Building “Living Soil”—Advanced

Warning

HUGE, BROAD Topic!!!

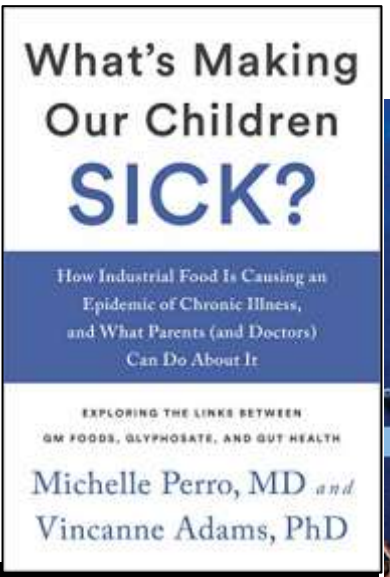
- We'll just "Scratch the Surface"
- This science is evolving and current "theories" may change

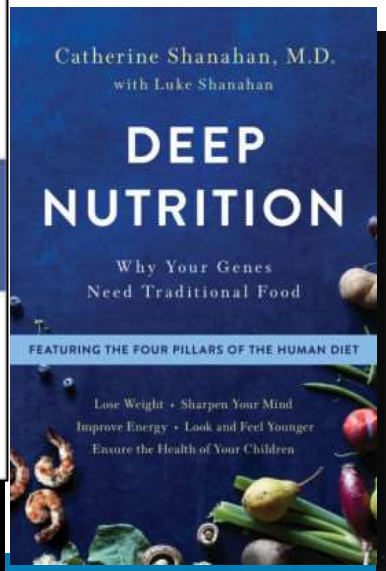
Objectives Today

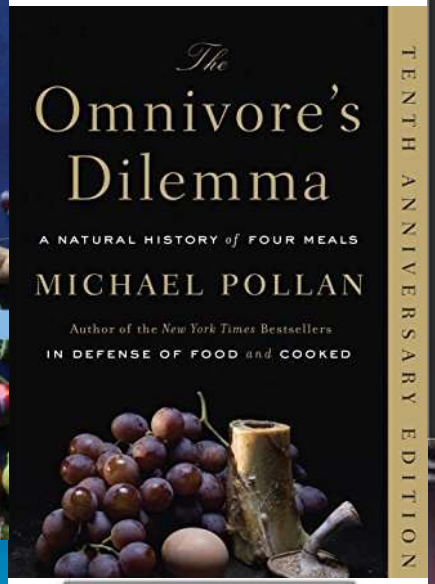
- Nutrient Density
- Vital Soil/Plant Principles
- Applying the Principles

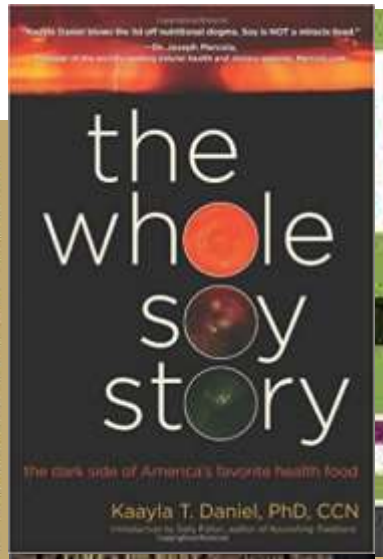
- (Slides @ Libertytracefarm.com)

