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# The Coming Food Crisis

## Why Is It Coming? How Should We Deal With It?

**By Paul W. Syltie, Ph.D.**

It may seem silly to talk about a food shortage when local supermarket shelves are loaded with all sorts of items, from watermelons to ice cream, and tortillas to ribeye steak, The illusion is that there is no imminent crisis in food supplies, and besides, aren't there bumper crops of corn, soybeans, wheat, and vegetables this year? Why worry?

Perhaps worry is not the best way to face the coming food crises that are facing this great nation—and all of the world—in this modern day. It is far better to understand the gravity of our current conditions, and then prepare for the eventuality that could sweep across humankind in very short order. How is this possible?

1 Even though 2016 has seen excellent crops in most parts of the United States, some areas such as California continue to experience serious drought that is affecting production and surface and groundwater supplies for future years. India has seen 330 million people affected by severe drought in 2016, and drought followed by food shortages is occurring in Malawi and Ethiopia. Only a few weeks of rainless weather can signal a crop failure in any nation at any time.

2 Food prices are rising, even in the face of bumper crops in 2016, at least in the United Sates and Europe. The United Nations Food and Agriculture Organization Food Price Index stood at 165.6 in August of 2016, up nearly 7% from a year earlier. Countries such as Venezuela have seen food prices skyrocket out of sight as of late, with a dozen eggs selling for $150 in September...recalling the words of Revelation 6:6: "A loaf of bread or three loaves of barley will cost a day's pay, and don't waste the olive oil and wine." The price of gasoline and food are intertwined, so if the price on fuel spikes, so will food prices. Most of the food in the supermarket has to be shipped from elsewhere, requiring considerable fuel.

3 Diseases of crops and livestock are continuing to be a problem, witness Panama disease crippling bananas in tropical countries, Southern Corn Leaf Blight devastating T-cytoplasm corn in the U.S. in 1970, African Swine Fever wiping out millions of hogs in various countries over past decades, and avian flu hitting the poultry industry in the Midwest and Upper-Midwest in 2016; over 30 million hens and

*See Dealing With a Food Crisis, page 2*

# The Great Farm Disconnect

## Widespread Ignorance of Where Food Comes From

**By Livia Gamble**

In 2010, as part of his Food Revolution, Jamie Oliver stood in front of a classroom of six-year-olds to find out if children really did know what fresh food looked like. Holding up some tomatoes, Oliver asked: "Do you know what these are?" He was met with stumped faces until one boy shouted: "Potatoes!"

Four years later, kids still don't know where their food comes from. A recent national survey, commissioned by Woolworths, found that a third of Australian children struggled to identify fruit and vegetables, and were confused about where produce came from. The study, which surveyed 1,601 Australian children aged between six and 17 years, revealed 92 per cent did not know bananas grew on plants. Researchers also found that "six in 10 [children] are unaware that herbs such as mint grow from the ground".

In 2012, a national study conducted by the Australian Council for Educational Research found children were just as confused back then. The sur-

***Many young people believe that cheese grows on trees, a consequence of families being removed from farms.***

vey, made up of year 6 and year 10 stu-

*See Kids and Adults Don't Know, page 6*

# Dealing With a Food Crisis

*Continued from page 1*

1.5 million turkeys were destroyed in Iowa alone that spring. With reductions in supplies come higher prices and potential shortages.

4 Food safety concerns have led to recalls of peanuts, frozen vegetables, meat, and processed foods, Modern food handling mismanagement has led to outbreaks of Listeria, E.coli, Salmonella, and a host of other food borne illnesses. Unsanitary factory practices can allow a contaminant to quickly spread. Add transportation, storage, and unsafe handling and you've got food that is ready to play host to multiple strains of bacteria. GMOs have entered the picture in a big way as well, with their negative effects on people and animals systematically covered up by the media and corporate interests. Some countries, such as those in Europe, have outlawed the planting of GMOs.

