agricultural Chemical Usage Report"

The increase in potassium fertilizer efficiency measured is depicted in the chart "Corn: Potassium Utilization Efficiency." Potash efficiency increased by 20 percent in the last 15 years.



* 2004 data estimated

Data Source: USDA, NASS "Agricultural Chemical Usage Report"

Conserving Land for Future Generations

Because American farmers are dependent upon the integrity of their soil and other natural resources for their livelihoods, they have worked to protect and improve the land. In the case of corn production, farmers understand that satisfying demands of a growing world population must not come at the expense of ecological health, human safety or economic viability.

Accordingly, for decades corn growers have adhered to a principle of continuous improvement and an incessant pursuit of greater efficiency. As a result, significant benefits to society have been achieved and improvements in efficiencies will continue to lessen the environmental impacts of food production. Corn farmers are involved in numerous local, state and national programs that idle environmentally sensitive land from crop production and encourage other on-farm conservation measures. The geographic variability of cropland makes voluntary, locally led incentive-based programs more important than ever. Such programs should recognize the unique abilities and limitations of farmers.

Through the use of farm bill conservation programs, farmers are making important environmental gains, including reduced soil erosion, improved water quality and increased wildlife habitat. To continue this trend greater emphasis must be placed on working lands conservation programs.

This begins with the Conservation Technical Assistance (CTA) program that provides technical assistance supported by science-based technology and tools to help people conserve, maintain and improve their natural resources. The CTA program provides the technical capability, including direct conservation planning, design and implementation assistance, that helps people plan and apply conservation on the land. Natural Resource Conservation Service, (NRCS) through the CTA program, provides conservation technical assistance that addresses natural resource conservation issues at the local level that are of state and national concern.

Key to working lands, the Environmental Quality Incentives Program (EQIP) is very popular and delivers effective conservation program dollars to assist landowners who face natural resource challenges on their land. EQIP is the principal source of cost sharing assistance for agricultural producers who wish to implement air, soil and water conservation practices. Corn growers utilize EQIP to ensure animal effluent is managed responsibly through the Comprehensive Nutrient Management Plans. The use of EQIP funds to provide producers with financial assistance to adopt best management practices to address Total Maximum Daily Load concerns also assists farmers with their stewardship activities.

The Conservation Security Program is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life and other conservation purposes on working lands. CSP supports ongoing stewardship of private agriculture lands by providing payments for maintaining and enhancing natural resources. CSP identifies and rewards those farmers and ranchers who are meeting the highest standards of conservation and environmental management on their operations.

Additionally, corn farmers are involved in numerous state, local and national programs that idle environmentally sensitive land from crop production and encourage other on-farm conservation measures.

The Conservation Reserve Program (CRP) is America's largest voluntary, private-lands conservation program. The NRCS reports that 36.7 million acres—an amount of acreage equivalent to half of 2006's harvested corn acres—are currently enrolled in the CRP. It protects millions of acres of American topsoil from erosion and is designed to safeguard the nation's natural resources. By reducing water runoff and sedimentation, CRP protects groundwater and helps improve the condition of lakes, rivers, ponds, and streams.

During its 20-year history, CRP has amassed a wealth of benefits for the United States at an average cost of less than $49 per acre annually. Through January 2007, CRP has restored 2 million acres of wetlands and 2 million acres of buffers. CRP effectively reduces soil erosion across the United States by 454 million tons each year.

Acreage enrolled in the CRP is planted to resource-conserving vegetative covers, making the program a major contributor to increased wildlife populations in many parts of the country. An estimated 23.2 million acres out of 27.8 million acres of eligible CRP contracts are expected to be re-enrolled in 2007. An estimated 4.6 million acres in CRP contracts will exit the program between 2007 and 2010. Of the 4.6 million acres, approximately 1.4 million acres are in major corn producing states.