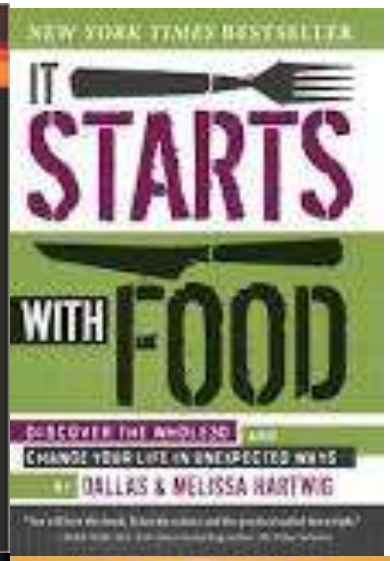
2008 and Every Day Since…

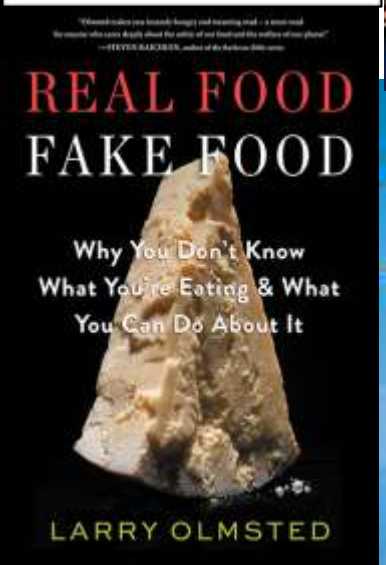


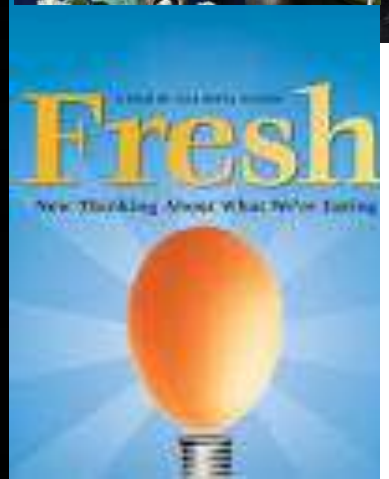


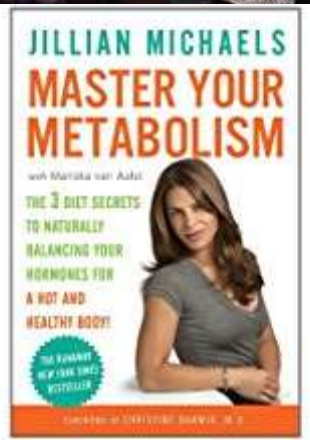


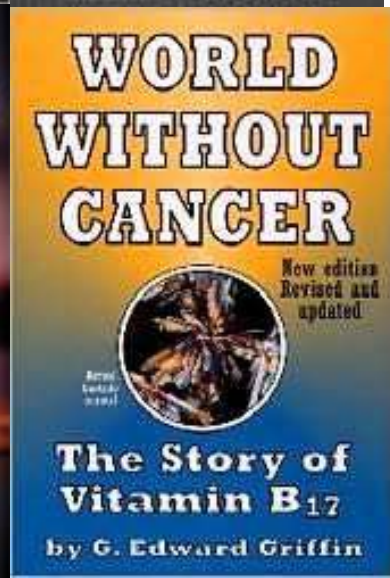




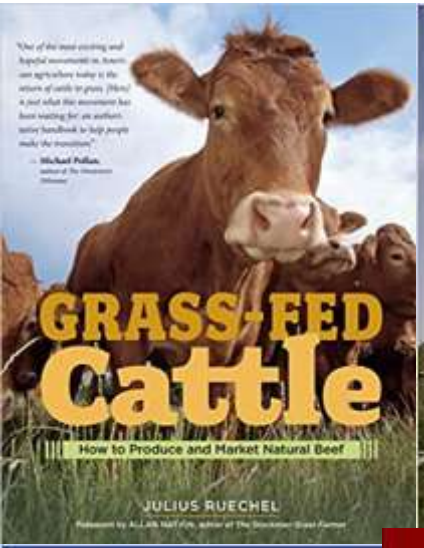


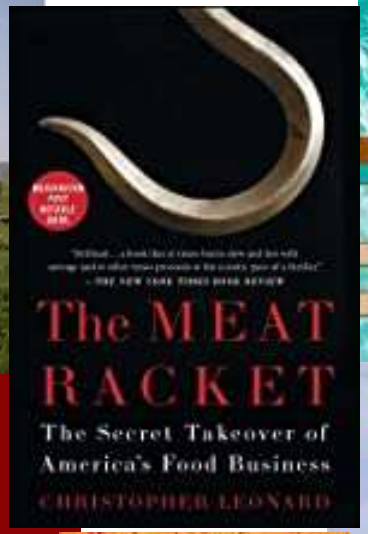


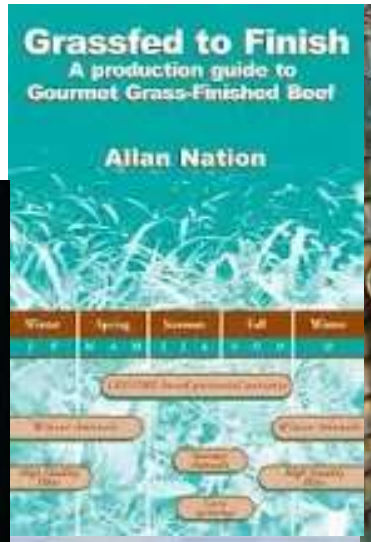


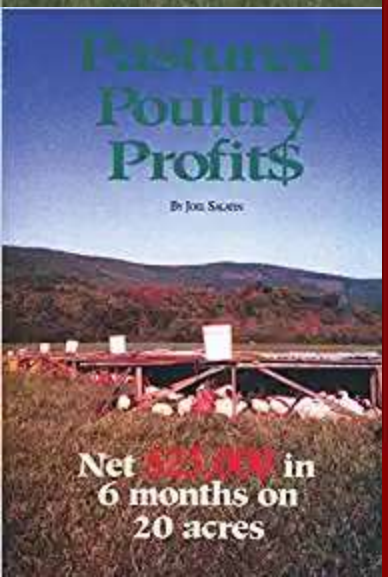


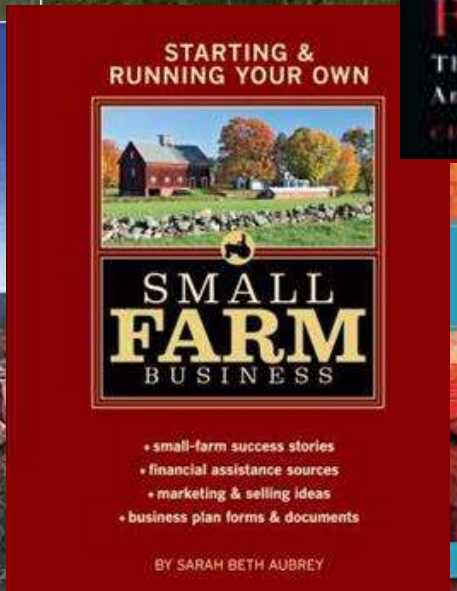
Let's Start a Farm!

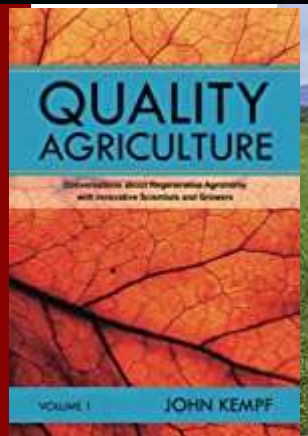


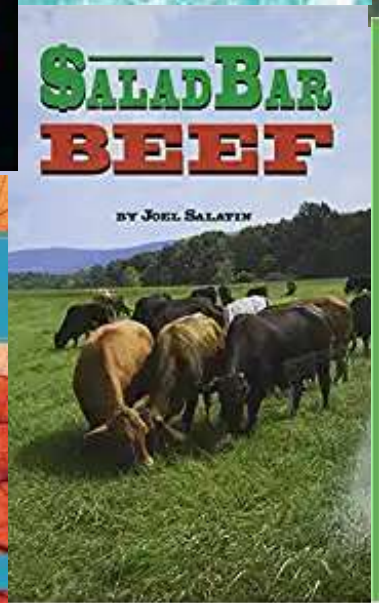


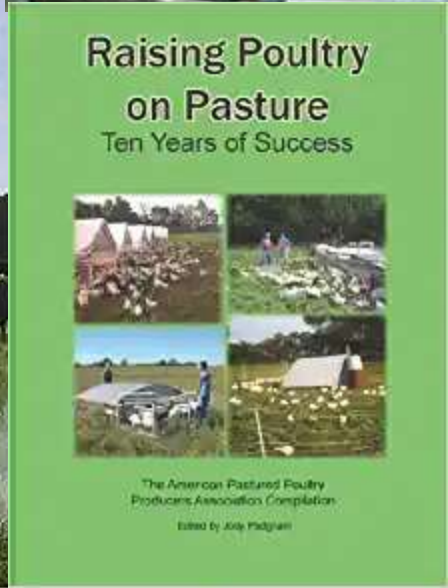












A Few Sad Statistics

- 2017: 75% of our youth 17-24 unqualified to join military
- 1965: 4% of our population had a chronic disease
  - Today 46% of our children have a chronic disease
- 2006: MS only state above 30% obesity--today 41 states
- US spent $4.5 Trillion on healthcare in 2022
  - We spent $4.1 Trillion on WWII (today's dollars)
  - 5+ times Defense Budget ($778 Billion in 2020)

- What's a Trillion??? ($1M/day for how long?)