5 Soils have continued to degenerate across the globe, especially through unmitigated erosion and commercial farming practices. According to the USDA , in 2001 the productivity of some lands had declined by 50% due to soil erosion and desertification. Yield reduction in Africa due to past soil erosion ranged from 2 to 40%, with a mean loss of 8.2% for the continent. In South Asia, annual loss in productivity was estimated at 36 million tons of cereal equivalent valued at $5,400 million by water erosion, and $1,800 million due to wind erosion. It is estimated that the total annual cost of erosion from agriculture in the U.S. is about $44 billion per year. On a global scale, the annual loss of 75 billion tons of soil costs the world about $400 billion per year, or approximately $70 per person per year.

The Fukushima and Chernobyl crises spewed nuclear material onto many acres that are rendered useless for agriculture, and cities, airports, and roads continue to remove large tracts of fertile land from production every year.

6 Wars bring with them a disruption of food production and distribution, and wars are currently rampant around the world. There were 54 documented wars and skirmishes in 2016, with no end in sight. Rather, the number of conflicts will likely increase during the coming years, further disrupting food supplies. Moreover, a nuclear war would create a "nuclear winter" that would cool the planet significantly for many months, and devastate crops around the globe. leading to widespread famine.

7 Last but not least, an EMP (electromagnetic pulse) burst, severe solar storm, or acts of terrorism would knock out the electrical grid in seconds, and EMPs will fry delicate computer chips that control virtually everything in our modern world. Energy production would come to a standstill, fuel could not be pumped, cars and trucks would be halted, and no part of the food production chain could continue to function. Within a few days, famine would be staring mankind in the face.

### Solutions That Would Work

The official prescriptions for solving the world food crisis call for more of the same policies that caused the crisis in the first place. Expecting the institutions that built the current food system to solve the food crisis is like asking an arsonist to put out a forest fire. More corporate welfare, free trade, and technological "fixes" are good news for the industrial agri-foods complex but will do nothing to restructure our environmentally vulnerable global food system.

To solve the food crisis there needs to be an empowerment of an agro-ecologically resilient family agriculture, the type of system that built America but incorporating modern, sustainable practices. Food can become abundant and affordable for all by turning the food system into an engine for local economic development in both rural and urban areas.

It is impossible to solve the current food security issues without getting into politics and associated economics. Stable and fair prices to farmers, workers, and consumers are essential.

Gamblers (investors) in commodity markets have poured hundreds of billions of dollars into the commodities futures markets, manipulating food and energy prices for private gain. This system of financial gimmickry destroys compassion for one's fellow man, and elevates short-term profits above the needs of the countless needy people in many nations.

There is a desperate need to promote a return to smallholder farming. Extensive research shows that small family farms are more productive than large-scale industrial farms. Three-quarters of the world's poor are small farmers, and by promoting their needs the specter of famine can be greatly reduced.

Rebuilding national food economies will require immediate and long-term political commitments from governments. An absolute priority has to be given to domestic food production in order to decrease dependency on the international market. Peasants and small farmers should be encouraged through better prices and stable markets to produce food for themselves and their communities.

Agro-ecological farms are highly productive and—according to a study from the University of Michigan—can easily provide us with all the food we need. As industrialized farming and free trade regimes fail us, these small-farm, eco-friendly approaches will be the keys for building resilience back into a dysfunctional global food system. Farmers need to be freed from the shackles of government intervention and price controls, and wars need to cease—a tall order for a war-torn world, but an order we all need to strive for so hunger can be erased.

In the meantime, it is wise to stock up on long-term food storage items, and if you can, move to the country and become as self-sufficient as you can. Food shortages are coming, and we ought to prepare. ❐

# The Difficulties With Soil Testing

## Getting Uniform and Reliable Results Is Not Easy

**By William C. Dahnke, Ph.D.**

For more than a century, soil and plant scientists have been developing methods for determining the levels of plant-available nutrients in soils. One of the first quick soil tests for "active" (available) nutrients was that of Daubeny (1) in 1845. It involved extracting the soil with carbonated water. His suggested test, however, was never put to practical use because of analytical difficulties. The first known fertilizer recommendations based on a soil test were made by Dr. Bernard Dyer in 1894[2]. He recommended that phosphate fertilizer be applied to soils releasing less than 0.01% $P_2O_5$ (.0044% P) when extracted with 1% citric acid.

Since 1845, many extracting solutions have been suggested and tried. Some of the tests have proved to be very successful in spite of the fact that many different chemical forms of each nutrient occur in the soil, each having a different level of availability to plants.

