The Vital Earth News

Agricultural Edition

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Organically Grown Food Is Best!

The proof is in ... and it is irrefutable.

By Paul W. Syltie, Ph.D.

Once again a study has shown that organically grown food is superior to the conventionally grown fare. However, this new study is the "mother of all studies" on the subject. It wields more weight than perhaps any other in proving the increased nutritional value of foods grown the natural way.

What the Study Shows

Research commissioned by the European Union, and coordinated by Dr. Carlo Leifert of Newcastle University at a cost of $25 million, investigated over four years the merits of fruits, vegetables, and milk grown on the 725-acre farm attached to Newcastle University, and on other sites across Europe. The results of the analysis of these crops and milk were earth shattering, to say the least. For starters, it was found that,

- Organic fruits and vegetables contain up to 40% more antioxidants.
- Organic produce has higher levels of beneficial minerals like iron and zinc.
- Milk from organic herds contains up to 90% more antioxidants.

The "king of all vegetables "— broccoli — should find its place on the tables of everyone. It contains high levels of antioxidants, minerals, and vitamins.

The results were so powerfully in favor of organically grown foods that the standard government advice, at least in England, is likely to be overturned. Historically, that advice has been there is no difference in the nutritional quality of organic and conventional produce. Dr. Leifert boldly stated that the government was wrong in stating there is no difference. "There is enough evidence now that the level of good things is higher in organics," he said.

The Food Standards Agency of England is reviewing the data, which shows significant variations in some of the information collected. Next on the research agenda is to discover why these variations exist, but in the meantime it is hoped that the official government stance will be to recommend the widespread use of organic foods.

Why the Concern?

The knowledge that a group of biochemicals called"antioxidants" is so important to human health has grown

See Antioxidants to the Rescue!, page 2

Early Weed Competition Robs Yield

By Larry Reichenberger

[By permission of The Furrow*/Deere and Company, Moline, Illinois.]*

It's a caper on a grand scale, and it happens in plain sight in many corn and soybean fields every spring. Weeds and grass too small to draw farmers' ire are busy stealing expensive nutri-

Small weeds use surprising amounts of crop nutrients and soil water.

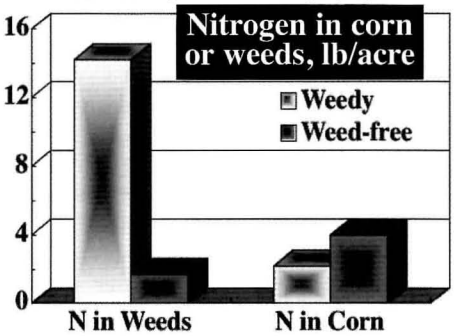
ents and precious soil moisture, and they do so at an alarming rate.

"Most farmers believe weeds cause no real damage until they're 4-5 inches tall, but research shows a significant impact occurs much earlier," says Bob Kacvinsky, technical support representative with Syngenta Crop Protection. "The popularity of crops with genetic resistance to non-selective herbicides has led many growers to rely totally on a postemerge weed control program. As a result, there's less early weed control and that's putting a stress on crops that can last all season. Using a preemerge herbicide can reduce this early weed pressure."

Nitrogen heist

Kacvinsky worked with researchers from the University of Nebraska to document nutrient and moisture use by weeds in various stages of growth. The chart below displays data collected in corn this past spring.

See Waiting for Roundup, page 3



Antioxidants to the Rescue!

Continued from page 1

tremendously over the past few years. These substances prevent or slow the oxidative damage caused by free radicals (toxic cell by-products, in particular the O^- radical) released during cell metabolism. Antioxidants "scavenge" for these harmful metobolitcs that can cause cancer, heart disease, macular degeneration, diabetes, and a host of other ailments, and neutralize them. These antioxidants most likely also enhance the body's immune function, lowering the risk of infections throughout the body and consequential cancer, atherosclerosis, and other diseases originating with tissue infection.

Commonly known antioxidants are listed in the box below.

Why Is Organic Culture So Special?

Flavenoids and other antioxidants are biochemical by-products that the plant produces to help protect itself from insects, bacteria, fungi, and photo-oxidation. Thus, they are natural defenses for the plant that likewise are essential for human and animal cell function by neutralizing free radicals.

