The Vital Earth News
RESOURCES
Agricultural Edition
Volume XXXII, Number 1 Vital Earth Resources • Gladewater, Texas Winter 2025

More Hope for Agriculture in the U.S

Promising Trends in the Latest Census of Agriculture

By Paul W. Syltie, Ph.D.

As the son of an Upper Midwest crop and dairy farmer, I have a very strong affinity for the land and the future of farmers on it. The fact that agricultural production forms the basis for all new wealth in this country—

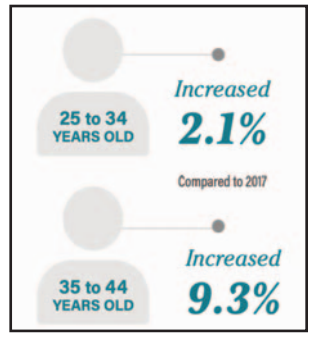
and every country, for that matter—makes it imperative that policies in the nation motivate agricultural production in a positive direction. Every dollar earned by a farmer is translated into five dollars as the raw materials move through the economy, a fact revealed by an in-depth study in 1957 entitled *All New Wealth Comes from the Soil.*[1]

We have seen a plethora of problems appear within the agricultural sector these past decades, such as:

- Low prices for commodities, which oftentimes fluctuate greatly year by year
- Increasing costs for farm inputs, such as machinery, fuel, fertilizers, pesticides and herbicides, taxes, and land rent
- The aging of the farm land owner and operator population
- The concentration of farming operations into larger and larger parcels and feedlots
- Neglect of soil conservation practices to speed of field operations

The 2022 Census of Agriculture[2]

The latest Census of Agriculture, compiled every five years, has been made available, and the results are somewhat encouraging. Let's take a look at what this census tells us.



Although the average age of farmers increased slightly, the new data reveals there are **more new and younger operators**. A bit over 1 million of the total 3.4 million operators have

See Organic Farming On Rise, page 2

Integrated Crop/Livestock Agriculture

A Practice That Deserves a Second Look

By Kathleen Hilimire
Abridged from the *Journal of Sustainable Agriculture* 35(4):376-393

Integrated agriculture is not a new phenomenon. Before the advent of industrial agriculture, agroecosystem function in farming systems was based on Integrated Crop/Livestock in the U.S.: complexity and diversity, where the integration of crops and livestock was the norm. Livestock were an integral part of crop farms in the U.S. and were used for production of food and fiber, powering farm machinery, and soil fertilization.

However, over the past century, food systems have tended towards industrialization and specialization, creating a food system predicated on economies of scale, specialization, and cheap labor. Disintegration of crops and livestock was spurred by a convergence of policy and technology changes that directed agriculture towards specialization, as well as the growing availability of cheap fossil fuels.

The first driver of crop/livestock separation was likely the improvement of tractor design in the 1920s, when growers began to select tractors over animal-pulled plows, decreasing the need for work animals on the farm. In the following decade the U.S. government passed the first Agricultural Adjustment Act of

Combining livestock with pasture and field crops is a practice that the natural laws of land management teach us.

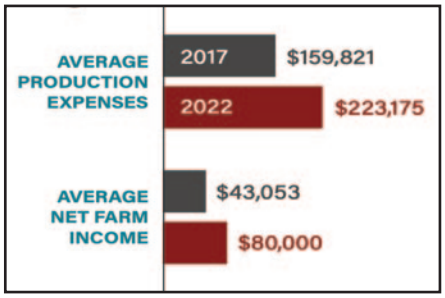
See The Need to Understand, page 2

Organic Farming On the Rise!

Continued from page 1

been in business for 10 years or less.

Sadly, the total number of farms decreased from 2.04 million in 2017 to 1.9 million in 2022, continuing the slide



in farm numbers, the first time these numbers have ever dropped below 2 million. At the same time, total acres farmed has dropped slightly, from 900 million to 880 million acres.

With reasonably high crop and livestock prices, farm income increased in spite of higher expenses. The prices of most commodities such as corn, soybeans, wheat, and cotton have in the past two years dropped substantially, but prices for livestock have actually increased.

The number of farms using conservation or reduced tillage has increased by 10,000 over these five years, and the total number of acres planted to cover crops increased. These are positive trends in preserving soil structure and organic matter, and recycling nutrients for subsequent crops.