Research efforts in developing soil testing as a useful guide to soil management have been extensive in soils and agronomy departments in the [North Central U.S.] region. In most departments one or more prominent soils scholars have been associated with soil testing research over considerable periods of time. This, plus the fact that many soils in this region are amenable to corrective management, has resulted in the extensive use of soil testing in the NCR-13 region.

The preliminary work for this bulletin was done several years ago when a soil sample exchange was conducted among the member states. The results of this exchange indicated that differences in procedure were possibly causing significant differences in soil test results. A cooperative study among several of the states was conducted to determine the importance of procedural differences. For example, temperature, time and speed of shaking, and shape of extraction vessel were found to have an influence on the amount of phosphorus and potassium extracted. Soil scoops of the same volume but different depth and diameter were found to influence the amount of soil they hold. To solve this variability problem, a standard soil scoop was suggested.

Another purpose of this bulletin is to describe the detailed procedures based partly on the above studies for soil pH, lime requirement, phosphorus, potassium nitrate-nitrogen, calcium, magnesium, CEC, zinc, iron, manganese, copper, boron, chloride, sulfate-sulfur, soil organic matter, soluble salts, and greenhouse media. We believe that use of these procedures by all public, private and industrial soil testing laboratories in our region will do much to reduce any confusion connected with soil testing and thus lend greater credibility to its role in the fertility management of soils.

A word of caution to readers of this bulletin: A soil test is only as successful and usable for a region as the degree to which it is correlated and calibrated for the soils and crops of the area. The procedures described in this bulletin are especially suited to our region. Do not assume that they will work in your area without doing the necessary research. ❒

**References**


1. Daubeny, Charles. 1845. VII. Memoir on the rotation of crops, and on the quantity of inorganic matters abstracted from the soil by various plants under different circumstances. Royal Society of London, *Philosophical Transactions* 135:179-253.

2. Dyer, Bernard. 1894. On the analytical determination of probably available mineral plant food in soil. *Journal of the Chemical Society (London)* 65:115-167.


[From *North Central Regional Research Publication No. 221 (Revised)*, Recommended Chemical Soil Test, Procedures for the North Central Region.]

# A Less Efficient Future Spells Trouble

**By Alan Guebert**

[Condensed from *Farm Forum, Green Sheet,* Sept. 16, 2016]

A United Nations Environmental Program report, "Global Material Flows and Resource Productivity," recently stated, "Overall, the global economy expanded more than three-fold over the four decades since 1970, population almost doubled, and global material extraction tripled."

Did you get that? Less than double the number of people worldwide used half again as many resources per person as during previous years.

If less than twice as many people used three times more "global material"—oil, coal, grain, minerals, water, soil, etc.—in the last 40 years, the next 40, with more people and more wealth, will push the world's resources to their breaking point.

In 2016, globally, more material per unit of GDP is required than the previous resource-gobbling ratio to fuel our growth-obsessed, always more culture. We in agriculture have our own upside-down ratios. For example, it is farming gospel that in adding two billion people to the world's population by 2050—or about 30% more people in just 34 years—farmers and ranchers will need to grow 60% more food than today.

How on earth will we sustain that estimated 2:1 food-to-population ratio given today's fast-shrinking "materials base?" The short answer is that we will not, at least not for long. According to the United Nations report, "In order to accommodate an additional two billion people"—the exact target U.S farmers have been told to focus on—"material consumption will need to nearly triple to 180 billion tons...almost three times today's amount.

Think about this tonight in your bed! ❒

# 15-Minute Soils Course

## Lesson 44: Soil Testing: Philosophy and Practice

Soil testing is an extensive subject that cannot be covered easily in 15 minutes' reading, but some essential points wil be mentioned here.

Philosophies of soil testing:

**1. Sufficiency levels.** This approach attempts to measure the nutrient levels that are needed to produce a particular yield goal for a specific crop, by analyzing the soil levels with a chemical test, and subtracting from that the amount of the element extracted by the crop. For example, a 150 bu/acre corn crop contains 135 pounds of nitrogen. If the soil test shows 65 lb/acre of available nitrogen, the fertilizer recommendation will be 135-65=70 lb/acre. Actual fertilizer recommendations will be higher than 70 lb/acre, however, due to losses of N in the field, so oftentimes a value of 1.0 to 1.4 lb of N/bu is used. Such losses do not occur nearly as much with the other elements.

