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Diversified Agriculture's Many Benefits

Health of Soil and People Is Just the Start

By The Organic Center
[www.organic-center.org/research, 4-7-24]

A new study published in the journal Science shows that increasing agricultural diversification simultaneously benefits both environmental and social outcomes, creating multiple win-win situations.

This first-of-its-kind study synthesized the work of 58 researchers from 24 studies, across 11 countries and 2,655 farms. Historically, research on diversified farming systems tended to look at the outcomes of using diversification practices on environmental outcomes alone, but this study added key socioeconomic metrics like yield, food security, and human well-being. While potential tradeoffs between environmental and social outcomes have not been well understood, this comprehensive study shows very few negative consequences to diversifying farms—in fact, when more diversification practices are used more environmental and social benefits were identified, particularly for biodiversity and food security, without reducing yields.

One coauthor, Ingo Grass of the University of Hohenheim explains, "Agricultural diversification has been accused of perhaps being good for biodiversity, but having a few negative aspects too — especially with regards to not being able to achieve sufficiently high yields. But what we actually see, is that there is no reduction in yield from diversified agriculture – not even when we include data from large-scale European agriculture."

Mixed crop and livestock farming is the model we find in the created world. We should emulate this.

Measuring the impacts on social (e.g., human well-being, yields, and food security) and environmental (e.g., biodiversity, ecosystem services, and reduced environmental externalities) outcomes, the study assessed five diversification strategies:

(1) Livestock inclusion and diversification (e.g., managed mammals, birds, bees, and fish)

(2) Temporal crop diversification (e.g., crop rotation and cover crops)

(3) Soil conservation and fertility management (e.g., compost application)

See Crops and Livestock Work, page 2

The Decline in Food Quality

A Tragedy That Needs to be Addressed

By Paul W. Syltie, Ph.D.

Common sense tells us we should eat foods that are dense in nutrients for optimum health, so we can live abundant, energetic lives relatively free from sickness. That means we should grow our fruits, vegetables, and grasses on soils that are rich in essential plant nutrients, using crop varieties that produce the highest possible complement of essential nutrients. These 90 essential nutrients are as follows: [1]

60 elements: Ca, Mg, P, K, Na, Cl, S, Co, Cu, Al, As, Ba Br, B, Br, C, I, Fe, Mn, Se, Zn, Ce, Cs, Cr, Dy, Er, Eu, Gd, Ga, Gr, Au, Hf, Ho, Hn, La, Li, Lu, Mo, Nd, Ni, Nb, N, O, Pr, Re, Rb, Sm, Sc, Si, Ag, Sr, Ta, Tb, Tm, Sn, Ti, V, Yb, Y, Zr

2 or 3 Essential Fatty Acids: Omega 3, Omega 6, Omega 9

16 Vitamins: A, B1, B2, B3, B5, B6, B12, C, D, E, K, Biotin, Choline, Flavonoids, Folic Acid, Inositol

12 Amino Acids: Valine, Lysine, Threonine, Leucine, Isoleucine, Tryptophan, Phenylalanine, Methionine, Histidine, Arginine, Taurine, Tyrosine

These nutrients are obtained from the foods we eat, and the food crops absorb them from the soil. Thus, soil fertility and crop variety are critical in maintaining high levels of these essential nutrients in our diets for optimum health.

Food Quality and Soil Fertility

Healthful living from an excellent diet is a priceless possession in today's world.

See Importance of Soil Fertility, page 2

Crops and Livestock Work Together

Continued from page 1

(4) Non-crop plantings (e.g., flower strips and hedgerows)
(5) Water conservation (e.g., contour farming)

The study found that applying multiple diversification strategies creates more positive outcomes than individual management strategies alone. According to the lead author, "Our results from this comprehensive study are surprisingly clear. While we see very few negative effects from agricultural diversification, there are many significant benefits. This is particularly the case when two, three, or more measures are combined. The more, the better, especially when it comes to biodiversity and food security."

To realize the benefits described here, well-designed policies with strong incentives to motivate the adoption of multiple diversification strategies in unison are needed. But according to Professor Claire Kremen of the University of British Columbia, these efforts will pay off.