Conventional agriculture, which depends heavily upon chemical fertilizers, pesticides, and irrigation suppresses the production of antioxidants by removing the need for plants to produce them. Insects and microbial pests, as well as water stress, are limited, giving rise to high yields of crop varieties that are replete with starch and water, but oftentimes deficient in vitamins, minerals, and antioxidants.

It is easy to see, as a consequence of the use of crop protection chemicals, that plants deficient in their own self-defense flavenoids and vitamins are also less able to provide the body with these critical free-radical scavengers. The natural chain of protection has been broken by pampering weak varieties with agrichemicals, bequeathing not only fewer antioxidants to the consumer but also a dose of the dangerous crop chemical and its by-products as well.

What Should We Do?

The obvious direction in which this discussion leads is towards eating foods that are organically grown. However, food is only a part of the answer. To be healthy one must regularly exercise, think positively, get proper sunshine and fresh air, and practice excellent hygiene and safety. Yet, food constitutes a major component of health, one that we can personally influence.

Maintaining food purity and a high nutritional content ought to be a major goal of everyone's diet. Choosing to either grow one's own foods on well-balanced, high-organic-matter soils is the wisest choice, since freshness, purity, and variety can all be controlled. Open-pollinated varieties are best; avoid hybrids, and any food that might contain genetically engineered corn, soybean, or canola.

Many health food stores and supermarket chains offer organically grown vegetables, fruits, and milk, but be cautious about your purchases. Try to buy local produce that is properly grown as a first choice, since many of the organic foods offered by mega-stores come from China and Brazil. Their quality is highly suspect, and certainly not fresh and locally grown. Organic milk is pasteurized and has reduced value; opt for local raw milk. Some major organic milk producers have confinement factory farm dairies, not family farms intent upon maximum quality. They are certainly denying the intent of the organic food guidelines.

You can be assured that organic is best, but be cautious when buying at the supermarket. After all, their foremost concern is profit, not health.

Remember: you are what you eat! You were made to be healthy, so relish the deep greens, oranges, and reds!

COMMON ANTIOXIDANTS AND GOOD SOURCES OF THEM

Vitamin A and carotenoids: Carrots, squash, broccoli, tomatoes, kale, collards, peaches, apricots (bright-colored fruits and vegetables)

Vitamin C: Broccoli, citrus fruits, green peppers, strawberries, tomatoes, green and leafy vegetables

Vitamin E: Whole grains, nuts and seeds, greed and leafy vegetables, cod liver oil

Selenium: Fish, red meat, grains, eggs, chicken garlic

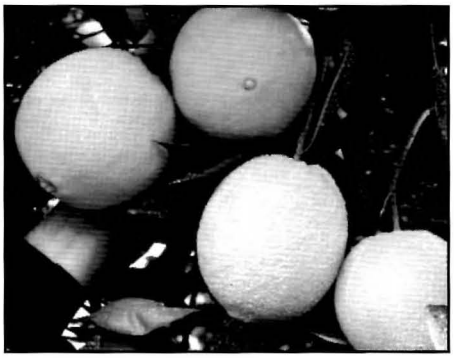
Flavenoids and polyphenols: Red wine, purple grapes, pomegranates, cranberries, tea

Lycopene: Tomatoes, pink grapefruit, watermelon

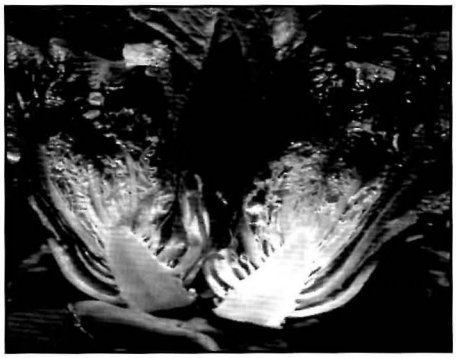
Lutein: Dark green vegetables like broccoli, spinach, and kale

Lignan: Flax seed, oatmeal, barley, rye

Vitamin-like antioxidants: Coenzyme Q10, glutathione



Oranges have a very content of the antioxidant Vitamin C, and are an excellent addition to anyone's diet.



Lettuce tends to be low in antioxidants, but the best kinds have deep green color like Romaine or Bibb.