**2. Cation balancing.** With this approach, which was pioneered by William Albrecht of the University of Missouri, the cations (positively charged ions, including calcium, magnesium, potassium, sodium, and hydrogen) are determined and recommendations for these are given to achieve, over time, a balance of the total cation exchange capacity of about 65 to 70% calcium, 12 to 18 % magnesium, and 2 to 5% potassium. Other elements are recommended based upon sufficiency levels.

**3. Radionic analyses.** For this method, a trained radionics practitioner utilizes the subtle energies emitted by plants and soils to determine the levels needed of various nutrient elements for a desired yield. These energies can be quantified by instruments designed for the purpose. Certain types of field towers or pipes have been utilized to broadcast energies to crops and soils to help supplement the plant's utilization of nutrients.

**4. Microbial analyses.** Some labs analyze for microbes such as bacteria, fungi, nematodes, protozoa, and other species, and fertilizer recommendations are based on microbe activity alongside nutrient levels, and in particular the ratios of bacteria to fungi.

The values of needed nutrients for a particular crop growing in a particular soil, as determined by soil test, can vary widely. This is due to variations in the way the samples are collected and handled in the field, and analyzed in the lab. Different labs oftentimes use different analytical methods, with results that are oftentimes very different for the same sample.

### Variables Determining Soil Test Values in the Field and the Laboratory

1. Method of sample collection
   - a. Number of subsamples taken in the area
   - b. Depth of sampling
   - c. Type of container (Metal or plastic)
   - d. Soil moisture content
   - e. Drying of the sample
   - f. Time before testing
2. Soil sample size, i.e., soil scoop qualities
3. Temperature, time, and speed of shaking
4. Shape of the testing vessel
5. Accuracy of the testing equipment
6. Techniques of the technicians

The philosophy behind the extraction agent used in a soil test is to try and simulate the action of roots in extracting nutrients from the soil. Thus, weak to strong acids are oftentimes used to extract the elements. Typical methods and extracting agents below are from the Penn State Agricultural Analytical Services Lab.

| | |
|---|---|
| **pH** | **Water extract** |
| **Lime requirement** | **Mehlich buffer** |
| **P, K, Ca, and Mg** | **Mehlich 3 (ICP)** |
| **Cation Exchange Capacity** | **Summation** |
| **Organic matter** | **Loss on Ignition** |
| **Total C** | **Combustion** |
| **Nitrate N** | **Specific Ion Electrode** |
| **Ammonium N** | **Specific Ion Electrode** |
| **Total N** | **Combustion** |

# 15-Minute Soils Course

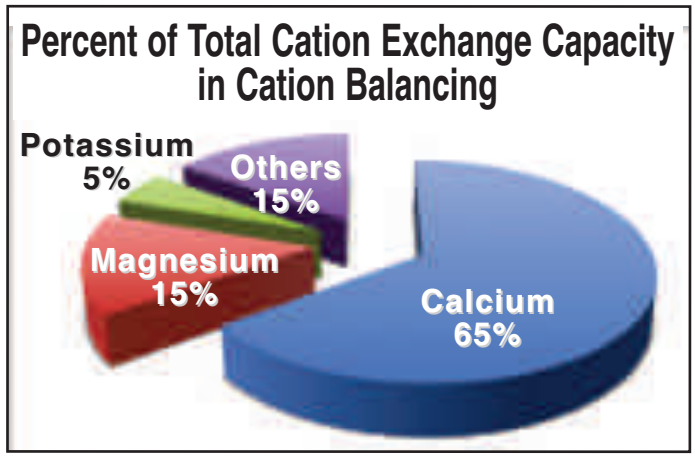
| | |
|---|---|
| **Soluble Salts** | **Electrical conductivity** |
| **Total Sorbed Cu, Zn, Pb, etc.** | **EPA Method 3050B/3051** |
| **Particle Size Analysis** | **Hydrometer Method** |
| **As** | **EPA Method 3050B/3051** |
| **Se** | **EPA Method 3050B/3051** |
| **Hg** | **EPA Method 7473** |
| **Calcium carbonate equiv.** | **ASTM Method C 25** |

### The Most Essential Issues

With substantial variations in soil test results among the various laboratories, ***it is of utmost importance to use a lab that gives consistent results which you can trust in extrapolating the numbers to fertilizer recommendations that work.*** Many farmers employ agronomists who specialize in this effort. While many labs and consultants will give acceptable results, the cation balancing method for Ca, Mg, and K is a preferred method in that the farmer seeks to achieve an ideal soil condition.