MOMS ACROSS AMERICA

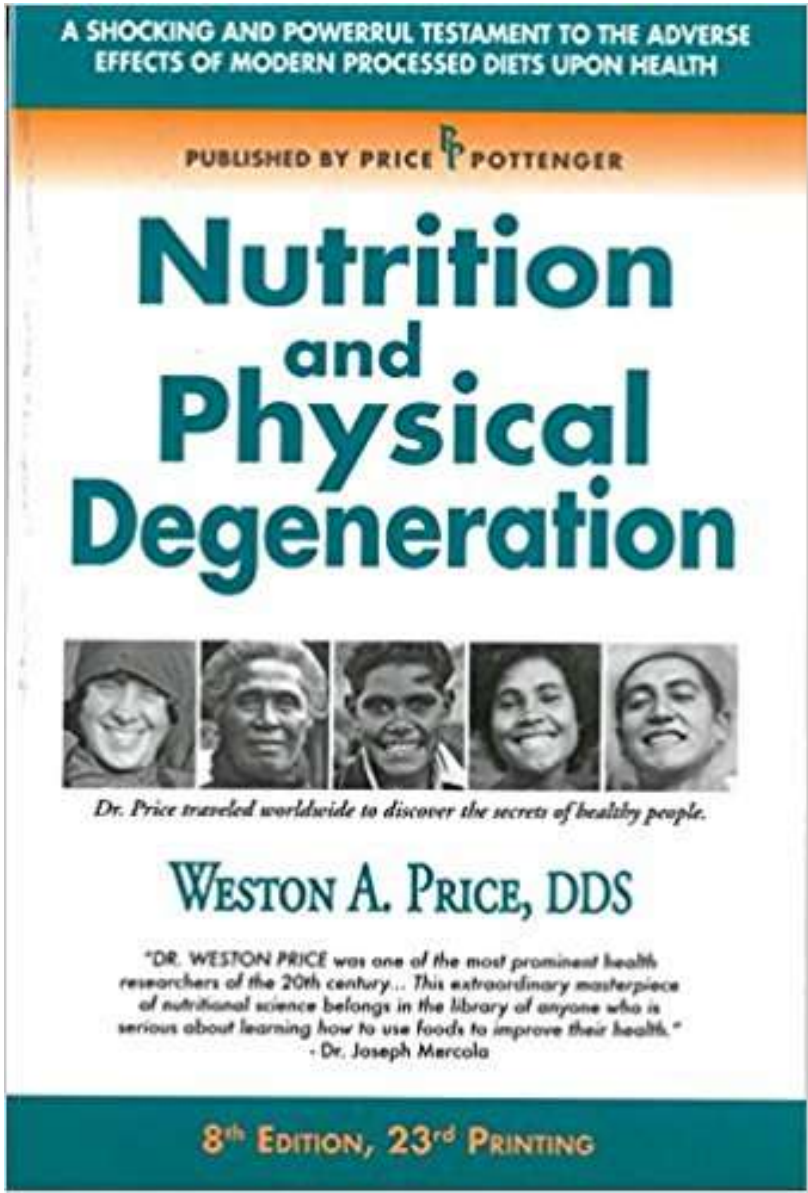
100% of Top Twenty Fast Food Brands Positive for Glyphosate Herbicide 76% Positive for Harmful Pesticides

POSTED BY ZEN HONEYCUTT 4006.40GS ON OCTOBER 11, 2023

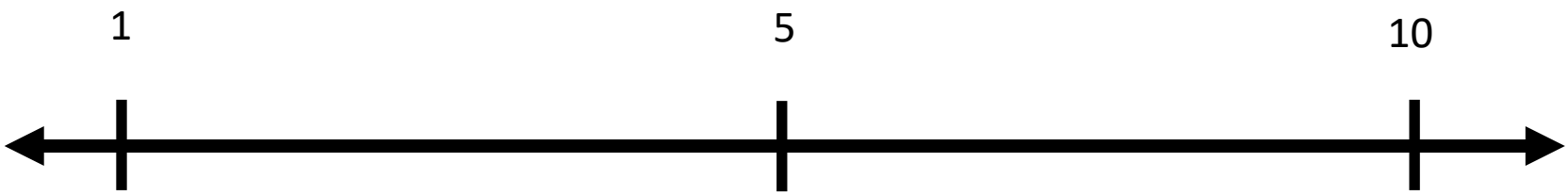
Top Twenty Fast Food Brands Glyphosate and Pesticide Testing Report

Moms Across America, a nationwide non-profit, has initiated an extensive testing program on the top twenty fast food brands in America, plus one restaurant, California's In-N-Out Burger. Forty-two samples of 21 brands were tested for the most widely used herbicide in the world, glyphosate, 236 agrochemicals, 4 heavy metals, PFAS, phthalates, and mineral content. The top ten brands were additionally tested for 104 commonly used veterinary drugs and hormones, B Vitamins and calories.