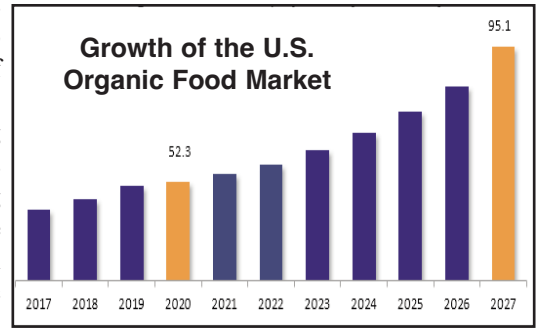
Organic Farming Is Advancing

Another positive trend in agriculture is the continued rise in acreage and production of organically certified crops and livestock. The U.S. organic food market was worth USD 52.3 billion in 2020, and according to one study the market is estimated to grow 8.7% per year, to about $95.1 billion by the end of 2027.[3]

The organic market is growing due to increasing health awareness among consumers, and increasing environmental concerns due to the heavy use of pesticides, commercial fertilizers, and other non-organic inputs. There has been a 17% increase in the number of certified farms in the U.S. between 2016 and 2019, and in 2021 there were 17,445 certified organic farms in the United States, operating on an area of 4,895,279 acres.[4]

The growing shift towards organic farming is driving the U.S. organic food market. The accompanying graph shows how the organic food market has grown since 2017, and is projected to grow by 2027 to $95.1 billion.[5]

These are some of the highlights I have uncovered that point towards hope for a brighter future for the American farmer. As always, I will point farmers and cattlemen towards conforming with the laws of nature that the Creator has placed within the ecosphere of our good earth. These laws have been discussed extensively in previous issue of *The Vital Earth News*, and can be accessed on-line at www.vitalearth.com. ❒



Bibliography

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2. C. Kramer and S. Mercier, Tales from the latest census of agriculture, *Farm Journal*, March 2024.
3. Bioweave Consulting and Research, Pvt Ltd, Jan.25, 2022, *www.globenewswire.com.*
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5. See 3.

The Need to Understand Animal Husbandry

Continued from page 1

1933, intended to stimulate rural economies following the Great Depression. The act created price support for certain designated commodities: milk, cattle, swine, wheat, cotton, corn, rice, rye, flax, barley, sorghum, peanuts, and tobacco. This policy may have promoted specialization by mitigating risks for those particular commodities. During the same time period, synthetic fertilizers were growing in popularity and accessibility. Growers who specialized in crop production could switch from animal manure to petroleum-based soil fertilization.

Challenges of Integrating Livestock Into Crop Agriculture

Growers seeking to reintegrate livestock in present times face this history of specialization along with a suite of challenges such as 1) confronting a loss of animal husbandry knowledge; 2) regulations designed for specialized agroecosystems; 3) erosion of animal genetic diversity; and 4) limited meat processing infrastructure for small-scale production.

Integration of crops and livestock fell out of wide practice after the 1920s, and it has become a lost art to many farmers. Crop farmers often do not have training in animal husbandry, and integrated agriculture requires proficiency with both crops and livestock. In particular, younger farmers often do not have experience, training, or a background of working with animals. In California, for example, the average age of a rancher is 59. Would-be integrated farmers with a crop background may be challenged by animal care and health.

Without a relationship to slaughter and processing facilities, integrated farms face challenges to animal product finishing. Processing a small quantity of animal products can pose a serious hindrance to would-be integrated growers due to a paucity of small-scale processing facilities in the U.S. The lack of small-scale facilities has been traced to an unwieldy regulatory framework for butchering and processing, vertical and horizontal integration within the industry, labor-intensive smaller operations, and cost of

Continued on page 3

Benefits of Integrating Crops and Livestock

Continued from page 2

byproduct disposal. Many of the costs associated with a meat processing facility fall evenly across scale, making real costs higher for small-scale plants.