Even more important than soil testing, its accuracy and the need for expert recommendations, is the need to build a vigorous organic matter and microbiotic component through judicious returns of fresh organic residues annually. The microbial action triggered by the teeming microbes involved in this breakdown is a major key in making nutrients available, and not just nitrogen. Minimizing tillage also will aid in the building of a strong soil structure and a high organic matter content that will help release nutrients to the crop.

***Soil testing labs vary in their methods and values obtained for various nutrients. Select one whose results give consistently excellent crop responses.***




### See How Much You Learned

1. Determining soil test values is easy, and they are highly consistent from lab to lab. T or F

2. Philosophies of soil testing include a. cation balancing, b. radionic analyses, c. pressurized estimation, d. microbial analyses, e. sufficiency levels, f. all five of these.

3. The most important factor in choosing a soil testing lab is to find one that provides _____ results that correlate well with crop yield responses.

4. It is highly important that there be expert interpretation of the soil laboratory numbers in order to spend fertilizer dollars wisely. T or F

5. Some of the variables that affect soil test values as determined in the lab include a. sample size, b. expertise of the lab technicians, c. size and shape of the testing vessels, d. all of these.

6. Soil test extracting agents are chosen to try and simulate the action of _____.

7. William Albrecht was the originator of soil cation balancing. T or F

Answers: 1. T; 2. a, b, d, e; 3. consistent or uniform; 4. T; 5. d; 6. soil; 7. T.

# Kids and Adults Don't Know Where Food Comes From

*Continued from page 1*

dents, found holes in young people's basic food knowledge. "Three-quarters of Australian children in their final year of primary school believe cotton socks come from animals, and 27 per cent are convinced yoghurt grows on trees," reported Fairfax. In fact, 75 per cent believed cotton was an animal product.

British primary school kids are just as clueless as Australian children. In 2013, a British survey found that almost a third of the country's primary school children thought cheese was made from plants and a quarter thought fish fingers came from chicken or pigs. The poll, conducted by the British Nutrition Foundation, surveyed about 27,500 children aged between five and 16 years, and found there was also some confusion about where pasta and bread came from. "A third of five-to-eight-year-olds believe that they [pasta and bread] are made from meat," reported the BBC.

According to another survey, young adults in Britain are none the wiser. The online poll, led by the charity LEAF (Linking Environment and Farming), surveyed 2,000 people aged between 16 and 23 years and found a third of them did not know that bacon came from pigs. Researchers also found that four in 10 young adults did not know where milk came from, with 40 per cent of them failing to recognise the link between milk and a picture of a dairy cow. ❒

*Editor's note: The ignorance of so many of our young people about food is a consequence of their being raised in urban areas, apart from the food production process. It behooves us to teach our children where their sustenance comes from, and to learn to grow their own food if at all possible.*

[Abridged from *The Sydney Morning Herald*, May 27, 2014]

## Deliver Our Blows Gently to the Land

**"... no matter how rhapsodic one waxes about the process of wresting edible plants and tamed animals from the sprawling vagaries of nature, there's a timeless, unwavering truth espoused by those who worked the land for ages: no matter how responsible agriculture is, it is essentially about achieving the lesser of evils. To work the land is to change the land, to shape it, to benefit one species over another, and thus necessarily to tame what is wild. Our task should be to deliver our blows gently."**

**— James McWilliams**

# Your Land As Legacy

**By Lance Woodbury**

[Condensed from *The Progressive Farmer,* Oct. 16, 2016]

Among all of the financial assets you pass on to the next generation, perhaps none is as valuable and unique as your agricultural land. Indeed, land holds a special place in our psyche: We've heard "they don't make any more of it." Here are some deeper reasons why I believe land is such a special part of your legacy.