Dr Weston A. Price



Health Range (1-10)



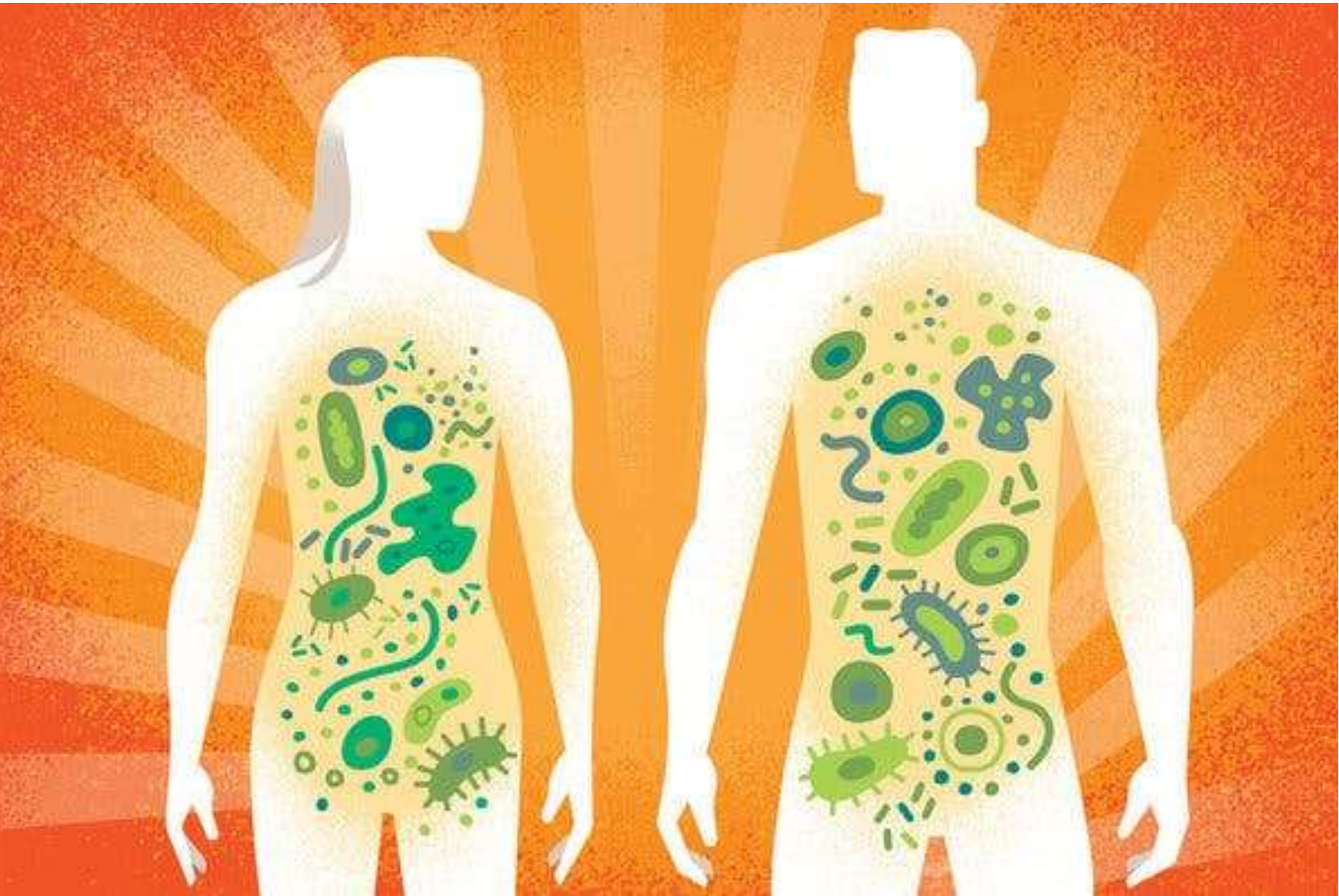
DISEASE

- Chemical Toxins
- Pesticides
- GMOs
- Electromagnetic Radiation
- Stress
- Nutrient Deficiencies

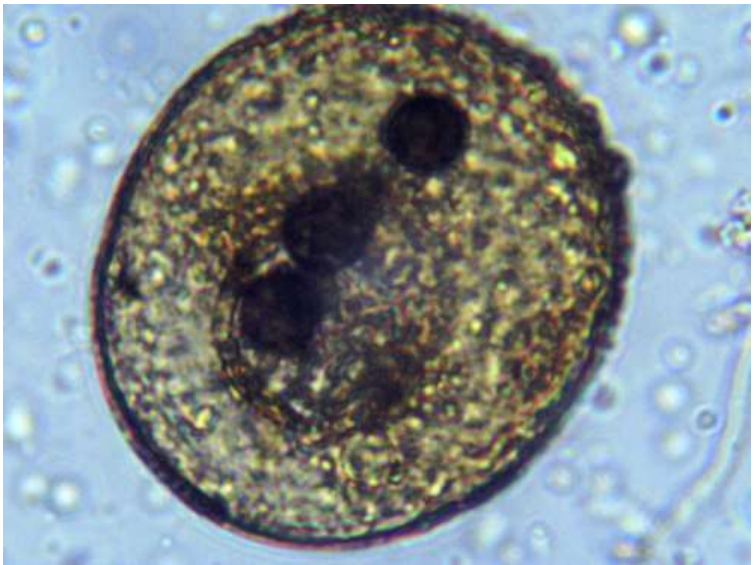
HEALTH

- Nutrient Density
- Vitamins
- Minerals
- Enzymes
- Amino Acids
- Microbiome

2016--Microbiome

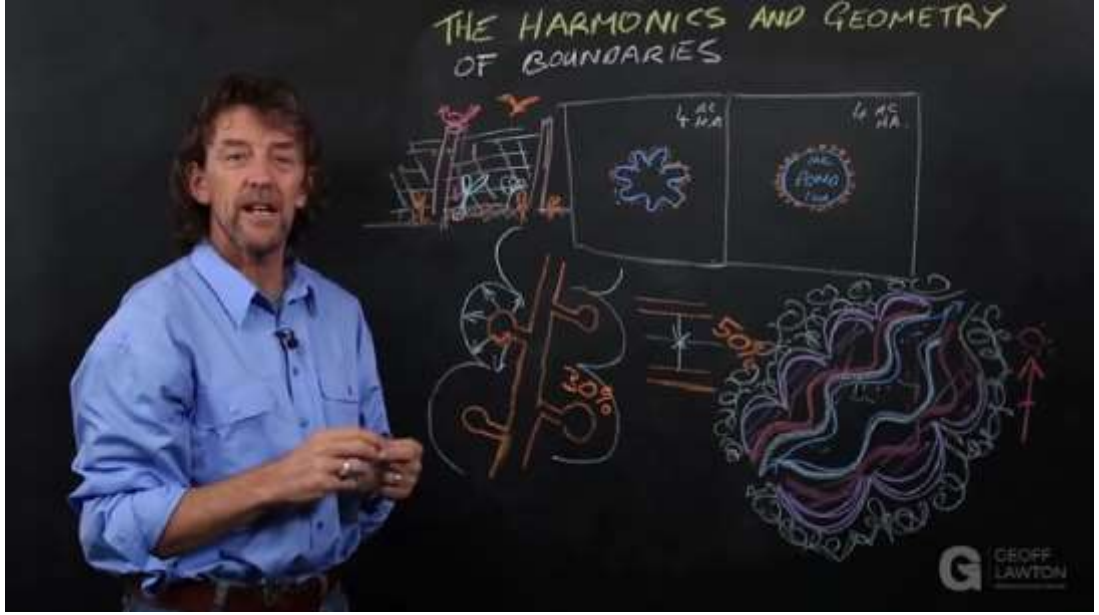


Dr. Elaine Ingham (PhD in 1981)



