The Future of Food: Empowering Regenerative Organic Agriculture for a Human Health Revolution

JEFF TKACH
CHIEF GROWTH OFFICER
“Only 60 Years of Farming Left If Soil Degradation Continues”

• “Generating three centimeters of top soil takes 1,000 years, and if current rates of degradation continue all of the world’s top soil could be gone within 60 years, a senior UN official said.”

• “Unless new approaches are adopted, the global amount of arable and productive land per person in 2050 will be only a quarter of the level in 1960, the FAO reported, due to growing populations and soil degradation.”
While we have been successful in rolling out new technologies in agriculture in recent decades, we’ve seen an inverse, rapid decline in human health, and increased scarcity of fresh, healthy, and nourishing food.
U.S. OBESITY RATES CONTINUE TO CLimb

The State of Obesity in California

California has the fourth lowest adult obesity rate in the nation, and the 24th highest obesity rate for youth ages 10 to 17. California’s adult obesity rate is currently 25.1%, up from 18.7% in 2000 and from 9.9% in 1990. This state profile includes data on adult and childhood obesity, obesity-related health issues, and policy actions California is taking to prevent and reduce obesity. According to the most recent data, adult obesity rates now exceed 35% in seven states, 30% in 29 states and 25% in 48 states. View adult obesity rates for all states.

Adult Obesity New Data

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Obesity Rate (2017)</th>
</tr>
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<tbody>
<tr>
<td>18-25</td>
<td>12.7%</td>
</tr>
<tr>
<td>26-44</td>
<td>24.0%</td>
</tr>
<tr>
<td>45-64</td>
<td>31.7%</td>
</tr>
<tr>
<td>65+</td>
<td>24.3%</td>
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<table>
<thead>
<tr>
<th>Race</th>
<th>Obesity Rate (2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>22.1%</td>
</tr>
<tr>
<td>Black</td>
<td>31.4%</td>
</tr>
<tr>
<td>Latino</td>
<td>32.1%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Gender</th>
<th>Obesity Rate (2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>24.5%</td>
</tr>
<tr>
<td>Women</td>
<td>25.0%</td>
</tr>
</tbody>
</table>
Agriculture & Human Health are Inextricably Linked

- **Developmental Disabilities**: 17% increase overall, ages 3–17 (1997–2008)
- **ADHD**: 3% increase every year, ages 6–17 (1997–2006)
- **Autism**: 78% increase, age 8 (2002–2008)
- **Childhood Cancers**: 25% increased incidence, ages 0–19 (1975–2004)
- **Diabetes**: 53% increase, ages 0–19 (1990–2011)
- **Obesity**: 171% increase, ages 6–11 (1980–2004)

Pesticide Action Network North America 2012
CHEMICALS IN MY FOOD?

The most widely used commercial pesticide is a glyphosate-based herbicide called Roundup.

99.99% of Roundup never even hits a weed—instead, it ends up in the water we drink, the air we breathe, and the food we consume.
CHEMICALS IN MY FOOD?
SO, WHAT IS ROUNDUP?

“A Weed Killer Is Increasingly Showing Up in People’s Bodies”

• “Researchers led by Paul Mills, professor of family medicine and public health at the University of California San Diego, found that the percentage of people who tested positive for a chemical called glyphosate, which is the active ingredient in the herbicide Roundup, shot up by 500% in that time period. The levels of glyphosate also spiked by 1208% during that time.”
## HEALTHCARE COST VS. HEALTHY FOOD PRICES

**Expenditures ($USD)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Food</th>
<th>HealthCare</th>
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<tbody>
<tr>
<td>1960</td>
<td>$74.6 million</td>
<td>$27.2 million</td>
</tr>
<tr>
<td>2017</td>
<td>$1.5 trillion</td>
<td>$3.2 trillion</td>
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GENE EDITING REPLACES GMO

FROM CORN TO CATTLE, GENE EDITING IS ABOUT TO SUPERCHARGE AGRICULTURE

By Dyllan Furness — April 17, 2017 3:00 AM
HOW GENE EDITING WILL CHANGE AGRICULTURE

By Betsy Freese
11/22/2016

For thousands of years, farmers have been choosing which traits their crops and livestock carry by using selective breeding. The first genetically modified crops were commercialized in the 1990s. In 2012, a huge scientific breakthrough changed what is possible yet again.