"The study shines a light on real-world farming conditions in many different regions and contexts worldwide. With the clear positive outcomes of these diversification strategies, it suggests that governments and businesses should invest more in incentivizing farmers to adopt such strategies, which will in fact help them while also promoting agricultural sustainability and planetary health," she says. ❒

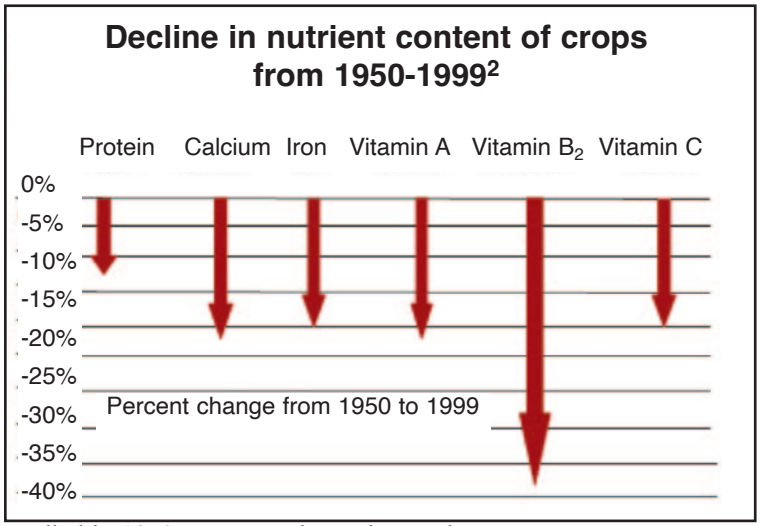
Editor's note: It is interesting that these suggestions for improving agriculture by diversification of enterprises are very similar to the tenets of natural farming methods put forth by Sir Albert Howard, the father of the organic agricultural movement. (See The Vital Earth News, Vol. 2, No. 2, Summer, 1997). These tenets are:

1. Mixed farming is the rule; plants and animals are always found together.
2. The soil is always protected from the direct action of sun, rain, and wind.
3. Rainfall is carefully preserved in surface layers and subsoil.
4. The forest manures itself, making its own humus and supplying its own minerals.
5. Mineral matter needed by trees and undergrowth is obtained from the soil.
6. The soil always carries a large fertility reserve.
7. Crops and livestock look after themselves, and maintain health due to internal vitality imparted by the soil.

Importance of Soil Fertility and Genetics

Continued from page 1

A study on nutrient levels in common food crops, published in the Journal of the American College of Nutrition, compared USDA nutritional data on 43 vegetables and fruits in 1950 and 1999. This study found that the foods showed up to 38% declines in protein, calcium, potassium, iron, riboflavin, and ascorbic acid; see the chart below. According to head researcher Donald Davis, additional nutrients not studied in 1950 — magnesium, zinc, and vitamins B6 and E — also have likely declined.[3]



This decline has been attributed in part to higher levels of fertilizers applied, in particular nitrogen, which tends to increase yield but dilutes the concentration of vitamins and minerals.

Food Quality and Genetics

Genetics of our food crops has also contributed greatly to the reduction in food crop nutrient content. Open-pollinated varieties have traditionally supplied the genetics for food crops since man's creation on earth, but modern agriculture has invented hybrid and genetically engineered varieties (GMOs), which have all but replaced these open-pollinated varieties for several decades.

For example, one study of open-pollinated versus hybrid corn in a side-by-side study showed remarkable differences in several critical nutrients.[4] The open-pollinated variety had this much more nutritional value:

Crude protein: +19%
Digestible protein: +35%
Copper: +60%
Iron: +27%
Manganese: +25%

When this open-pollinated corn was compared to 4,000 samples of hybrid corn from 10 Midwestern states, the open-pollinated corn showed up even better:

Crude protein: +75%
Copper: +875%
Iron: +345%
Manganese: +205%

The same trend was also seen in the content of calcium, sodium, magnesium, and zinc. The hybrid crops contained much less cobalt as well, which is essential in forming Vitamin B12, which deficiency is implicated in undulant fever and brucellosis.