- Soilfoodweb School
  - Fundamental Courses
  - Certified Lab-Tech
  - Consultant Training Program
    - **Microbiome**
    - Make **biological** amendments
    - Microscopy
    - Turn dirt to soil

- Korean Natural Farming—Chris Trump
  - 2000 years of Korean/Japanese farming
- **Biology is most important ingredient**

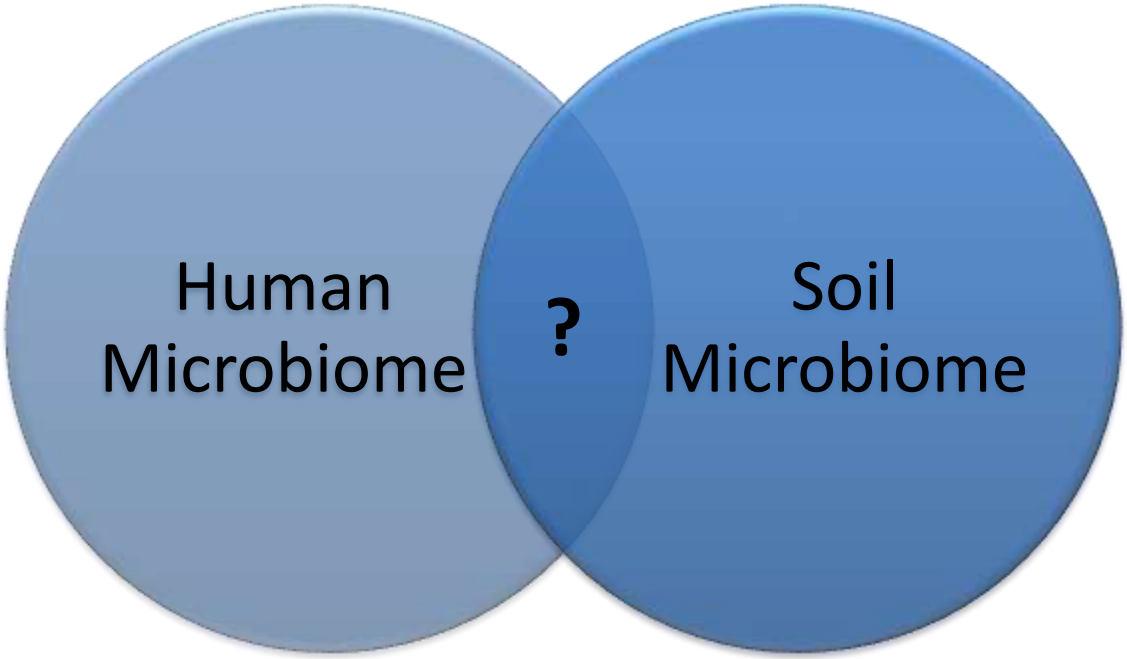


Geoff Lawton's

Permaculture Design Certification

The Soil!

- Injects nutrients & microbiome at bottom of the food chain



Dirt vs Soil

- Dirt–physical rocks, sand, silt & clay
- Soil—living skin of the planet
  - Handful of healthy soil has more critters in it than people on planet earth
  - Not just there for the “hell of it”

But, Dirt's Taking Over

- Modern agriculture focused on "chemistry"
- What kills biology?
  - Excessive Tillage
  - Chemical Fertilizers (N, P, K)
  - "icides"...Herbicides & Insecticides



Soil to Grass to Beef to Me

Plants--Energy Accumulators

- Chemistry—minerals & chemical reactions
  - Ca, P, K, NO3, NH4
- Physics—electrical energy
  - Sunlight, moonlight, + ions, - ions
- Biology—microbiome workers
  - Leverage chemistry & physics to care for the plant

“Chemistry” Soil Test

Lab Number: 602069 **Sample Name:** TEST2 **Farm Name:**

Soil Results

pH		Phosphorus	Potassium	Calcium	Magnesium	Zinc	Iron	Manganese	Boron	Sodium
Soil pH	Buffer Value	P	K	Ca	Mg	Zn	Fe	Mn	B	Na
		Pounds per acre - Mehlich 1								
6.65		25 M	84 L	1842 S	140 S	2.3 S	17 S	20 S	0.5	12

Crop/plant Interpretation ranges on last sheet

L = Low, M= Medium, H=High, V= Very High, S = Sufficient

Additional tests, if they were requested											
Sulfur	Nitrogen			Carbon	C/N Ratio	Organic Matter	Soluble Salts	Particle Size Analysis - Hydrometer Method			
LBS/ACRE	NH4-N ppm	NO3-N ppm	Total N %	%	%	%	dS/m	% Sand	% Silt	% Clay	Soil Texture
						3.3	0.03	20	64	16	Silt Loam

INTERNATIONAL AG LABS
A BIOLOGICAL APPROACH TO AGRICULTURE
PHONE 507-235-6909 FAX 507-235-9155 P.O. BOX 788 FAIRMONT, MN 56031

NAME:	Kevin Krause	**DATE:**	02/12/24
		SAMPLE TESTED:	TA1 Bottom
ADDRESS:	4447 Dry Fork Road		Bio/Clean
		Plot Size:	1 Acre **Sq. Ft.**
CITY/STATE:	Hampshire, TN 38461	**2023 CROP GROWN:**	Very Little Bermuda
		2024 CROP:	Mix Clover, Chicory, Brome
		LAB TEST#	**299**