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Waiting for Roundup Can Be Costly

Continued from page 1

"We measured the amount of nitrogen in corn that was 4-6 inches tall growing with weeds that were only 1-2 inches. Where no preemerge herbicide was used there were weeds and grass typical of what you often see in farm fields. Those weeds contained 14 pounds per acre of nitrogen while the corn contained only 2 pounds per acre. When weeds were controlled with a preemerge herbicide, they contained less than 2 pounds of nitrogen per acre while the corn contained 4 pounds," Kacvinsky points out.

The data is similar to results from a year earlier, when researchers found 1-2 inch weeds contained 9 pounds per acre of nitrogen while 4-6 inch corn contained less than 2 pounds. When weeds were 3-4 inches tall they contained 28 pounds of nitrogen while at the same time 8-10 inch corn contained only 7 pounds per acre.

Purdue University weed scientist Bill Johnson recently summarized similar research. "We found when corn and grass emerged at the same time, the grass was a fierce competitor. At 3 inches in height, the grass contained about the same amount of nitrogen as the corn. However, by the time the grass reached the 12-inch height it contained three times as much nitrogen as the corn," he says.

Lasting impact

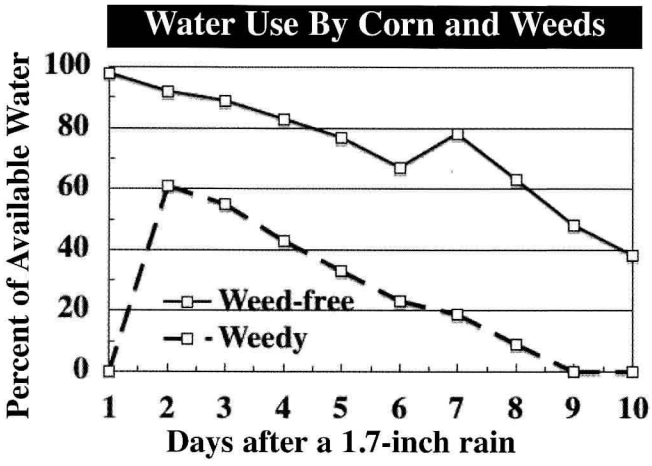
Not only does corn accumulate less nitrogen in the presence of weeds, it's also unable to catch up after weeds are removed. "The nitrogen deficit appears to last all season, and that can impact crop health and grain yield. In fact, we suspect that increasing problems with stalk rot and lodging may be related to reduced nitrogen accumulation in plants caused by early season weed competition," says Kacvinsky.

Soil moisture is another target of competing weeds. University of Nebraska agronomist Bob Klein says corn uses roughly 42 gallons of water to produce one pound of dry matter. In contrast, lamb's-quarter use 73 gallons and mustards use 288 gallons of water to produce a pound of dry matter.

In his research, Kacvinsky buried moisture sensors to study water use by weeds. "We wanted to confirm the 3-3-1 rule of thumb — 3-inch tall grass growing for 3 days uses 1 inch of water. three years of research has shown that old adage to be accurate," he says.

Foxtail and velvetleaf do not appear to be harming this corn, but they are robbing water, nutrients, and eventual yield. Early weed control is essential.

The chart on the left shows the fate of a 1.7-inch rainfall in Kacvinsky's study. "Our moisture sensor was installed at a 6-inch depth. In weedy corn, 40% of the rainfall didn't even reach the sensor. A 0.5-inch irrigation five days later had little impact on water availability in that weedy plot, and seven days after it fell the rainfall was gone. Meanwhile 50% of the water was still available in corn where weeds were controlled by a preemerge herbicide". ❐



Do You Know Your Corn Growth Stages?

Vegetative Stages

VE: The plant's shoot (coleoptile) breaks the surface.

V2 to V3: Two to three leaves are fully open. The plant is 3" to 4" tall, and the growing point is still below the soil surface.

V4 to V5: A stalk begins to appear. Potential ear shoot number for the plant is determined, and a microscopic tassel is initiated.

V6 to V7: The growing point is above the surface, and stalk growth tears lowest leaves from the plant, making visual staging more difficult. Tillers may appear at the plant's base. The plant determines the number of kernel rows.

V8 to V9: Ear shoots start to grow from each node; The plant is growing quickly at this stage.

V10 to V11: The time between appearance of new leaf stages now shortens to every two to three days.

V12 to V13: Brace roots begin to grow from nodes above the soil surface to help support the plant and seek water and nutrients in upper soil layers.