Food Quality, Premature Harvest, and Transport

Produce is being harvested earlier to accommodate longer transports in both national and global agriculture. There are two main issues involved here:

1. Premature harvesting: Think of a plant attached to its vine like a baby

Continued on page 3

Food Transport Reduces Nutritional Value

Continued from page 2

attached to its umbilical cord. The vine is the nutrient source, which channels nutrients from the soil through the roots and on into the fruit of the plant. The problem we now face is that our fruits and vegetables are being harvested prematurely, then routinely ripened with ethylene en route to the supermarket. Premature harvesting reduces the time the plant can feed nutrients into the leaves or fruit, reducing total nutrient concentration.[5]

2. Transportation time: Nutrients in plants begin declining the moment they are picked. The average produce item travels 1,500 miles from the farm to the dinner table. Broccoli purchased in February was probably grown in California or Mexico and spent a week in an 18-wheeler before being sold. Conventional foods typically spend 7 to 14 days in transit before arriving at the supermarket.

Food Quality and Contamination

Conventional produce is often grown using pesticides and insecticides, growth hormones, and antibiotics. It is oftentimes irradiated, may contain genetically engineered organisms (GEOs) and/or genetically modified organisms (GMOs), and can be grown using sewage sludge fertilizer. The Environmental Working Group's analysis of U.S. Department of Agriculture data found that two-thirds of non-organic produce has detectable pesticide residues. The average person eating non-organic produce consumes approximately 16 pounds of chemical pesticides every year. Needless to say, this concentration of toxic residue entering our system dampens our ability to thrive. They contribute to the body's need to detoxify itself, and lead to various diseases.[6]

Most produce is delivered to food stores by trucks over hundreds or thousands of miles.

We have not touched in this discussion on the harmful effects of food processing on depleting nutrients in food — the refining of wheat flour and the pasteurization of milk, for instance — plus the addition of artificial preservatives, flavors, sweeteners, and emulsifiers. Even so, each of us has the choice of whether or not to select fresh, organic, and locally grown foods grown on rich, minerally balanced soils. To select this choice is a major step towards achieving better health and longevity, a choice no one will regret. ❒

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4. C. Walters, Eco-Farm, An Acres U.S.A. Primer, ACRES U.S.A., 2003.

5, 6. Anonymous, Why isn't our food as nutritious as it used to be?, Nutrition Simplified, www.nutritionsimplified.co.

The Wisdom of the Soil — Some Quotes

"Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals." — Aldo Leopold, A Sand County Almanac, 1949

"We are part of the earth and it is part of us .... What befalls the earth befalls all the sons of the earth." — Chief Seattle, 1852

"... the Latin name for man, homo, derived from humus, the stuff of life in the soil." — Dr. Daniel Hillel

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"The soil is the great connector of our lives, the source and destination of all." — Wendell Berry, The Unsettling of America, 1977

"I saw all the people hustling early in the morning to go into the factories and the stores and the office buildings, to do their job, to get their check. But ultimately it's not office buildings or jobs that give us our checks. It's the soil. The soil is what gives us the real income that supports us all." — Ed Begley, Jr.

"History is largely a record of human struggle to wrest the land from nature, because man relies for sustenance on the products of the soil. So direct is the relationship between soil erosion, the productivity of the land, and the prosperity of people that the history of mankind, to a considerable degree at least, may be interpreted in terms of the soil and what has happened to it as the result of human use." — Hugh H. Bennett and W.C. Lowdermilk, circa 1930s

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"How can I stand on the ground every day and not feel its power? How can I live my life stepping on this stuff and not wonder at it?" — William Bryant Logan from Dirt: The Ecstatic Skin of the Earth

"Whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together." — Jonathan Swift, Gulliver's Travels, 1726

"We know more about the movement of celestial bodies than about the soil underfoot." — Leonardo Da Vinci, circa 1500s

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"For all things come from earth, and all things end by becoming earth." — Xenophanes, 580 B.C.

"While the farmer holds the title to the land, actually it belongs to all the people because civilization itself rests upon the soil." — Thomas Jefferson

[The Natural Resources Conservation Service, USDA, www.nrcs.usda.gov.]