Benefits of Integrating Livestock Into Crop Agriculture

Despite the challenges to re-integrating animals into agriculture in the U.S., in recent years there has been a resurgent interest in integrated crop/livestock farming from researchers and the popular media. Integrated crop/livestock agriculture is recognized for its capacity to ***1) fertilize soil with an on-farm input, livestock manure; 2) encourage growers to maintain semi-permanent pasture fields, which can improve soil quality; 3) increase crop yield; 4) enhance on-farm biodiversity and related ecosystem services such as pollination, and weed/pest management; 5) enhance profitability to growers; and 6) grant social benefits to growers and communities.***

Integrating animals into crop production may provide a cost-effective on-farm source of soil fertility in the form of animal manure. Animals recycle nutrients contained in forage and feed and make them available in their excreta, thus becoming part of the on-farm nutrient cycle. Excreta from rotationally managed animals is deposited directly into pasture fields that are later planted with crops or have perennial species growing in them.

Integrated agriculture is not a panacea for soil degradation, and management must be tailored to manage for the known impacts of livestock such as labile nitrogen or high phosphorus levels, which can lead to pollution and imbalanced soil fertility.

Even in wilderness areas, animals like bison recycle soil nutrients while growing their herds.

Pastures Enhance Soil Quality

In addition to manure, pasture itself can enhance soil quality in integrated systems due to the deep and abundant root systems of pasture plant species and the ecological functions of plants such as nitrogen fixers. Maintaining a field with a pasture mix of grass and legume species is functionally similar to, but may be less expensive than, cultivating a cover crop because the sale of meat and animal byproducts may allow the field to pay for itself or generate a profit. Additionally, pasture is tilled less frequently than crop fields, and studies have found that reduced tillage greatly improves physical soil quality. With animals on pasture producing marketable products, integrated agriculture becomes an economically viable way to maintain a multi-year low-till cover crop.

Soil quality enhancement in integrated systems is also associated with increased yield in some studies. Integrated farms have been shown to have higher species richness than crop-only or animal-only farms. Integrated systems can also be used to manage weed and pest populations and improve land use efficiency, to produce more calories from less land, [which] aids both food security goals and local food economy initiatives, such as "eat local" campaigns. ❒

The Wisdom of William Albrecht

Abridged from SD Microbes
www.sdmicrobeworks.com, 5/23/23

William Albrecht (1888-1974) was an American soil scientist who spent several decades studying the connection between soil fertility and human health. Albrecht firmly believed that the key to vibrant plant growth lies in maintaining a balanced soil ecosystem. His work emphasized the significance of providing plants with the necessary minerals and trace elements to unleash their full potential.

Albrecht's research paved the way for the concept of soil balancing, which focuses on achieving optimal soil health through the correct mineral balance. According to Albrecht, a well-balanced soil not only provides essential nutrients to plants, but also creates an environment where they can efficiently absorb and utilize those nutrients. This approach enhances plant vigor, disease resistance, and nutritional quality.

The Albrecht Papers, a collection of scientific papers and articles authored by him, are a testament to his profound understanding of soil fertility. These papers provide a wealth of knowledge on various topics: soil testing, mineral deficiencies, and the impact of soil health on crops.

1. Mineral Balance

Through meticulous research, Albrecht identified specific mineral ratios that promote superior plant performance.

2. Soil Testing for Precision

Albrecht advocated for comprehensive soil testing to assess nutrient levels accurately. He developed new methods and techniques to determine the soil's mineral content.

3. Nutrient Density and Human Health

He discovered that well-balanced soils produce nutrient-rich plants, leading to healthier food and improved human nutrition.

4. Organic Matter and Soil Structure

Albrecht recognized the vital role of organic matter in building and maintaining healthy soils.

5. Soil-Food-Health Connection

Albrecht's work emphasized the interconnectedness of soil health, plant nutrition, and human health: the nutritional quality of food crops is directly influenced by the soil they grow in. ❒

15-Minute Soils Course

Lesson 60: A Closer Look At Soil Fungi

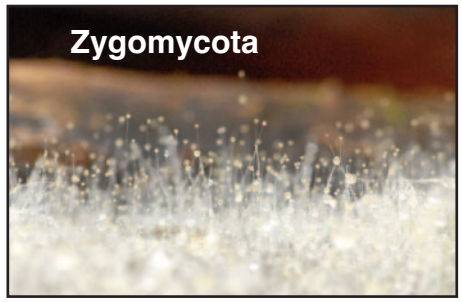
Fungi are a critical part of the creation, and exist everywhere on planet earth. They come in various sizes and perform many functions, not a few of which are in the soil, where they perform several critical functions:

1. The breakdown of plant residues into plant-available nutrients and organic matter
2. The creation of a strong soil structure to permit the efficient movement of air and water through the soil
3. Protection from various plant diseases and other pathogens, nematodes, and pests
4. The promotion of the efficient uptake of essential nutrients, by the mycorrhizae

Some of these functions have been discussed in previous issues of *The Vital Earth News*, such as in Volume 7, Number 1 and Volume 8, Number 2.