SOIL ANALYSIS REPORT

	UNIT	DESIRED RATIO	DESIRED LEVEL	LAB RESULTS
HUMUS			30-40	3
NITRATES	lbs. / Acre		40	8
AMMONIA	lbs. / Acre		40	6
PHOSPHORUS	lbs. / Acre	1P:1K	174	7
POTASSIUM	lbs. / Acre		167	214
CALCIUM	lbs. / Acre	7 Ca : 1 Mg	3000	1104
MAGNESIUM	lbs. / Acre		429	68
SODIUM	PPM		<35	6
ERGS	µS / Centimeter		200	144
ORP			28	22
pH			6.5	5.7
COPPER	PPM		0.8-2.5	0.5
IRON	PPM		10 50	69.2
ZINC	PPM		1-6	2.1
MANGANESE	PPM		10 50	21.5
BORON	PPM		0.8-1.2	Not Tested
SULFUR	PPM		30	Not Tested
ORGANIC MATTER	%		4%	Not Tested
FORMAZAN	PPM		600	Not Tested

Soil Index

0.03 : 1 P to K Ratio

16.24 : 1 Ca to Mg Ratio

Broadcast:
1 ton Soft Rock Phosphate
1 ton Low Magnesium Limestone
500 lbs. Gypsum
125 lbs. 11-25-0
125 lbs. Ammonium Sulfate
50 lbs. Magnesium Sulfate
40 lbs. Copper Sulfate

When Cattle Are Removed in Fall Apply:
2 qt. Z-Hume
2 lbs. Dextrose
20 gallons water
Note: This will help jump start trash decomposition.

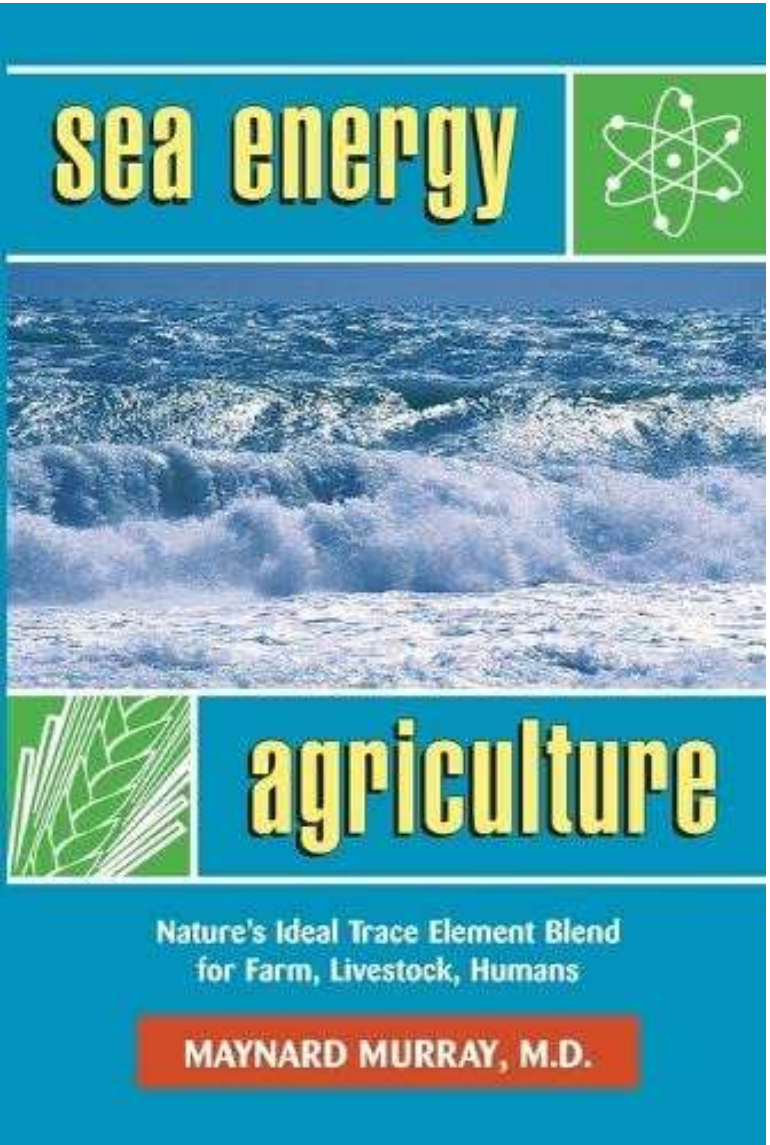
Chemistry--Minerals

- Dr Carey Reams (1903-1985)
  - Calcium: 2000 (lbs/acre)
  - Phosphorus: 400
  - Potassium: 200
  - Sulphur: 200
  - Nitrates: 300
  - Ammonium: 40
  - Iron: 40

Mineral Sources

- Rock--Sand, Silt, Clay
- Rock dust (Soft Rock Phosphate, Basalt, Azomite)
- Blood meal & Bone meal
- Sea salt (90 minerals)
- Organic matter (leaves, wood chips, etc)
- Commercial products—Good & Bad (N, P, K)
  - Potash (Potassium Chloride)
    - 60-125 lbs/acre = 15-31 ppm Chlorine (2-4 ppm pool)