15-Minute Soils Course

Lesson 59: Soil Minerals and Plant Disease

The soils lesson this month deals with the relationship of soil minerals with plant disease, and will draw heavily on the book *Mineral Nutrition and Plant Disease*, edited by Lawrence Datnoff, Wade Elmer, and Don Huber (The American Phytopathological Society, St. Paul, Minnesota, 2007).

Nitrogen (N). This fourth most abundant element in plants, essential for the production of amino acids, proteins, enzymes, hormones, phytoalexins, phenolics, and many other compounds, is by far the most extensively reported element affecting plant disease. It is the nutrient applied in the greatest quantity and the most frequently deficient element, and has been related to dozens of plant diseases such as root rots, canker, damping off, leaf spot, stem rot, scab, and various wilts.

Nitrogen availability to plants is related to the rate of fertilizer application, time of application, form of N, temperature, rainfall, and other factors that affect mineralization, nitrification, ammonification, denitrification, and leaching.

The severity of infections can be reduced by improving N availability, uptake, and utilization through the rate and timing of applications, balancing all soil nutrients, crop sequence, plant density, tillage, and the form of N applied. Organic forms are preferred to allow a metered release during times of optimum growth.

Phosphorus (P). This element plays a critical role in plants for energy transfer and protein metabolism. It determines the number of tillers in grains, pods in vegetables, grain density, and yield, among other effects. Effects of P applications on plant diseases have been variable, but root rot, downy mildew, rust, stalk rot, early blight, leaf spot, blotch, and other diseases have been tied to P deficiency.

Plant infection and P deficiency relates to various soil conditions: moisture, temperature, tillage, etc. Soil mineral balancing, cultivar selection, and rates and timing of P applications can help alleviate plant diseases.

Potassium (K). Potassium is essential for many plant functions, and remains in solution, not comprising any tissue but acting as a regulator. It is highly mobile in the plant, and can move from older to younger tissues as needed.

Potassium is noted for decreasing the intensity of many plant diseases, most likely due to affecting host resistance rather than directly affecting the pathogen. Potassium thickens the walls of epidermal cells as well.

A deficiency of K can lead to various wilts, blights, stem rot, canker, mildews, root rot, rust, stem rot, stalk rot, mosaic, and many other syndromes.

Maintaining a balance of soil minerals is important in reducing disease with K, since a well-nourished plant will resist disease better.

Calcium (Ca). Calcium is the fifth most common element in the earth's crust, and is well known for enhancing soil structure, and thus the movement of air and water within the soil mass. These effects enhance root and plant health, enabling the plant to better withstand attacks from pathogens.

Applications of Ca to soils, leaves, and fruit have been shown to greatly reduce the incidence and severity of several diseases, such as clubroot, botrytis rot, various root rots, pod rot, scab, powdery mildew, wilt, and many other diseases. Since Ca comprises a principle part of the Ca-pectate layer protecting various crops, such as potatoes and fruits, the storability of the crops can be greatly improved by applying Ca to balance soil minerals.

Magnesium (Mg). Magnesium is an essential component of plant structures, and

15-Minute Soils Course

participates in many biochemical processes. It also constitutes the heart of the chlorophyll molecule that enables photosynthesis to occur. About 90% or more of cellular Mg is bound, mostly in ribosomes. This Mg is involved in enzyme activation and the formation of DNA and RNA, and has a role in the synthesis of sugars, oils, and fats. It is mobile in the plant. unlike its closely related element Ca.

Deficiencies of Mg lead to bacterial blight, downy mildew, fire blight, leaf spot, root rot, scab, stem rust, wilt, and many other plant diseases. Soil mineral balancing is a key to alleviating plant disease due to Mg deficiency.

Sulfur (S). This element is highly important in a number of cellular plant functions. It comprises parts of some amino acids and a number of other compounds and tissues that relate to pathogen resistance.

Elemental S has a direct topical fungicidal effect, and when applied to S-deficient soils these anti-fungal effects are noted in plants. Various wilts, powdery mildew, leaf spot, late blight, mosaic, and stem rust are but a few of the diseases related to S deficiency.

