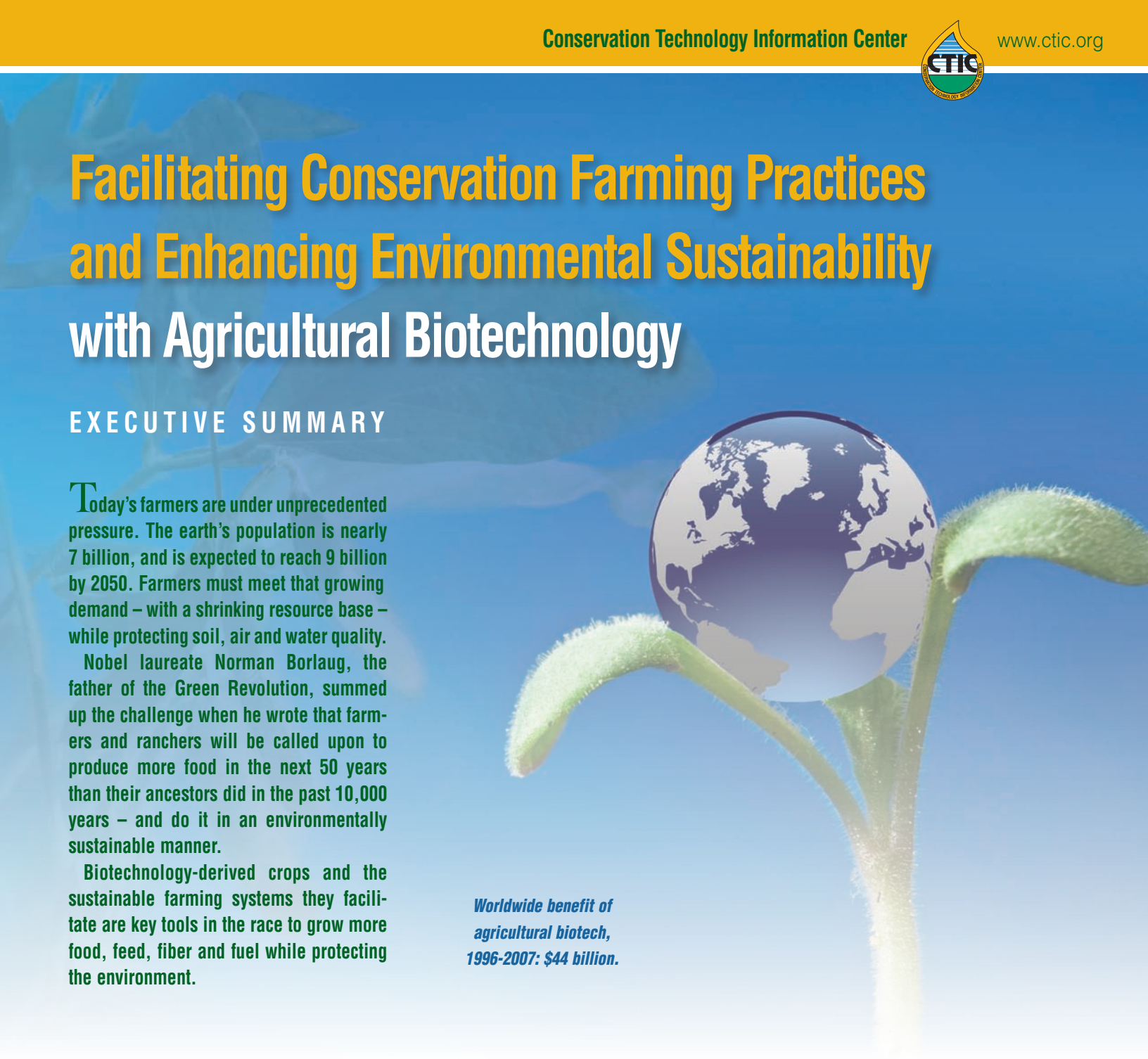
Facilitating Conservation Farming Practices and Enhancing Environmental Sustainability with Agricultural Biotechnology

EXECUTIVE SUMMARY

Today's farmers are under unprecedented pressure. The earth's population is nearly 7 billion, and is expected to reach 9 billion by 2050. Farmers must meet that growing demand – with a shrinking resource base – while protecting soil, air and water quality.

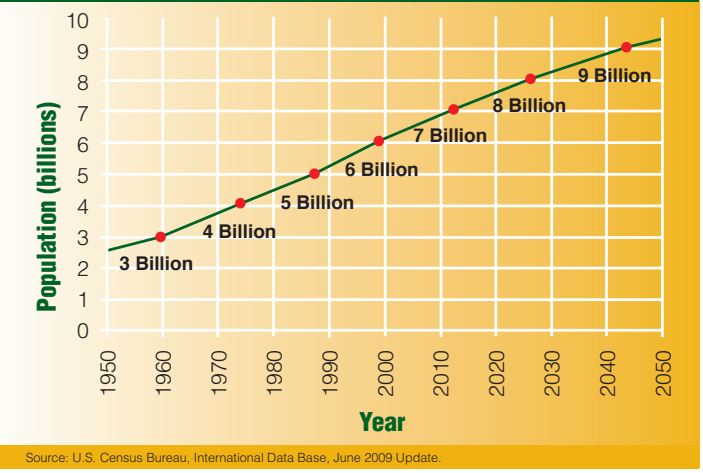
Nobel laureate Norman Borlaug, the father of the Green Revolution, summed up the challenge when he wrote that farmers and ranchers will be called upon to produce more food in the next 50 years than their ancestors did in the past 10,000 years – and do it in an environmentally sustainable manner.