While there are essentially three different groupings of fungi—yeasts, molds, and mushroom fungi—the molds are the real workhorses in soils. There are at least 70,000 different species of fungi that have been identified by microbiologists, but it is estimated that there may be an estimated total of 1.5 million species worldwide.

It is interesting that fungal cells resemble the cells of plants and animals in that they have membrane-bound organelles. Bacteria do not possess this property.



Types of Fungi

There are four major groups of soil fungi: *Zygomycota, Ascomycota, Basidiomycota*, and *Deuteromycota*. *Zygomycota,* such as bread molds*,* occur with less than 1,000 species represented, and *Ascomycetes* have about 30,000 species, mostly yeasts used in baking. *Basidiomycetes* include most mushrooms, toadstools, and puffballs, while *Deuteromycota* include lichens and the mycorrhizal fungi.

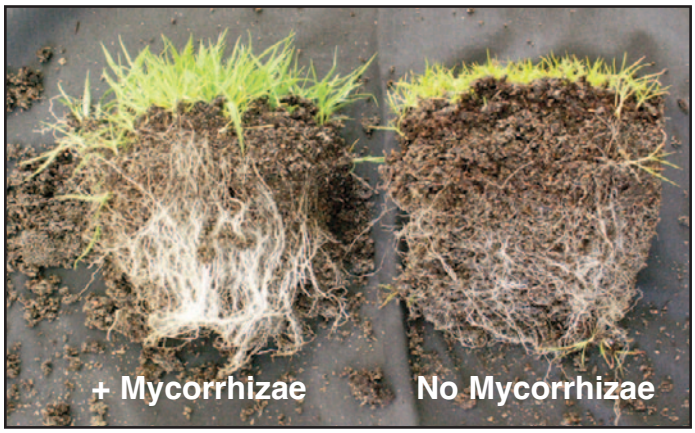
Fungi are classified as ***heterotrophs*** because their carbon (energy) source comes from the decomposition of organic compounds or residues. Decomposers are also called ***saprophytic fungi*** which break down cellulose, hemicellulose, and lignin in the soil. Sugar fungi (*Zygomycetes*) decompose simple sugars, but most fungi break down the more hard-to-decompose organic residues. Some byproducts of this decomposition may be converted to humic substances and can remain in the soil for thousands of years.

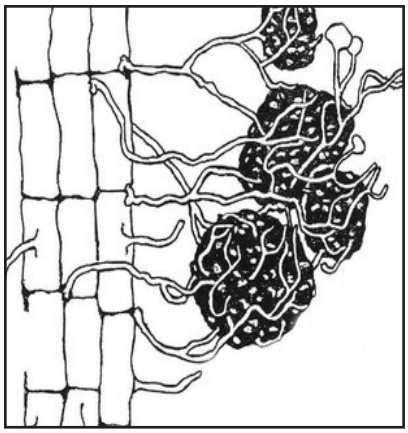
Pathogenic fungi cause many root diseases such as *Phytophthora, Rhizoctonia, Pythium*, and *Verticillium*. Downy mildew *Ascomycetes* fungi are microscopic in size and dominate in agricultural soils and grasslands, while the *Basidiomycetes* have large fruiting bodies or mushrooms that dominate in high residue and forested soil. Some beneficial fungi help control diseases and predators such as nematode-trapping fungi, which feed on nematodes, in particular pathogenic types.

15-Minute Soils Course

Mycorrhizal fungi form a mutualistic relationship with 80 to 90% of plants, in particular with grasses, row crops, vegetables, and shrubs. Some species, such as the *Cruciferae* family (e.g., cabbage, broccoli, mustard, and canola) and the *Chenopodiaceae* family (e.g., lambsquarters, spinach, beets, and oilseed radish) have poor mycorrhizae associations.