Iron (Fe). Iron is essential for respiration, DNA synthesis, photosynthesis, and N fixation, among other plant functions involving electron transfer and redox reactions. Deficiencies of Fe, often expressed by Fe-chlorosis of newly developing tissues, will weaken the plant and make it susceptible to pathogens. Thus, Fe supplementation as a soil or foliar amendment is usually helpful.

Manganese (Mn). A fairly abundant element in soils, Mn is integral in photosynthetic reactions, and is an activator of several enzymes, many of which are involved in carbon and N metabolism, and also the synthesis of secondary metabolites such as phenolics and lignin.

Deficiencies of Mn lead to mildew, root rot, various wilts, leaf spot, and blights, among many other plant diseases. Soil and foliar applications are effective in alleviating these diseases.

Zinc (Zn). A Zn deficiency can give rise to citrus blight, mildew, scab, mosaic, leaf spot, and other diseases.

Copper (Cu). A deficiency of Cu is associated with wilt, anthracnose, root rot, blight, storage rot, and many other plant diseases.

Chloride (Cl^-), Molybdenum (Mo), Boron (B), and Nickel (Ni). These essential plant elements, if deficient, will produce various plant diseases.

It is clear that soil nutrient deficiences are directly related to plant diseases of various types. The cure for these diseases is to apply the needed elements and balance the minerals. This approach is much superior to the use of pesticides, fungicides, nematicides, and miticides to control plant diseases, and is the future of plant health and disease control.

See How Much You Learned

1. These are essential plant nutrients: a. potassium, b. copper, c. niobium, d. iron, e. all four.
2. Nitrogen is usually the most deficient nutrient. T or F.
3. Plant wilt can be caused by a deficiency of a. nitrogen, b. calcium, c. sulfur, d. a, b, and c.
4. Magnesium constitutes the heart of the _____molecule.
5. Potassium does not comprise a part of actual plant tissue, but is mobile in the plant. T or F.
6. Organic additions of nutrients to correct deficiencies are preferred over inorganics for a. nitrogen, b. calcium, c. sulfur, d. a, b, and c.
7. The storability of potatoes and fruits is usually promoted by adequate _____levels.

Answers: 1. a, b, d; 2. T; 3. d; 4. chlorophyll; 5. T; 6. d; 7. calcium.

The US–Mexico Dispute Over GM Corn

By Amy Denny
[Abridged from *The Epoch Times,* April 13, 2024]

Mexico's effort to keep genetically modified corn out of the country is triggering a trade dispute with the United States and Canada that could affect the future of agriculture.

The trade dispute hinges on a key question: whether genetically modified (GM) corn poses a threat to human health.

U.S. trade representatives argue that it does not and wants to force GM corn into Mexico. Given that GM seed is used in 90 percent of U.S. crops, the dispute could have far-reaching effects should Mexico win. Beyond the U.S. agricultural sector, it could damage the German and Chinese companies that make and sell those seeds.

Mexico issued a presidential decree in February 2023 that bans GM corn in tortillas and dough and signaled the country's intention to gradually replace GM corn in all animal and human foods.

Canada—which is deeply integrated into U.S. and Mexican agricultural trade—and the United States both opposed the ban.

Mexico has kept genetically modified corn from being grown within its borders for 25 years in an effort to protect both its citizens' health and ancient strains of maize. Corn is a staple crop eaten in 89 percent of Mexican meals.

The United States has largely disregarded health concerns arising from GM crops and has spent the past year working to prove Mexico's 2023 decree violates the United States–Mexico–Canada Agreement (USMCA).

The restrictions, originally slated to go into effect this year, set off a disagreement now in the hands of a USMCA trade panel after Mexico and the United States failed to resolve it through negotiations.

The United States contends that there's no scientific evidence that GM corn is unsafe to eat, a claim that Mexico refutes. Mexico says the United States hasn't presented any evidence of GM corn's long-term safety, particularly when eaten at high levels.

Corn consumption is 10 times higher in Mexico, raising concerns among its medical and governmental leaders about research linking GM crops to health issues. The trade disagreement highlights clashing ideological values and interests. Mexico has concerns for public health and indigenous maize. The United States aims to protect U.S. farmers, food security, and the future of agricultural biotechnology.