**1 Land Serves People in Multiple Ways.** Land provides food and nutrition for others in the world. Through certain crops, it also provides energy for our country, clothing and from trees, shelter. It provides an economic livelihood for millions, space for people to experience nature and, for those who own the land, financial security in retirement.

**2 Land Connects Us to Others.** Ownership of land creates a bond among family members, a connection between generations past and future. Joint ownership of land provides a reason to come together as a family and talk, plan, explore…and sometimes even fight.

**3 Land Also Connects Us to Our Neighbors.** At some point in your history, you have probably received help from, or provided assistance to, a neighbor due in large part to your shared border. Your land creates a bond with the people around you, and that bond often

translates into care for one another. And when you consider the jobs provided to those who farm your land or the income you spend in the local town because of farming or rental income, this economic fruit of the land connects us to other people in our communities.

**4 Land Gives Us Stories.** For many of us, the emotional attachment to land is connected with memories. I recall long, slow drives with my grandfather to check the crops listening to his stories about the dust bowl, blizzards, floods and other life-altering events for our family. The theologian Walter Brueggemann writes, "Land is never simply physical dirt but is always dirt freighted with social meanings derived from historical experience. There are no meanings apart from roots."

Discipline. Stewardship. The value of hard work. Appreciation for someone's skills. Respect for nature. Gratitude for God's bounty. In many ways, land is the foundation for principles we teach our children today.

**5 Land Is the Evidence of Faith.** Through land, we see the cycle of life and death; Ecclesiastes 3:2 reminds us there is "a time to plant and a time to uproot." Through land, we see God's physical commitment to provide and to nourish. In the Bible, land is a central tenet of God's commitment to his people. In this way, land is bound up in our most deeply held beliefs. ❒

# When Bumper Crops Lead to Farm Distress

**By Alan Bjerge and Jeff Wilson**

The American farm boom is all but over. Farmland values are down from all-time highs. Global surpluses left corn and soybean prices below the cost of production. And the amount of agricultural debt relative to income ballooned to the highest in three decades, just as the Federal Reserve has begun raising interest rates for the first time since 2006.

While many growers remain profitable, the global commodity slump is increasing pressure on a Midwest economy that was largely shielded from the worst of the financial crisis by high crop prices and land values. Last year, farm income was the lowest since 2002. This year's agriculture-trade surplus in the U.S. -- the world's top exporter -- will be the smallest in a decade. At the same time, sales are dropping for the likes of tractor-maker Deere & Co. and seed supplier Monsanto Co.

"The farm economy had a near-perfect five or six years," built upon record U.S. demand for corn-based ethanol in fuel, surging food purchases in Asia, and near-zero-percent interest rates that helped spur land investment, said Brent Gloy, an agricultural economist at Purdue University in West Lafayette, Indiana. With the oil slump eroding ethanol margins and a strong dollar eroding U.S. exports, the Fed's decision last month to start raising borrowing costs "means there's nothing left of the boom."

With the prices of corn and soybeans, the nation's biggest crops, down by more than half from records in 2012, net farm income probably tumbled in 2015 to a 13-year low of $55.9 billion, down 55 percent from a record $123.3 billion in 2013, the U.S. Department of Agriculture estimates. Debt is 6.6 times larger than net income, up from 3.8 a year earlier, and the ratio is the highest since 1984, when farm foreclosures were the highest since the Great Depression, government data show.

***The paradox of bumper crops leading to farm distress is characteristic of our unforgiving economic system.***

### Exports Falter

As surpluses keep prices low, demand for American farm exports is dropping as other countries boost output, and the strong dollar makes competing supplies from Brazil to Ukraine cheaper for importers. With U.S. exports at a six-year low and imports up, the nation's trade balance in agriculture will slump to $9.5 billion in 2016, down 78 percent from a record $43.1 billion in 2014, when shipments were the biggest ever (USDA data).

Compounding the strain is higher borrowing costs, which makes it more difficult for farmers to finance operations or purchase land and equipment. The Fed raised interest rates by 0.25 %-point last month—ending more than seven years at near zero percent—and signaled its intent for further increases this year.

"Low rates pushed ag markets and farmland beyond true value," said Jim Farrell, president of Omaha, Nebraska-based Farmers National Co., which manages more than 5,000 farms and ranches in 24 states. "Rising interest rates are another headwind" that could reduce farmland values by as much as 15 percent within two years, he said.