Biotechnology-derived crops and the sustainable farming systems they facilitate are key tools in the race to grow more food, feed, fiber and fuel while protecting the environment.



Worldwide benefit of agricultural biotech, 1996-2007: $44 billion.

World Population: 1950 - 2050



Source: U.S. Census Bureau, International Data Base, June 2009 Update.

Race Against Time

To meet the projected soybean demand of 2030, growers would have to add 168 million acres of soybeans to existing production if global yields remained the same as today, or double those yields to 59.5 bushels per acre to harvest enough soybeans on today's acreage.

Biotech crops show promise to double or triple the current rate of yield increase in corn, and match or exceed the average 0.5-bushel-per-acre annual increase in soybean yields.

Not surprisingly, millions of farmers have adopted biotech crops readily. In the U.S., 91.5 percent of the soybeans, 85 percent of the corn and 88 percent of the cotton in the 2009 crop was planted to biotech varieties.

A New Generation

The first wave of biotechnology-derived crops focused primarily on input traits, which improved production efficiencies. In fact, the worldwide economic benefit of agricultural biotechnology between 1996 and 2007 was calculated at $44 billion.

The next generation of biotech crops will feature additional input traits such as tolerance to more herbicides and insects, as well as more efficient use of water and nitrogen. It will also introduce valuable output traits, including:

- Improved health profiles of oils and grains,
- Modification or elimination of major allergens, and
- More efficient conversion to biofuels.

Biotech means fewer applications. In 2007, U.S. farmers cut:

- ***47.4 million pounds of herbicide***
- ***8.67 million pounds of insecticide***

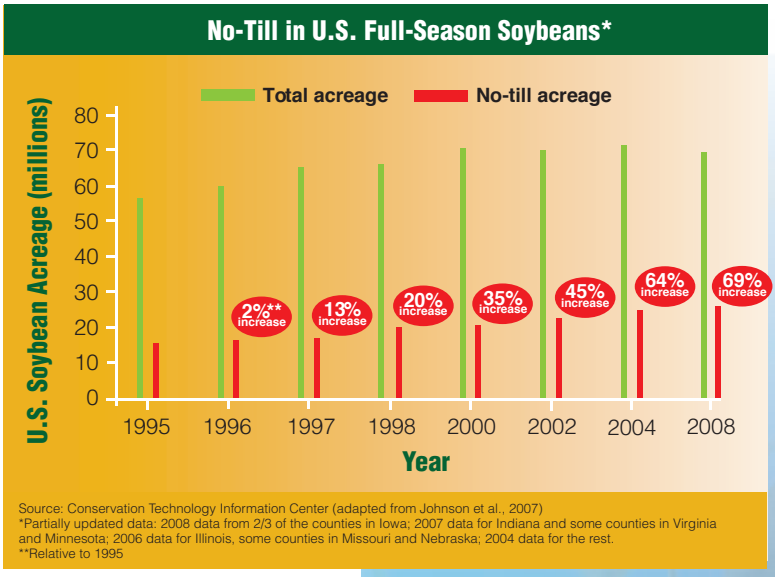
on acreage with biotech crops.

Protecting the Environment

Environmental benefits from biotech input traits add up quickly in pounds of herbicides and insecticides eliminated from the production system. For example:

- Herbicide-tolerant soybeans and cotton reduced U.S. herbicide usage in 2007 by 47.4 million pounds of active ingredient, and
- Insect-resistant cotton and corn varieties decreased insecticide applications that year by 8.67 million pounds of active ingredient.

There are significant long-term benefits, too. The adoption of biotech crops – especially soybeans – closely tracks the expansion of conservation tillage and no-till production. Between the introduction of Roundup Ready® soybeans in 1996 and the 2008 cropping season, the U.S. acreage of no-tilled full-season soybeans grew by nearly 70 percent.



Source: Conservation Technology Information Center (adapted from Johnson et al., 2007)
*Partially updated data: 2008 data from 2/3 of the counties in Iowa; 2007 data for Indiana and some counties in Virginia and Minnesota; 2006 data for Illinois, some counties in Missouri and Nebraska; 2004 data for the rest.
**Relative to 1995

Conservation tillage and no-till improve soil quality, conserve water and provide wildlife habitat. They also significantly reduce soil erosion, nutrient enrichment of streams and herbicide runoff. In fact, a number of studies show reductions in soil loss of more than 90 percent and reduced movement of total phosphorus by more than 70 percent on no-till fields.

High-residue farming practices also build up soil organic matter by capturing and storing atmospheric carbon. In fact, reducing tillage can quadruple carbon sequestration in cropland soils, and no-till can increase annual carbon storage five-fold. Reducing or eliminating tillage also lowers fuel consumption, cutting greenhouse gas emissions further. In all, conservation tillage and no-till can significantly improve the carbon footprint of farm operations.

Markets for water quality and carbon credits are emerging that could make environmental services such as combating water pollution and sequestering carbon – which conservation farming practices can often accomplish more cost-effectively than many alternatives – into income opportunities for farmers.

Best Option

No other options have been identified with the potential to improve yields and safeguard the environment as well as biotech crops farmed with sustainable practices.

Every ton of soil saved on the field, every pound of pesticide that doesn't have to be applied, every dollar that helps a farmer stay economically viable and every bushel of yield produced is a milestone in the effort to provide for a steadily increasing global population.

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