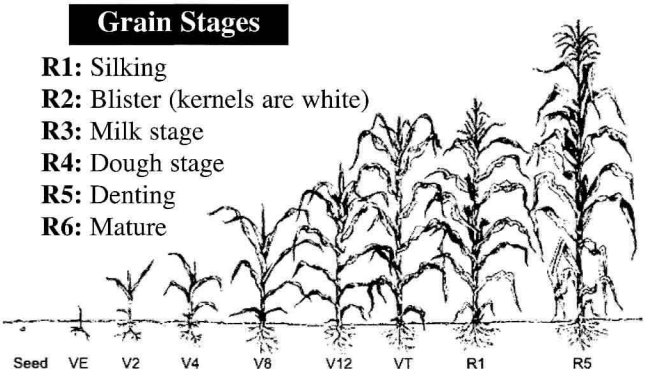
V14 to V15: The number of ovules that develop silks is being determined, so kernel number is being determined. Tassel is near full size but not yet visible.

V16 to V17: New leaf development occurs every one to two days. The tip of the tassel may be visible.

V18 to VT: Ear development becomes apparent. The last branch of the tassel is fully visible, but the silks have not emerged. All leaves are exposed. ❐

Grain Stages

R1: Silking
R2: Blister (kernels are white)
R3: Milk stage
R4: Dough stage
R5: Denting
R6: Mature



15-Minute Soils Course

Lesson 26:

Boron (B): a Prime Micronutrient

Besides nitrogen, phosphorous, potassium, calcium, magnesium, and sulfur, plants need small amounts of several elements. One of these is boron, well-known but oftentimes underappreciated. On the Periodic Table it is beside carbon, and is highly essential for plant growth. It is always found in the combined state in nature.

5	10.811
Boron	
2079	2550
B	

Soils vary considerably in their content of boron. Since it is highly soluble when released into the soil in one of its several ionic forms ($B_4O_7^{-2}$, H_2BO_3-1, HBO_3^{-2}, or BO_3^{-3}), it tends to be low in areas of high rainfall, but high in desert climates. In fact, boron has accumulated to huge deposits in places of the desert Southwest of the U.S., where it is mined near Death Valley, and in other dry lakebeds.

Soils may contain from 5 to 150 ppm of total boron, of which often less than 1% is extractible. Much of it is tied up in rather insoluble minerals or organic matter.

What Boron Does

The Roles of Boron in Plants

1. **Works with calcium to build strong cell walls**
2. **Expedites the movement of calcium into and within the plant**
3. **Aids cell division at root tips and apical meristems**
4. **Helps transport sugars from the sites of photosynthesis to storage areas**
5. **Promotes root nodule development**
6. **Aids flower and pollen tube development**
7. **Enables plant hormone regulation**
8. **Regulates potassium: calcium ratios**
9. **Promotes nitrogen absorption**

These alfalfa leaves show boron deficiency. Note the bright upper leaves, stunted growth, and rosetted growing points.

Boron plays critical roles in the plant as indicated in the table below. It is not known exactly how boron does these things, but we know that it cross-links polysaccharides in cells walls and is part of "quorum sensing signal molecules"; in both cases borate esters, diols, and polyols, are involved. Bacteria synthesize antibiotics containing boron, and even the nucleic acids DNA and RNA involve boron during synthesis. Boron plays a major role with calcium in transporting carbohydrates to roots and other plant organs. With too little, potato and beet roots can become hollow. See the list of deficiency symptoms on the next page.

Boron tends to keep calcium soluble, and is also involved with oxidation-reduction equilibria in cells. When the element becomes deficient, growth processes suddenly collapse and metabolism becomes deranged.

Similarities With Human Health

It is interesting that, while boron supports cell wall structure in plants, it also builds strong bones and cartilage in people and animals. People eating born-deficient foods grown on highly leached soils of Haiti, Madagascar, and other