Sea Water Minerals

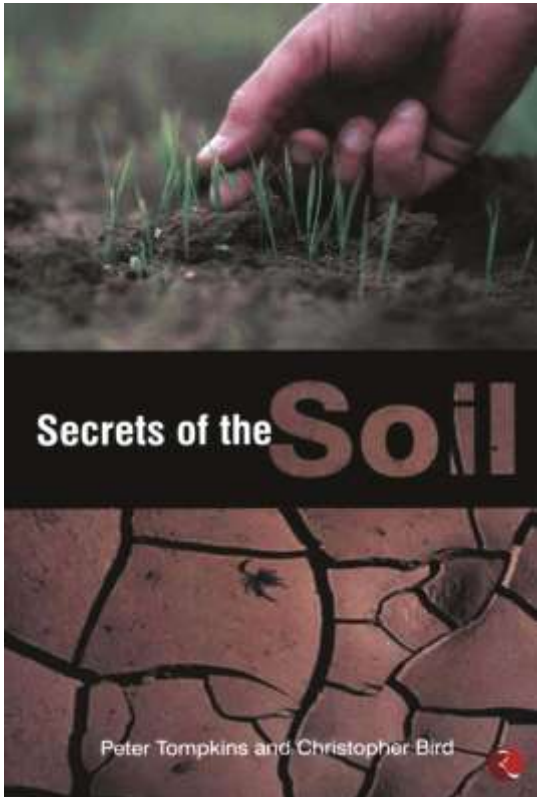


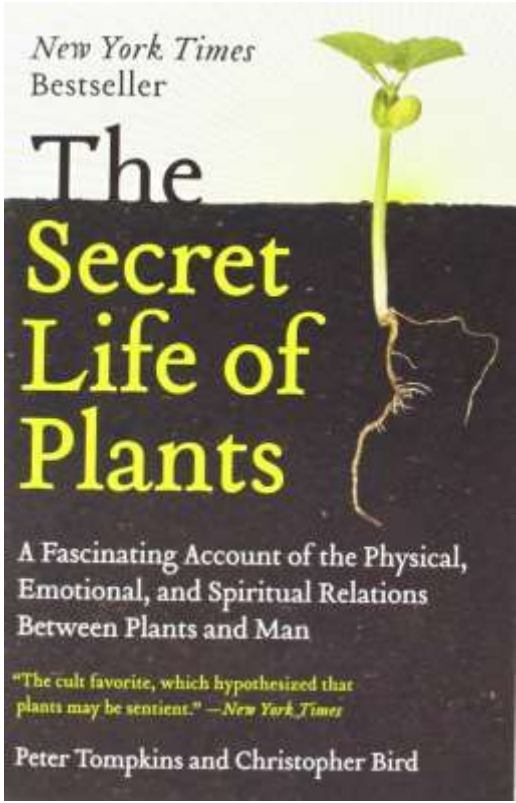
- Redmond or Sea 90
- 200-2200 lbs/acre

- HighBrixGardens.com
  - 43 lbs/acre
  - 43 oz/acre (water)

Physics

- Sunlight, Moonlight, Starlight
- Earth's Magnetic Field (Trees N/S)
- Song birds
- Music
- Your energy



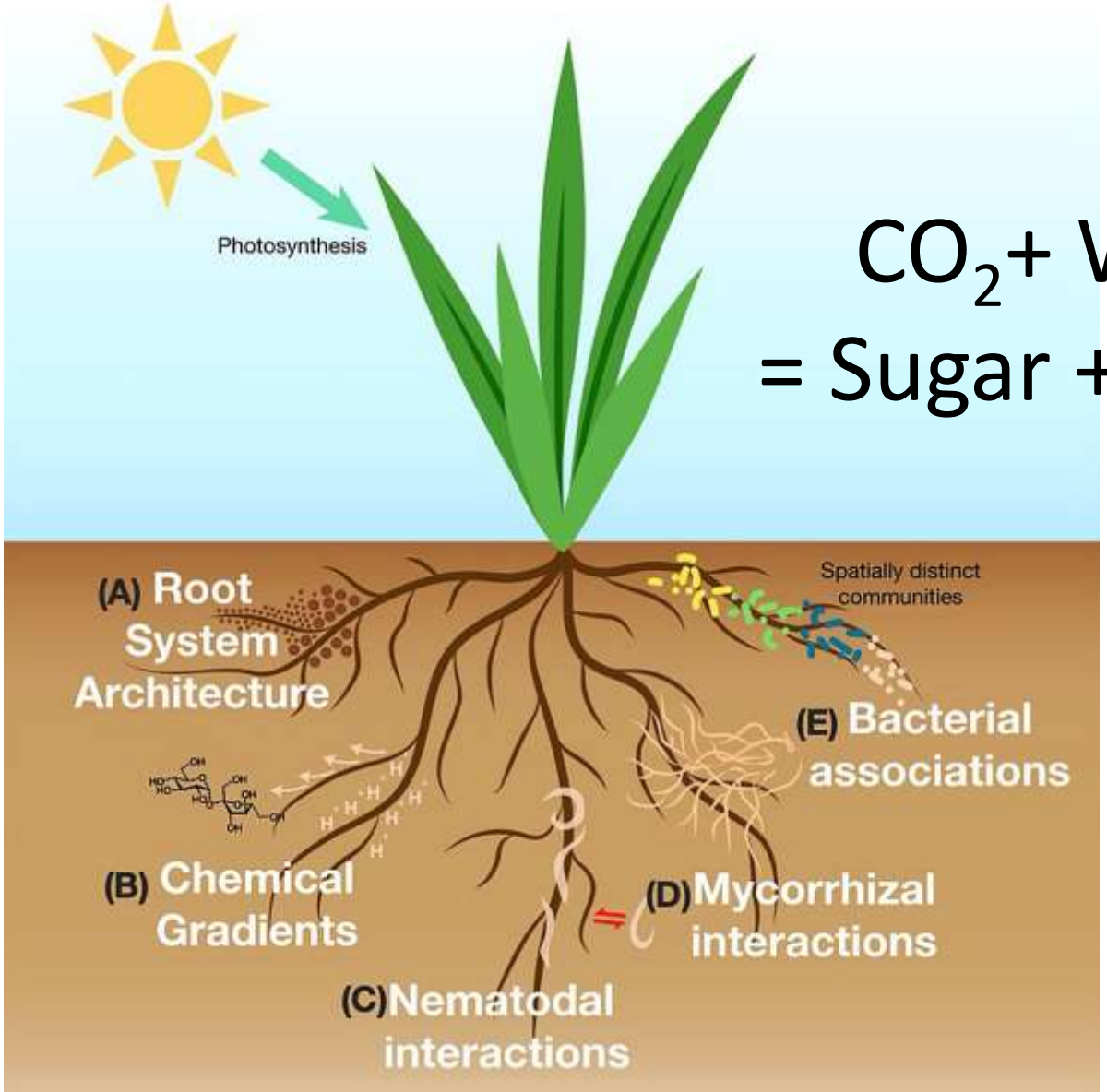


Biology
Plants have Microbiome Too!!