"If the panel pays attention to the science, they should come to the same conclusion as the Mexican government. If they're swayed by politics and the power behind the technology, it's going to be difficult for them to see the reality of the science," she [Lucy Sharrat, coordinator of the Canadian Biotechnology Action Network] told *The Epoch Times*. "This is a hugely significant decision the panel has before them."

Mexico filed a 200-page response to the U.S. trade violation complaint, which many observers say fulfilled the onus of its argument. It offered 66 articles in peer-reviewed journals pointing to GM corn's associated health risks including increased damage to organs, cancer, antibiotic resistance, and reduced nutritional content.

Mexico's disagreement with the U.S. in part stresses the need to protect the genetics of native varieties.

Glyphosate has become an important topic of research, and studies now suggest that it has several potential consequences on human physiology.

A 2014 study published in the *Journal of Organic Systems* looked at two decades of information on the rising rates of chronic diseases and their association with glyphosate use. Correlation doesn't prove causation, but graph after graph of epidemiological data of 22 diseases reveal sharp increases that coincide with the accelerating use of glyphosate.

The study found highly significant correlations between glyphosate applications and hypertension, stroke, diabetes prevalence and incidence, obesity, Alzheimer's disease, autism, multiple sclerosis, inflammatory bowel disease, several types of cancer, intestinal infections, and more.

Farm industry groups here praised the USTR [U.S. Trade Representative] for pursuing the dispute with USMCA.

"U.S. officials have exhausted every avenue trying to resolve this conflict and are left with no other choice but to turn to a third-party panel in hopes of quickly rectifying this issue. We are deeply appreciative of USTR for standing up for America's corn growers," the National Corn Growers Association said in a statement.

Are There Only 2 Options?

Others observe that the United States hasn't acted in good faith to resolve the matter, however. Lucy Sharratt said it wouldn't be that complicated for the United States to work with Mexico by adapting the type of white corn that it grows and exports to the country to be free of genetic engineering—allowing a compromise that might benefit both countries.

"Forcing GMO corn into Mexico is a political move. It's not a move necessary for U.S. farmers. There are strong alternatives," she said.

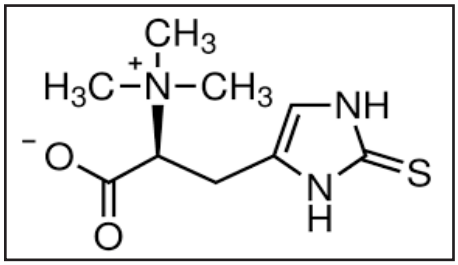
Mr. Bejarano [executive director of Pesticide Action Network in Mexico] noted that Mexico's decree would actually benefit those farmers already growing organic, non-GMO white corn in the United States. "It's the right of Mexico to decide what kind of protection is needed," he said. "We can have free trade without sacrificing the constitutional duties of the government to protect their own people."

Should Mexico win the trade dispute, it's unlikely that U.S. consumers would not take note. Such a weighty ruling would also likely trigger closer scrutiny of the science regarding GM corn and other modified food crops. In the end, Mexico could become a harbinger for the decline of U.S. dependence on foreign seed companies and the herbicides that pair so well with their GMOs. ❐

Ergothioneine: An Important Human Nutrient

By Joseph Carrara and others[

Evidence has emerged that the antioxidant ergothioneine may be important in preventing many inflammatory diseases in humans. However, ergothioneine is not produced by humans or plants and is only made by fungi and some bacteria in soils. As such, humans get ergothioneine from eating fungi (mushrooms) or plants that take it up from the soil. In this study, we found that growing plants with beneficial fungi called arbuscular mycorrhizal fungi increased the amount of ergothioneine in plant tissues. This suggests that promoting agricultural practices that maintain healthy populations of beneficial soil fungi may improve the nutritional quality of crops.



Ergothioneine is a powerful vitamin-like compound produced by mycorrhizal fungi that is beneficial for human health.