Continued on the next page

15-Minute Soils Course

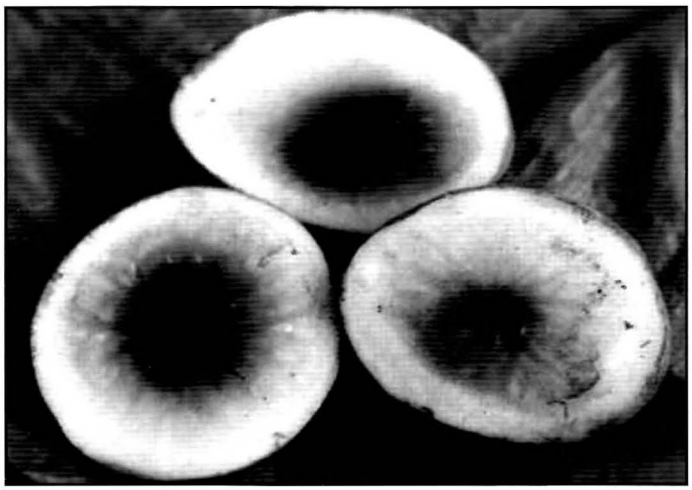
tropical areas tend to develop arthritis, whereas those from more arid areas, having boron rich soils, do not. In plants, boron-deficient tissues are brittle and fragile, whereas those grown on high-boron soils are usually flexible and resilient. As plant hormone levels are aided by adequate boron, so are human hormones, such as testosterone in men and estrogen in women.

Common Deficiency Symptoms of Boron

Alfalfa	**Stunted growth, bright yellow upper leaves, reduced seed yields**
Apples	**External and internal cork (hard, wrinkled tissue)**
Peaches	**Dieback of terminal twigs, curled leaf edges, dead buds**
Citrus	**Heavy fruit shelling, yellow leaf veins**
Cotton	**Excessive shedding of flower buds and bolls**
Celery	**Cracks crosswise to stalks**
Potatoes	**Hollow spots of tubers**
Peanuts	**Deformed and spotted nuts**

Overcoming Boron Deficiencies

It obviously pays to amend soils, or apply foliar boron, when deficiencies occur. General application rates are 0.2 to 3 lb/acre of actual boron for the soil. Foliar rates depend upon the crop being treated and the degree of deficiency. Follow label directions for Solubor or other foliar fertilizers. A soil test of 1.5 ppm boron (3.0 lb/acre) in the extractant is usually adequate for most field crops.



Potatoes with hollow, dark centers give immediate evidence that boron is deficient. Simple applications of borax would solve the problem.

Beans, corn, and cotton are especially sensitive to high application rates, while sugar beets and alfalfa require high levels. It is a serious mistake to use the recommended dosage for sugar beets on beans.

Since a goodly portion of total soil boron is usually in the organic matter, it is always an excellent practice to increase the organic stores of the field. If the soil pH is much above 6.5, the availability of boron will drop. Overliming will cause a tieup of the element and can induce deficiencies. Also, periods of dry weather may induce plant shortages, since most nutrient uptake in those periods is from the relatively boron-deficient subsoil.

See How Much You Learned

1. "Hollow heart" of potatoes and sugar beets is caused by a boron deficiency. T or F
2. It is a good practice to increase soil _____levels to reduce the chances of a boron deficiency.
3. Which of the following symptoms are associated with boron deficits? a. Hollow heart; b. Meristem dieback; c. Excessive fruit shedding; d. Bright green leaves.
4. Sufficient boron in plants leads to flexible, resilient plant tissues. T or F
5. A _____ soil pH will make boron less available to growing plants.
6. Plants such as soybeans and corn are quite susceptible to overapplications of boron. T or F
7. Boron is very critical for _____ uptake by plants.

Answers: 1. T; 2. organic matter. 3. a, b , c. 4. T. 5. high. 6. T. 7. calcium.

GE Crops Threaten Organic Growers

The EU suppresses a study showing genetically engineered crops add high costs for all farmers and threaten organic producers.

[From www.greenpeace.org, Brussels, Belgium, May 16, 2002]

A secret EU study leaked to Greenpeace states that all farmers would face high additional, in some cases unsustainable costs of production if genetically engineered (GE) crops were commercially grown in a large scale in Europe. The study predicts that the situation would become particularly critical for organic farming of oilseed rape as well as for intensive production of conventional maize.

The EU Commission ordered the study on the co-existence of GE and non-GE crops in May 2000 from the Institute for Prospective Technological Studies, of the EU Joint Research Centre. The study was delivered to the EU Commission in January 2002, with the recommendation that it not be made public.