The mycorrhizal networks release enzymes into the soil and break down complex molecules that the filaments then reabsorb. Fungi act like natural recycling bins, reabsorbing and redistributing soil nutrients back to plant roots. Most hyphae are either pure white or yellow and are often misidentified as plant hair roots.





Mycorrhizae germinate and send their hyphae into the epidermal cells of roots, where they obtain sugars and other compounds to grow, then extend out into the soil, bringing back nutrients to the root to feed the plant. In the process they help encapsulate soil particles to build structure.

Fungi are an essential part of the microbial ecology. The majority of fungi decompose the lignin and the hard-to-digest soil organic matter, but some fungi consume simple sugars. Fungi dominate in low pH or slightly acidic soils where soils tend to be undisturbed, and break down organic residues so that many other types of microbes can start to decompose and process these residues into usable products.

Fungi prefer slightly acidic conditions, less disturbed soils, perennial plants, and highly stable forms of organic residues with high carbon to nitrogen (C:N) values. Bacteria, on the other hand, dominate in highly disturbed ecosystems with fast nutrient recycling and low C:N values, and prefer annual plants, with nutrient additions outside the plant. Bacteria are single-celled organisms and need a film of water to survive, whereas fungi are multi-celled organisms that grow rapidly and to great lengths in the soil (feet or meters). This allows fungi to bridge gaps in soils and transport nutrients to far distant points.

Soil fungi make up 10 to 30 percent of the soil rhizosphere. There are usually fewer individual fungi than bacteria, but fungi dominate the total biomass due to their larger size. Fungi biomass in the soil ranges from the equivalent of two to six cows/acre in a healthy soil, or 1,100 to 11,000 pounds of biomass. ❐

See How Much You Learned

1. Soil fungi are critical in the soil ecological system by breaking down organic residues. T or F.
2. One of the most important types of fungi are the _____fungi.
3. Fungi are critical for a. structure formation, b. disease protection, c. nutrient uptake, d. chlorophyll production, e. plant nutrient uptake.
4. Because soil fungi require outside carbon sources to function, they are called _____.
5. Nematodes can be trapped by certain types of fungi. T or F.
6. Most plants have mycorrhizal symbiosis. T or F.
7. Mycorrhizal fungi belong to the _____group.

Answers: 1. T; 2. mycorrhizal; 3. a, b, c, e; 4. heterotrophs; 5. T; 6. T; 7. Deuteromycota.

A Victory in Battling Herbicide Resistance

By Paul W. Syltie, Ph.D.

Farm machinery developers in Australia have for many years been working on devices that will destroy weed seed viability after the crop passes through the combine. The tools invented have been found to work remarkably well,and have been shown to destroy seed germination by over 95% in most cases. This is a boon for farmers in their attempts to control the seed bank of noxious and other common weeds in their fields, and has been found especially useful when addressing the problem of herbicide resistant weeds.

While this method of weed control has been remarkably effective, it has not entirely replaced chemical weed control, since the seed bank in soils is populated by weed seeds that can be viable for many years. However, the newly emerging herbicide resistant weeds do not have high soil populations as yet and can be effectively managed by these new devices.

According to *Farm Progress* (July 1, 2023, *www.farmprogress.com*), "The iHSD (Integrated Harrington Seed Destructor) technology from Australia is a chemical-free harvest weed seed management system that is used to control weeds at harvest time. Importantly, the iHSD system is non-selective to herbicide resistant weed species, as it uses a mechanical process to devitalize weed seeds contained in the chaff fraction of the combine harvester waste. The processed chaff residue is then returned to the local field helping to retain soil moisture levels, improve nutrient levels and preserve soil micro-flora and soil fertility."

The iHSD is a tool that will destroy the viability of weed seeds moving through the combine to 99% or more.

The latest generation of the iHSD is the culmination of 25 years of development and research and is available in models to fit John Deere, New Holland, and Case IH combines. The popularity of the seed destructors is due to several reasons:

- They destroy up to 99.9% of targeted weed species.
- One pass harvest weed seed control.
- Economically viable.
- They help protect your farm from weeds for future generations.

Michael McClure, an Illinois farmer, stated, "With the resistance to weeds increasing drastically here in Central Illinois, we needed an alternative form of control. We strive to leave the land in prime condition for the 10th generation of our family to farm, and this was a great piece of equipment to help make weed prevention a reality."