Gene editing, led by the discovery of CRISPR-Cas, promises widespread, accelerated, and targeted discoveries. Areas of the genome linked to specific traits can now be precisely edited. Cut and paste, so to speak. Gene editing could eventually provide a catalog of options for farmers to order exactly what they need. Think of it like customizing a tractor. Don’t need a front-end loader? Remove it. Need dual rear wheels? Add them.
CRISPR is not the only game in town for gene editing. Cibus, for example, is one of many molecular plant biology start-ups trying to release products and secure patents for genome-editing technologies. Cibus already has a crop on the market, a herbicide-tolerant canola.

“Our goal is to have traits in every major crop within the next decade. We already have herbicide-tolerant SU Canola. We will see a release in the 2019-2021 time frame of glyphosate-resistant flax, herbicide-resistant rice, and numerous others.”
IS IT REALLY NECESSARY TO GO DOWN THIS PATH WHEN WELL-RESEARCHED, PROVEN METHODS ALREADY EXIST?
OUR BROKEN FOOD SYSTEM:
WHEN ONLY YIELDS ARE CONSIDERED.
“To be a successful farmer one must first know the nature of the soil.”

– Xenophon, Oeconomicus, 400 B.C.

“A physician should know something about the soil where a patient’s food comes from”

– Hippocrates, 460 to 370 B.C.
HEALTHY SOIL =
HEALTHY FOOD =
HEALTHY PEOPLE.  May, 1942.

A LEGACY OF WORDS AND MISSION

J.I. Rodale
Organic

Robert Rodale
Regenerative
Rodale Institute is a 501(c)(3) nonprofit dedicated to advancing regenerative organic agriculture through research, education and outreach. For seventy years, we’ve been researching innovative techniques to manage pests and diseases in organic agriculture while providing nutritious food and adapting to and mitigating climate change. Our findings, shared with farmers and scientists throughout the world, advocate for policies that support farmers, and educate consumers about how organic is the healthiest option for people and the planet.
Rodale Institute was founded in 1947 by J.I. Rodale, who is considered the pioneer of modern organic agriculture in North America. At the time, the concept of “organic” was revolutionary, as chemical fertilizers, pesticides, and herbicides became standard practice after WWII. Even then, J.I. understood that Healthy Soil=Healthy Food=Healthy People, which is the motto we still follow today.

J.I. was the author of numerous books and founded the publishing company Rodale Inc., which still produces many well-known health and wellness titles such as Prevention, Men’s Health, Women’s Health, Organic Life and more.
WHAT IS ORGANIC AGRICULTURE?
WHAT IS ORGANIC AGRICULTURE?

How Regenerative Organic Agriculture Removes Carbon from the Atmosphere and Stores It in the Soil

1. Photosynthesis
   This is the process plants use to change carbon dioxide from the atmosphere into carbon-based sugars.

2. Nutrient Exchange
   The carbon-based sugars created during photosynthesis then ooze out of the plant's roots, feeding bacteria and fungi living in the nearby soil. In turn, these microorganisms symbiotically transform organic matter and soil minerals into nutrients that feed the plant.

3. Capturing Carbon
   During this exchange of nutrients, the root sugars and organic matter that is consumed by the bacteria and fungi is converted into more stable materials that help store carbon in the soil for decades, even centuries.

4. Restoring Balance
   Increasing the number of microorganisms in the soil helps bring carbon levels back into balance, which leads to a healthier soil, healthier food, and a healthier planet.

Four Central Practices of Organic Farming

- **Cover Cropping:** Rather than leaving the soil bare between growing cash crops, cover crops ensure photosynthesis is an ongoing process, helping microorganisms thrive and actively store carbon all year round.
- **Natural Fertilizer:** Instead of nitrogen fertilizer, organic farmers use compost as fertilizer, which is typically just decomposed food waste, manure, and organic plant matter. Compost is a natural pesticide and since it is made from food waste, it also reduces waste sent to landfills.
- **Rotating Crops:** Instead of conventional monocropping—or planting the same crop in the same soil year after year—organic farmers rotate crops strategically to cultivate plenty of microorganisms that enable carbon storage and increase soil health.
- **Reduced Tillage:** The practice of tilling, or breaking up the soil in preparation for planting crops, is common in conventional agriculture. However, during this process, microorganisms living in the soil are killed off. Soil health improves dramatically when an organic, no-till method is employed.
SOIL HEALTH NUGGETS

There are some amazing things going on underground...

Here are some things you may not know...

There are more soil microorganisms in a teaspoon of healthy soil than there are people on the earth!

Millions of species and billions of organisms—bacteria, algae, microscopic insects, earthworms, beetles, ants, mites, fungi and more—represent the greatest concentration of biomass anywhere on the planet! Microbes, which make up only one half of one percent of the total soil mass, are the yeasts, algae, protozoa, bacteria, nematodes, and fungi that process organic matter into rich, dark, stable humus in the soil.
OUR SOIL WILL SAVE US.