"The European Commission has tried to keep this study secret", said Lorenzo Consoli, Greenpeace EU policy advisor, "because it was afraid of its political implications. The question is, if the introduction of GE crops on a commercial scale in Europe increases costs of production for all farmers, makes them more dependent on the big seed companies, and requires complicated and costly measures to avoid contamination, why should we accept GE cultivation in the first place?" The EU study states that in oilseed rape production the co-existence of GE and non-GE crops in a same region, even when "technically possible", would be "economically difficult" because of the additional costs and complexity of changes required in farming practices in order to avoid genetic contamination. Both organic and conventional farmers "would probably be forced to stop saving seed and instead buy certified seed", because of the increased risk of GE impurity for seeds that have been

Canola pollen may travel in the wind for many miles and cross-pollinate varieties, making isolation difficult.

exposed to field contamination. The study predicts that smaller farms would face relatively higher costs compared to larger entities, and that cultivation of GE and non-GE crops in the same farm "might be an unrealistic scenario, even for larger farms".

The main findings of the report were:

- Commercialization of GE oilseed rape and maize, and to a lesser extent potatoes, will increase costs of farming for conventional and organic farmers at a range between 10 and 41 per cent of farm prices for oilseed rape, and between one and nine percent for maize and potatoes.
- Coesixtence of GE farming and organic farming would be actually impossible in many cases.
- Generally, coexistence would only be possible with massive changes in farming practices, especially for conventional farmers; it would also require co-operation between farmers in a region and the willingness of all farmers concerned to participate in such co-operation; it is not clear who would implement these changes, who would be responsible for controlling their correct implementation, who would shoulder their costs.
- Seed and crop purity from GE at a detection level of 0.1 percent would be virtually impossible in most cases, i.e. all products and seeds of oilseed rape and maize would be contaminated with GE to a certain extent.

The study, based on a combination of computer modeling and expert opinion, analyzed the consequences of an increase in the share of GE crops. It focused on the three crops of which GE varieties are currently available: oilseed rape for seed production, maize for feed production, and potatoes for consumption. The study covered several farm types, both organic and conventional farming. It also considered three different threshold levels for genetic contamination: 0.1 percent (analytical detection level) for all the three crops, 0.3 percent for oilseed rape, and 1 percent for maize and potatoes.. ❐

THE APPLE GROWER AND THE HAIL

An apple grower had built up a good mail-order business and was justifiably proud of his product. His apples were wonderful — crisp, juicy, bright red, and shiny. His customers came to expect only the best in taste and appearance.

Then one year a hailstorm occurred just before harvest. Nearly every apple was marred by hail. The apple grower had thousands of orders and checks, and his customers were fully expecting baskets and boxes of his bountiful fruit for the holiday season. The problem was in the appearance of the apples. How could he turn this liability into an asset?

The fact was, they tasted great¡ The taste was better than normal because of the cold weather that year. So the grower decided to fill the orders he had, but with each shipment he enclosed a card that said, "Note the hail marks that have caused minor skin blemishes on these apples. They are proof of their growth at a high mountain altitude where the sudden chills from hailstorms help firm the flesh, develop the fruit sugars, and give these apples their incomparable flavor."

Nobody sent the apples back, and the next year the grower got orders with many notes expressing a preference for hail-marked apples rather than unblemished ones.

***Bits and Pieces*, May 2, 1991.**

Do Pesticides *Reduce* Crop Yield?

By Paul W. Syltie, Ph.D.

It may come as a surprise to many that the idea of pesticide applications reducing the yield of crops they are meant to protect is not new. Back in 1980 a book was published by Debard in Paris, France, entitled *Plants Made Sick by Pesticides — New Basis for the Prevention of Disease and Pests*. In that book, Francis Chaboussou summarized his findings which showed that plants accumulate free amino acids when pesticides poison the metabolic machinery which converts these protein building blocks into proteins.

Now a new study shows another way that pesticides reduce crop yields: by poisoning and thus reducing the activity of Rhizobium bacteria in legumes. The study was headed by Jennifer Fox at the University of Oregon, and is published in Proceedings of The National Academy of Sciences, June 12, 2007, Volume 104, Number 24, pages 10282-10287.

The report states, in part, "The last 20 years have seen diminishing returns in crop yield in response to increased application of fertilizers, which cannot be completely explained by current ecological models.... Here we show previously undescribed in vivo evidence that a subset of organochloride pesticides, agrichemicals, and environmental contaminants induces a symbiotic phenotype of inhibited or delayed recruitment of rhizobia bacteria to host plant roots, fewer root nodules produced ... and a reduction in overall plant yield at time of harvest. The environmental consequences of synthetic chemicals compromising symbiotic nitrogen fixation are increased dependence on synthetic nitrogenous fertilizer, reduced soil fertility, and unsustainable long-term crop yields."