There are other seed terminator devices on the market such as the Multi-Stage Hammer Mill. It seems that Australians have been very active in inventing and marketing these devices. ❒

Low Level Glyphosate Affects Reproduction

By Robert Malone, MD, MS

As I have written about before, glyphosate (Round-Up) and other herbicides are sprayed on almost all of our commercial grains, legumes, and seed oil crops to kill the plants all at once, thus making the processing much easier. These desiccants, as they are called, are found in trace amounts in our commercial grains and seed oils as well as legumes. That means in our breads, flours, crackers, cookies, cakes and snack foods that are not labelled organic will most likely contain glyphosates. You know, pretty much all of the food found on the inside aisles of our grocery stores. This use of glyphosate as a desiccant is relatively new.

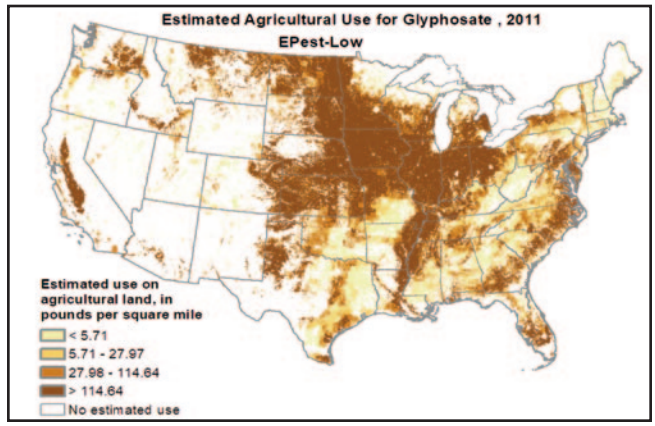
The map to the right speaks for itself, with corn, soybeans, and wheat using most of the administered glyphosate product. Of course, Roundup Ready soybeans, corn, and wheat have also increased glyphosate usage. Elevated weed resistance to glyphosate has also driven substantial increases in usage.

Big Ag screams that they couldn't possibly do without this chemical to grow food. But one has to wonder what they did before glyphosate became a farming staple.

This is beside the point. About 300 million pounds of glyphosate are used in the USA yearly, a 300-fold increase in agricultural use from 1974 to 2014.

Over the past five years, the number of peer-reviewed papers documenting real harms has grown exponentially.... Our health, our children's health, our generational health, and yes, our environment keeps worsening, as the peer-reviewed articles just keep piling up documenting the damages done. We have put together a list of over 200 peer-reviewed papers on the harms. These have been broken out into categories: cancer, epidemiology, fertility, pregnancy and reproductive harms, gut/inflammation, neurologic damage/ autism, non-Hodgkins lymphoma, obesity, organ damage, and other. ❒

www.ussanews.com, Nov. 16, 2024



Atmospheric CO_2 — An Alternative View

By Paul W. Syltie, Ph.D.

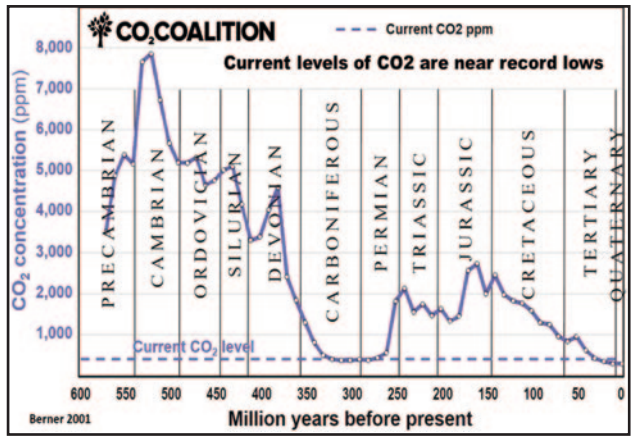
While the controversy over the imminent dangers of our changing climate has been resounding loudly across media channels, it is wise to step back and take a calm and collected view of this important issue. It turns out, according to recent research, that the temperature changes in the atmosphere are not a result of increasing CO_2 levels, but rather sunlight and clouds.

This short article gives but a brief introduction to the issue. Please access Nikolov and Zeller's article for a complete reading at *Geomatics* 2024, Vol. 4, No. 3, Pages 311-341.