Regenerative Organic Agriculture and Climate Change

A Down-to-Earth Solution to Global Warming
A New Paradigm in Agriculture

SAME RESOURCES, DIFFERENT PHILOSOPHY
OUR RESEARCH IS A CATALYST FOR CHANGE.
RESEARCH PROJECTS
FARMING SYSTEMS TRIAL

Our Farming Systems Trial®, started in 1981, is America’s longest running, side-by-side comparison of organic and chemical agriculture. FST is a 12-acre, 72-plot trial focused on grains. Scientific data from FST shows that organic yields match conventional yields, and outperform conventional in years of flooding and drought. The organic plots also have higher soil organic matter, use less energy, and are more profitable than conventional systems.
SOILS OF THE ORGANIC SYSTEMS HAVE A MORE ACTIVE SOIL BIOLOGICAL COMMUNITY.

- Higher levels of glomalin – a glycoprotein that acts like ‘glue’, binding organic matter to mineral particles.
- Greater populations of mycorrhizae – a fungus that forms a symbiotic relationship with its host plant; the fungus receives carbohydrates from the plant, which in return gains access to water and nutrients.

THIS LEADS TO IMPROVED SOIL STRUCTURE AND ENHANCED CARBON SEQUESTRATION.
AGROECOSYSTEM RESILIENCE (2016)

PHOSPHATE & NITRATE STRESS

Organic Corn

Conventional Corn
WATER USE EFFICIENCY

Wheat fields at Rodale Institute’s Farming Systems Trial (Summer 2018)

Conventional  Organic
## Farming Systems Trial

Our decades-long research has shown that organic systems:

<table>
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<tr>
<th>Benefit</th>
<th>Description</th>
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<td>Are competitive with conventional yields</td>
<td>Produce yields up to 40% higher in times of drought</td>
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<tr>
<td>Leach no toxic chemicals into waterways</td>
<td>Use 45% less energy</td>
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RESEARCH PROJECTS

VEGETABLE SYSTEMS TRIAL

Started in 2016, the Vegetable Systems Trial will be the produce companion of FST, with the goal of comparing organic and conventional systems for several decades. Crops in the rotation include root, fruit, and leaf crops, as well as brassicas and cucurbits.

One goal of VST will be to measure nutrient density (or the amount of proteins, vitamins, minerals, and more) in organic versus conventional produce. We believe this research will have significant effects on human health and global food security.
Total carrot antioxidants (mg/100g)
Rodale FST Kutztown, PA 2005.

Organic: 67
Conventional: 52
Mean Difference: 28.8%
VEGETABLE SYSTEM TRIAL
Year 1 Preliminary Results

Nutrient Quality Index Scores

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<th>Mean NQI Score</th>
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AGRICULTURAL INNOVATIONS
BIOLOGY VS. CHEMISTRY
Encourage a whole foods, organic diet.

Purchase certified organic food.

Join a CSA.

Get to know your farmer.

Support Organic farming research.

Remember, you have influence.
OLD BOSS.
NEW BOSS.

MISCONCEPTIONS

MILLENNIALS

THE REALITY

- 80 million millennials (in U.S. alone)

- Spend roughly $600 billion annually

THE NEED FOR DIGITAL CUSTOMER SERVICE

- We surveyed 20 millennials

- 72.5% prefer a website that answers questions quickly

- 79% tell friends about bad customer service experiences

- 51.5% will switch to a new company after a bad customer experience

WHAT DOES THIS MEAN FOR YOUR CUSTOMER SERVICE?

- Millennials have influence on friends' and families' purchasing decisions

- Millennials demand an integrated, seamless experience regardless of channel

A DANGEROUS MISCONCEPTION TO HAVE

- CUSTOMER SERVICE IS LESS IMPORTANT TO MILLENNIALS

IT'S A CONVERSATION

- (One that is increasingly digital)

CONVENIENCE IS KEY

- Digital self-service is more important than ever before
GROWTH IN THE ORGANIC MARKET

Total U.S. Organic Sales and Growth, 2006–2015

In Billions

- Organic Non-Food Sales
- Organic Food Sales
GROWTH IN THE ORGANIC MARKET

Organic food and farming has a big impact on the nation’s economy. From Kentucky to California, farmers, families, and businesses are choosing organic.
THE FUTURE OF HEALTHCARE

Putting data to social programs that reach patients, low-income populations, and train the next generation of farmers.
Because the future is organic.