The amino acid ergothioneine (ERGO) has recently gained attention as an antioxidant that benefits human health. ERGO is produced by fungi and mycobacteria in soils and is acquired only from diet. The mechanism by which ERGO is transferred from soil to plant is unknown. Recent work has shown that tillage reduces the amount of ERGO in crops. As tillage also reduces arbuscular mycorrhizal fungi (AMF) populations, we examined the relationship between AMF and plant ERGO uptake.

We grew asparagus, black beans, wheat, and oats with a variety of single and mixed species of AMF inocula and compared ERGO levels of these plants to plants that were uninoculated.

Mycorrhizal inoculation enhanced ERGO content across all plants. There was a positive correlation between AMF colonization level and plant ERGO content.

AMF appear to be important mediators of plant ERGO uptake. Future research is needed to identify the mechanism that leads to higher ERGO in plants colonized by AMF in order to promote farming practices that enhance AMF populations and increase crop ERGO concentration in field settings. ❒

[Joseph E. Carrara, Steven J. Lehotay, Alan R. Lightfield, Dongxiao Sun, John P. Richie Jr, Andrew H. Smith, Wade P. Heller, Linking soil health to human health: Arbuscular mycorrhizae play a key role in plant uptake of the antioxidant ergothioneine from soils, *Plants People, Planets*, February 21, 2023.]

Ergothioneine is a naturally occurring amino acid produced by vesicular-arbuscular mycorrhizae, with the formula $C_9H_{15}N_3O_2S$. In the body it scavenges for reactive oxygen and nitrogen compounds so reduces oxidative damage to molecules, thus reducing chronic diseases, heart disease, joint pain, and liver damage. It may increase lifespan.

Biological agricultural practices, which increase the colonization of roots with mycorrhizal fungi, will increase the amount of ergithioneine in soils, and thus the amount taken up by food crops, showing ***a strong connection between soil management practices and human and animal health.***

A Bit of Wisdom from the Farm

"Don't skinny dip with snapping turtles."

Choose your risks wisely. Some situations are simply not worth the potential trouble. At face value, the advice is obvious. Swimming naked with snapping turtles poses a clear and immediate danger as these animals have strong, swift bites. However, the deeper message points to the importance of weighing risks against rewards in our actions. Consider the potential outcomes before you leap into a situation. Not all opportunities are beneficial, and reckless or thoughtless actions can lead to unnecessary difficulties or dangers. Choose your risks wisely and avoid situations that are not worth the potential harm.

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.