It appears that the addiction of farming practices to modern agri-chemicals has far-reaching implications, several of which are encouraging farmers to use more and more of these to sustain yields. We need to get off this chemical merry-go-round and conform with nature's laws in all of our food production schemes. ❐

Beyond Organic: What's Really At Stake?

By Fred Kirschenmann

[From* Organic Farming Research Foundation Information Bulletin*, Fall 2007, Number 15.]

Why is all of that [in the preceding discussion] important in terms of how we position ourselves within the organic movement? The reason I think it is so important is because we have buried, in those works of Sir Albert Howard, Eve Balfour, J.I. Rodale, Rudolf Steiner, and Mokichi Okada principles that we need to pull into the future and marry them with the best science we have available now, to create a fundamentally new food system , a fundamentally new production system, based on those agroecological principles that were identified by these stellar individuals. That's the wave of the future.

Fred Kirschenmann, Distinguished Fellow for the Leopold Center for Sustainable Agriculture, Ames, Iowa.

Because the only thing that I can see that's going to enable us to produce the amount and the kind of good food we want and need is going to be through biological synergy ....

Fortunately we have farmers out there who, on their own, have begun to develop those kinds of models in their farming practices .... Very little outside energy is needed because the animals provide all the energy that's required. It is the kind of energy exchange that takes place in nature.

So, we have a wonderful opportunity to actually improve our quality of life as we move into the future, moving out of the industrial era into a new era based on agroecological systems. Cooperating with nature, using and adapting to nature's cycles rather than trying to dominate and control them as we currently do with our technology ❐

Statement of Purpose

Vital Earth Resources is a for-profit private corporation dedicated to the development, production, and sale of top-quality, ecologically sound horticultural and agricultural products. *The Vital Earth News* is a periodic publication of Vital Earth Resources to inform customers and other interested parties about our products and programs, and to educate our readership on critical issues facing growers today and in the future. If you would like to receive future issues of this newsletter or product information, simply fill out the form on the right and mail it to us.

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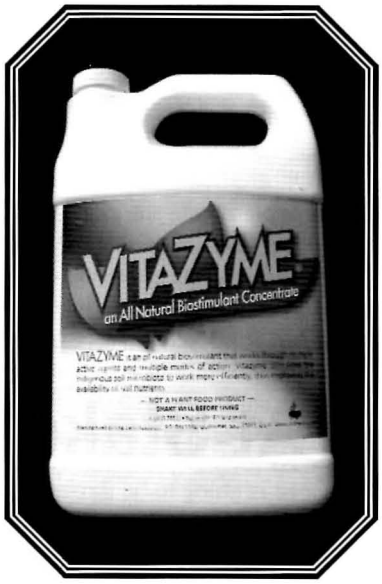
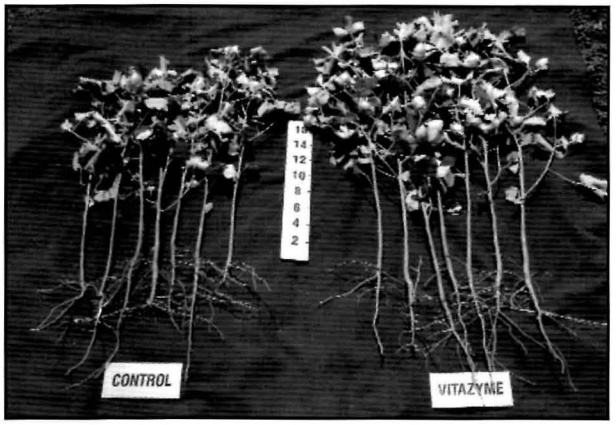
Vitazyme has once again excelled in a cotton study at Texas A&M, College Station, Texas. At only 50% of the maximum nitrogen rate, Vitazyme out-produced the 100% nitrogen rate (having no Vitazyme) by 90 lb/acre. Vitazyme also improved fiber length, strength, total nodes, and nodes above white flower.





With 60 lb/acre of nitrogen, three Vitazyme applications significantly increased yield.

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