In a September 16, 2024, article by Katie Spence titled "Sunlight And Clouds—Not CO_2—Drive Earth's Climate; 'Shocking' New Study Finds," the August European Commission's Copernicus report found that the global average temperature had reached record highs in the past 12 months, an increase of 1.51 degrees C above pre-industrial levels. Satellite data corroborates this temperature rise.

The United Nations Intergovernmental Panel on Climate Change (IPCC) states that this temperature rise is primarily caused by human-induced increases in carbon dioxide (CO2), a greenhouse gas, and "Stabilizing the climate will require strong, rapid, and sustained reductions in greenhouse gas emissions, and reaching net zero CO_2 emissions."

However, Ned Nikolov, a physical scientist and researcher affiliated with Colorado State University, said the IPCC is incorrect regarding CO_2. He states, "The greenhouse theory claims that atmospheric composition is important.



Our planet needs more CO_2, not less, for sustainable crop production and high yields.

They are arguing that tiny increases of the carbon dioxide in the atmosphere cause global warming and that we must stop burning fossil fuel to avoid dangerous climate change. ***That is completely wrong***."

In their study, Nikolov and Karl Zeller, a retired U.S. Forest Service meteorologist, published their study that found that recent warming is not the result of increasing CO_2. Instead, after analyzing satellite data, the two researchers concluded that ***the Earth has warmed because it's been absorbing more sunlight due to reduced global cloud cover***.

According to NASA, earth's atmosphere is constantly working to balance the planet's "energy budget"—the amount of energy entering and leaving it. After the sun's shortwave radiation reaches the Earth, the energy flows back into space as thermal radiation. If this balance is disrupted, and more sunlight is absorbed or not enough heat escapes to space, earth's temperature will rise.

Says Nikolov, "Cloud formation is partially controlled by cosmic forces. When clouds decrease, the planetary albedo drops and more radiation reaches the surface, causing warmer temperatures.... In our paper, we show, using the best available observations from the [Clouds and the Earth's Radiant Energy System] platform, that ***the warming of the last 24 years was entirely caused by the observed decrease of Earth's albedo and not by increasing greenhouse gas concentrations as claimed by the IPCC***."

In addition, it is worthy to note that the earth's atmosphere needs more CO_2, not less, as evidenced by the graph shown above. We are at about a 400 ppm CO_2 concentration at the moment, and any decreases will potentially prove debilitating to the earth's crops; the more CO_2 the better. The climate debate must be separated from political pressures. ❒

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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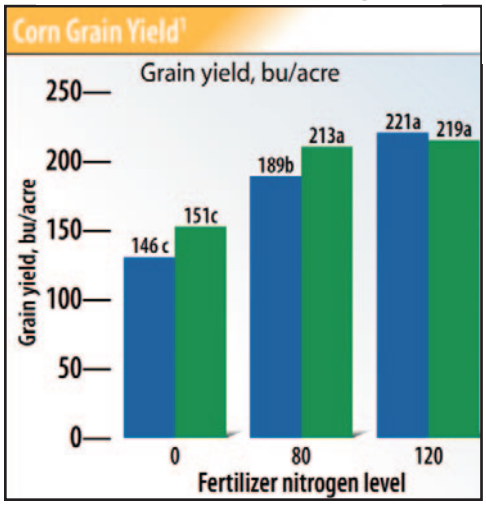
Thank you! The Team at Vital Earth Resources, Inc.

Vitazyme Continues to Prove It Is a Great Promoter of Fertilizer Efficiency

The 2024 research year for Vitazyme once again has shown that it improves the efficient use of fertilizers, especially nitrogen. This effect is especially important nowadays due to the high cost of fertilizer inputs and the move towards more sustainable cropping practices. Here are a few examples from 2024.