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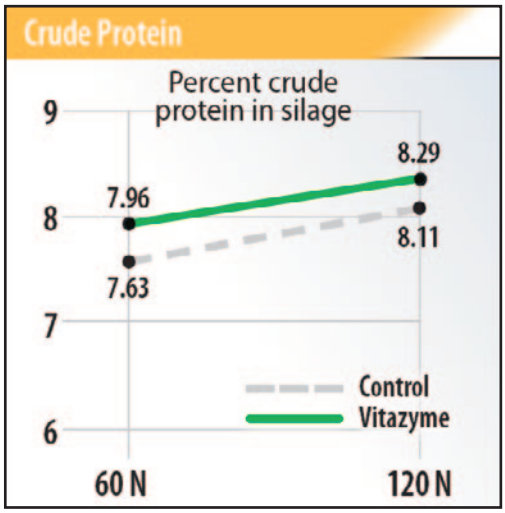
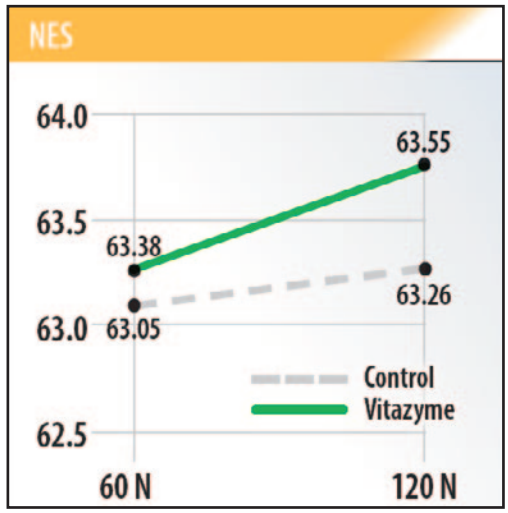
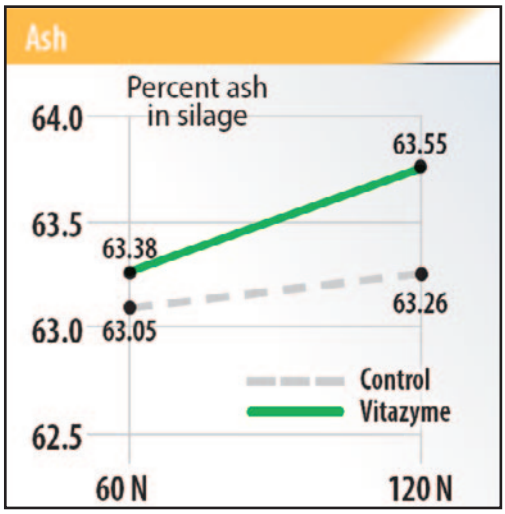
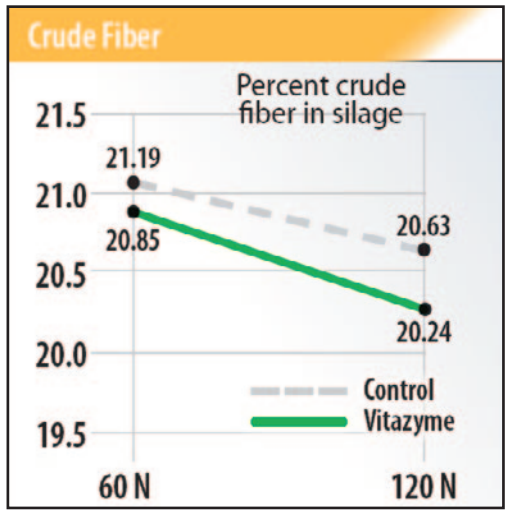
Increase in Corn Nutritional Value with Vitazyme — a Ukraine Study

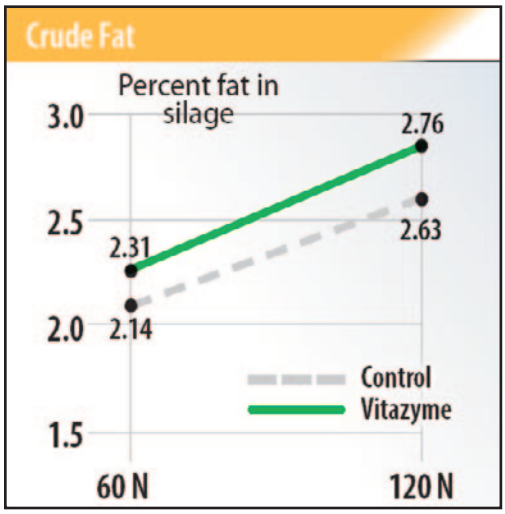
Farmers have profited from Vitazyme's ability to increase yields, with less fertilizer, and improve their bottom line, but crop quality is equally, if not more, important to the consumers of crops. Here are a few results from a study on corn at the National Academy of Agrarian Sciences of Ukraine in 2023.











THE PROGRAM

***Vitazyme*: 1 liter/ha (13 oz/acre) on the leaves/soil at V6-V7, using a hand sprayer**

***Fertilizer*: 100% was 120 kg/ha N; 50% was 60 kg/ha N; applied at V4-V5**

This study revealed yield increases with Vitazyme of from 5 to 18% for the two cultivars at the 60% and 100% N levels. At the same time, grain crude protein, ash, and crude fat were increased at both N levels, while crude fiber was decreased. Most importantly, the NES, which is a measure of feed digestible nutrient utilization, increased for the Vitazyme treated corn. Some of the increases with Vitazyme were not large, but they in all cases were positive. It is highly likely that, had a seed treatment of 1 liter/ha at planting been used along with the foliar/soil treatment, responses with Vitazyme would have been improved even more.

Increased in grain yield with Vitazyme.

DK 3400 — 60 kg/ha N ..... +6%
120 kg/ha N ..... +18%

SG 189 — 60 kg/ha ..... +5%
120 kg/ha N ..... +16%