### Tough Times

For Anthony Bush, who farms more than 1,400 acres of corn, soybeans and wheat outside Mount Gilead, Ohio, higher interest rates are just another sign that the boom is over.

"I look for a period of pretty tough times," said Bush, 45. "I need to borrow money in the spring to cover the costs I pay off in the fall, so when you're buying your seeds, your fertilizer, you have to take on your debt all at once."

But even with those increased costs, he expects farming to remain viable.

"If you want to stick in this business, you have to be an eternal optimist," Bush said. "We may not have cheap interest rates. But we'll still have to eat." ❒

[Abridged from The crop surplus is bad news for America's farms, *Bloomberg*, 1/1/16.]

## Statement of Purpose

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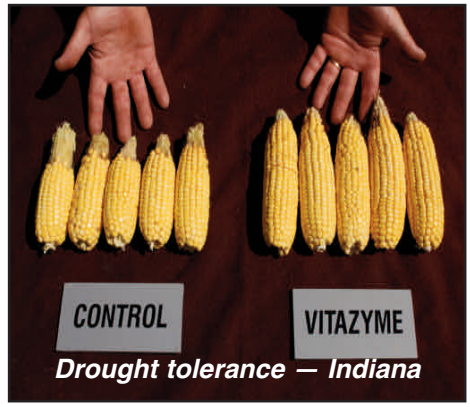
# Vitazyme Is a Perennial Winner in Corn Production

**All crops respond very well and consistently to Vitazyme application, and that includes corn, the crop with the greatest acreage and production across the United States. The USDA estimates there were 94.1 million acres of corn planted in 2016, with an estimated production of 15.2 billion bushels (161.5 bu/acre average). In contrast, soybean acreage is about 87.7 million acres, with an estimated production of 4.06 billion bushels (46.3 bu/acre average). Wheat takes a distant third in acres planted at 50.8 million acres.**

***Here is a hypothetical scenario*: Considering an average increase for corn of about 7 bu/acre with Vitazyme application on the seeds or in-furrow only, overall production in the U.S. would be increased by 658.7 million bushels. At the very low corn grain price of $3.50/bu, that represents $2.3055 billion in added income. With the cost of Vitazyme at $7.00/acre (subject to dealer pricing), for example, that input cost would be $658.7 million. The added net return to the farmers of the U.S. would be $1.6468 billion, a return on investment ratio of 3.5. Vitazyme is clearly a highly viable option for corn growers, even during a year of very low commodity prices.**

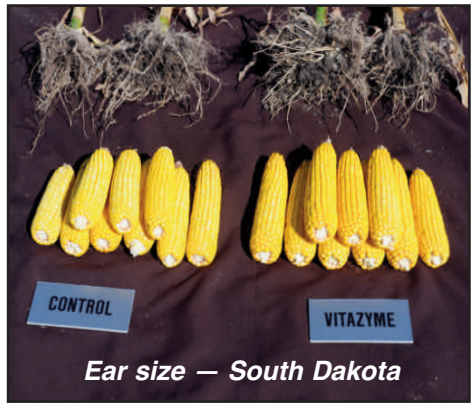
*Drought tolerance — New York*


*Rapid growth rate—South Dakota*



*Drought tolerance — Indiana*

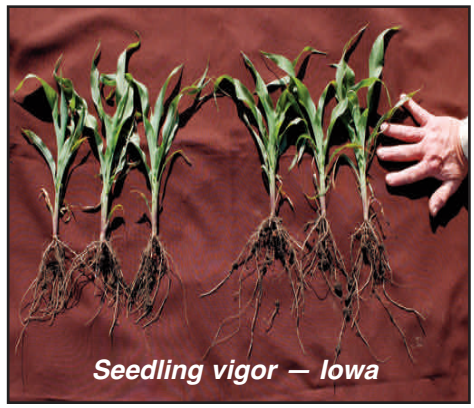

*Root growth — Ontario*



*Ear size — South Dakota*

*Root and stalk growth — Ontario*

*Rhizosphere intensity —Ontario*


*Seedling vigor — Iowa*

*Plant development — New York*