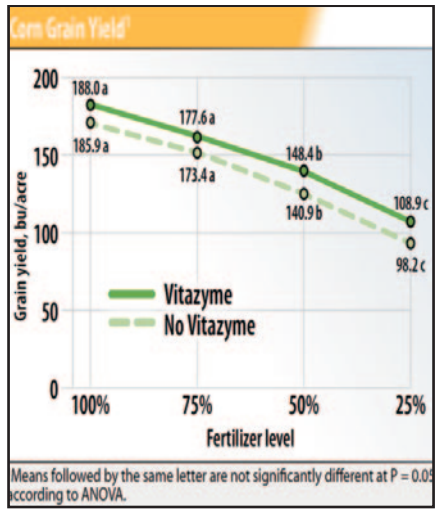
CORN—South Dakota State University



Yield change with Vitazyme at three fertilizer N levels

No N	+3%
80 lb/acre N	+13%
120 lb/acre N	-1%

CORN—Agricenter International, TN

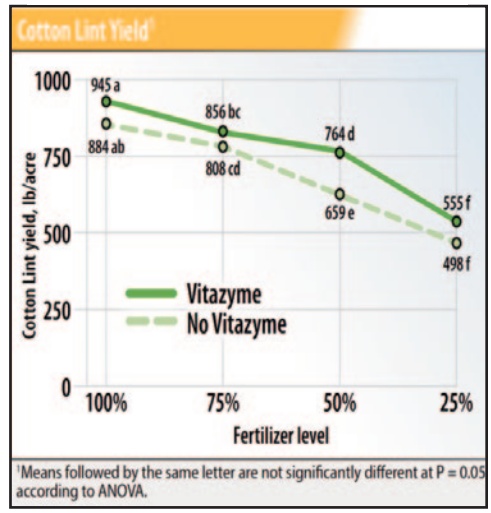


Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA.

Yield increases with Vitazyme at each fertilizer level

100% fertilizer	2.1 bu/acre (1%)
75% fertilizer	4.2 bu/acre (2%)
50% fertilizer	7.5 bu/acre (5%)
25% fertilizer	10.7 bu/acre (11%)

COTTON—Agricenter International, TN

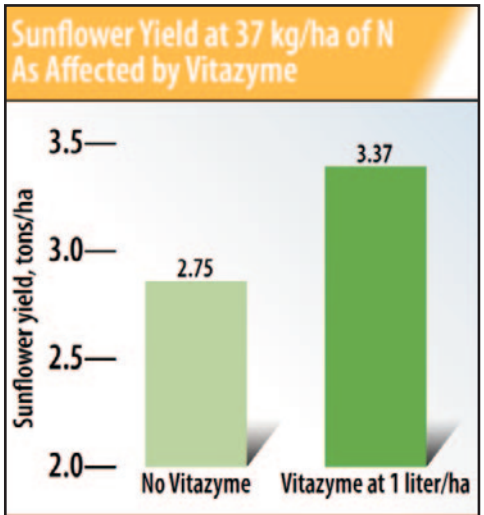


[1]Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA.

Lint yield increases with Vitazyme at each fertilizer level

100% fertilizer	7%
75% fertilizer	6%
50% fertilizer	16%
25% fertilizer	11%

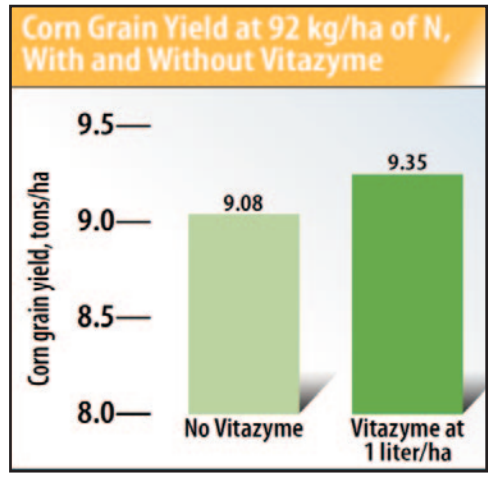
SUNFLOWERS—Kernel Company, Ukraine



Yield increase with Vitazyme at the same N level: 0.62 ton/ha (+23%)

These fertilizer efficiency results in 2024 are similar to results from previous years. More results are available at the Vital Earth Resources website (*www.vitalearth.com*), or on request in a booklet entitled *Vitazyme Studies Showing Improved Fertilizer Efficiency — 1995-2024*. For example, in an N15 study, grain use efficiency (the percent of applied fertilizer actually going into the grain) at 75 lb/acre of N fertilizer for the Vitazyme treated seed was 58%, while the untreated seed efficiency was 40.3%.

CORN—Kernel Company, Ukraine



Corn grain yield increase at the same nitrogen level: 0.27 ton/ha (+3%)