The Conservation Reserve Enhancement Program (CREP) is on offshoot of CRP and addresses high-priority conservation issues of local and national significance, such as impacts to water supplies, loss of critical habitat for threatened and endangered wildlife species, soil erosion, and reduced habitat for fish populations such as salmon. CREP supports increased conservation practices such as filter strips and forested buffers. These conservation practices help protect streams, lakes and rivers from sedimentation and agricultural runoff. CREP also helps landowners develop and restore wetlands through the planting of appropriate groundcover.

Also through CRP, the Farmable Wetlands Program (FWP) aims to restore farmable wetlands and associated buffers by improving the land's hydrology and vegetation. Eligible producers in all states can enroll eligible land in the FWP through the CRP. Restoring wetlands reduces downstream flood damage, improves surface and groundwater quality, and recharges groundwater supplies. Wetlands provide vital habitat for migratory birds and many wildlife species, including threatened and endangered species, and provide recreational opportunities such as bird watching and hunting.

Acting Locally to Preserve and Maintain Area Waters

In Missouri, government, citizen and private industry groups came together in the late 1990s to form a partnership to improve area waters. Working together the Missouri Corn Growers Association, the U.S. Environmental Protection Agency, the Missouri Department of Natural Resources, and Syngenta created a local partnership to engage, educate and persuade neighbors to implement strategies that will maintain and restore the waters in their area. The group launched the Watershed Research, Assessment and Stewardship Project (WRASP) to provide farmers with options based on sound, scientific data that would improve water quality while increasing profitability. In 1997, WRASP began providing government agencies with input from the regulated community. The project concluded in 2005.

Encouraged by the positive feedback to WRASP, the Missouri Corn Growers Association formed the Environmental Resources Coalition, a not-for-profit organization, in 2001. ERC is committed to managing, improving and enhancing land and water resources through the use of sound science and effective public outreach. Key to the success of ERC is the understanding that one size does not fit all in addressing water quality issues. This unique approach to environmental stewardship has been applauded by the bipartisan Missouri House Interim Committee on Water Quality. It also received the Governor's Environmental Excellence Award. In August 2005, the WRASP project was singled out for recognition by the White House Conference on Cooperative Conservation.

Other ERC projects include:

- ***THE SOUTHWEST MISSOURI WATER QUALITY IMPROVEMENT PROJECT*** to identify and address major water quality issues in the southwestern region of the state.
- ***THE ECOLOGICAL AND WATER RESOURCES ASSESSMENT PROJECT*** to deliver a science-based and balanced view to regulators and the public to help them develop reasonable policies concerning water protection activities.
- ***THE STEWARDSHIP IMPLEMENTATION PROJECT*** for fair implementation of many of those policies and practices.

Summary Points

A true measurement of sustainability encompasses environmental, economic, and social factors. Satisfying demands of a growing world population must not come at the expense of ecological health, human safety or economic viability.

Increasingly, farmers are employing best management practices to improve the environmental sustainability of their land. Among the best management practices used, include soil and tillage management to increase soil composition and decrease soil erosion; and insect pest management for greater efficiency and safety in pesticide usage.

The introduction of biotechnology more than 10 years ago has contributed to the environmental and economic sustainability of farmers. The use of biotechnology reduces fuel consumption, pesticide and herbicide use and results in less tillage.

The introduction of herbicide-tolerant corn hybrids in the late 1990s has resulted in better weed control, higher yields, and the introduction of minimum and no-till practices.

From 1948 to 1994, agricultural productivity has increased 200 percent with no increase in overall inputs.

Fungicides, herbicides and insecticides are among the major classes of pesticides employed in crop production. Pesticides enable producers to compete profitably in the global marketplace and are a necessary protection for our food production system.

Farmers are involved in numerous local, state and national programs that idle environmentally sensitive land from crop production and encourage other on-farm conservation measures. The geographic variability of cropland makes voluntary, locally led incentive-based programs more important than ever.

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NCGA is the voice of corn growers and works to ensure corn growers have opportunities now and in the future.

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