- Caretakers of the plants
  - Live on and inside
  - Recycle nutrients (dead plants/animals)
  - Harvest minerals from sand, silt, clay
  - Make Vitamins & Enzymes plant can't
  - Create humus
  - Diversity keeps all "in check"

- Inject Nutrient Density at bottom of food chain

Nutrient Density

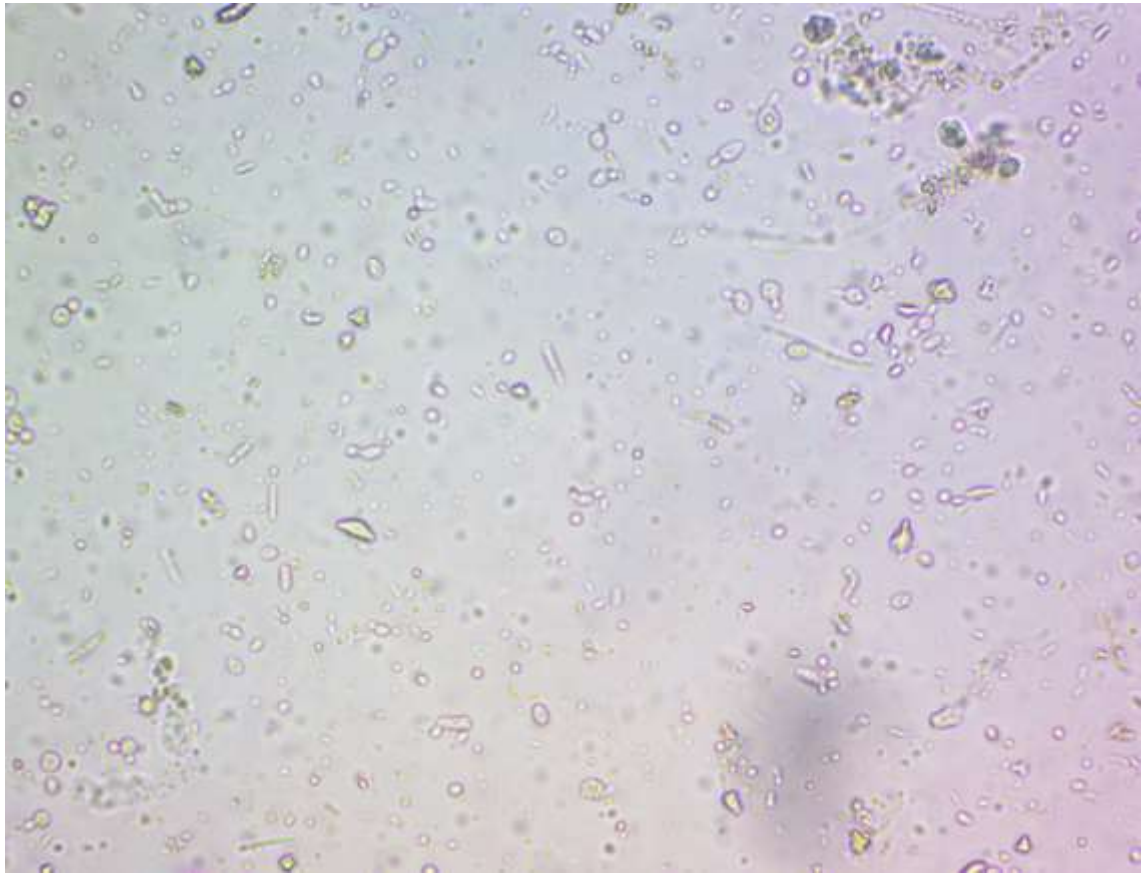


CO_2+ Water
= Sugar + Oxygen

Photo Source: Soil Science Society of America

Bacteria

- Recycle simple organic matter
  - Manure, alfalfa, green grass (Green, high nitrogen)
  - Fix nitrogen



Fungi

- Recycle more complex organic matter
  - Wood chips, leaves, straw, etc (woody, high Carbon)

Photo Source: Israel Chemicals Limited Growing Solutions

Protozoa--Predator

Nematodes--Predator

Industrial Mindset

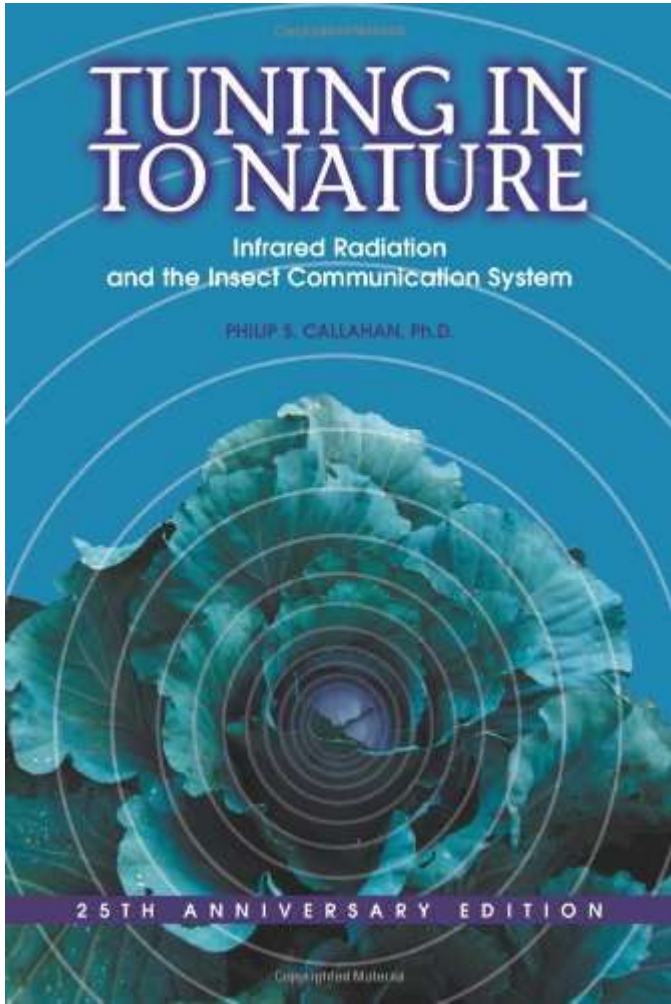
- Plants attract insects and pathogens
  - Root cause—lack of pesticide(s)
- Weeds always grow
  - Root cause—lack of herbicide(s)
- Humans feed plants
  - Root cause—lack of chemical fertilizer (N, P, K)
- Farmer paid for quantity
  - Quality doesn’t really matter!

Your Mindset

- Sick plants attract insects and pathogens
  - Root cause—poor soil health
- Weeds grow best in “poor” soil
  - Root cause—”poor” soil health
- Biology feeds plants
  - Recycled plants & animals
  - All 90 natural minerals—sand, silt, clay
- Quality is all that matters
  - It’s FOOD—your health depends on it!

Insects

- Nature's garbage collectors
  - Sick plants radiate off-frequency
  - Get Brix ≥ 12

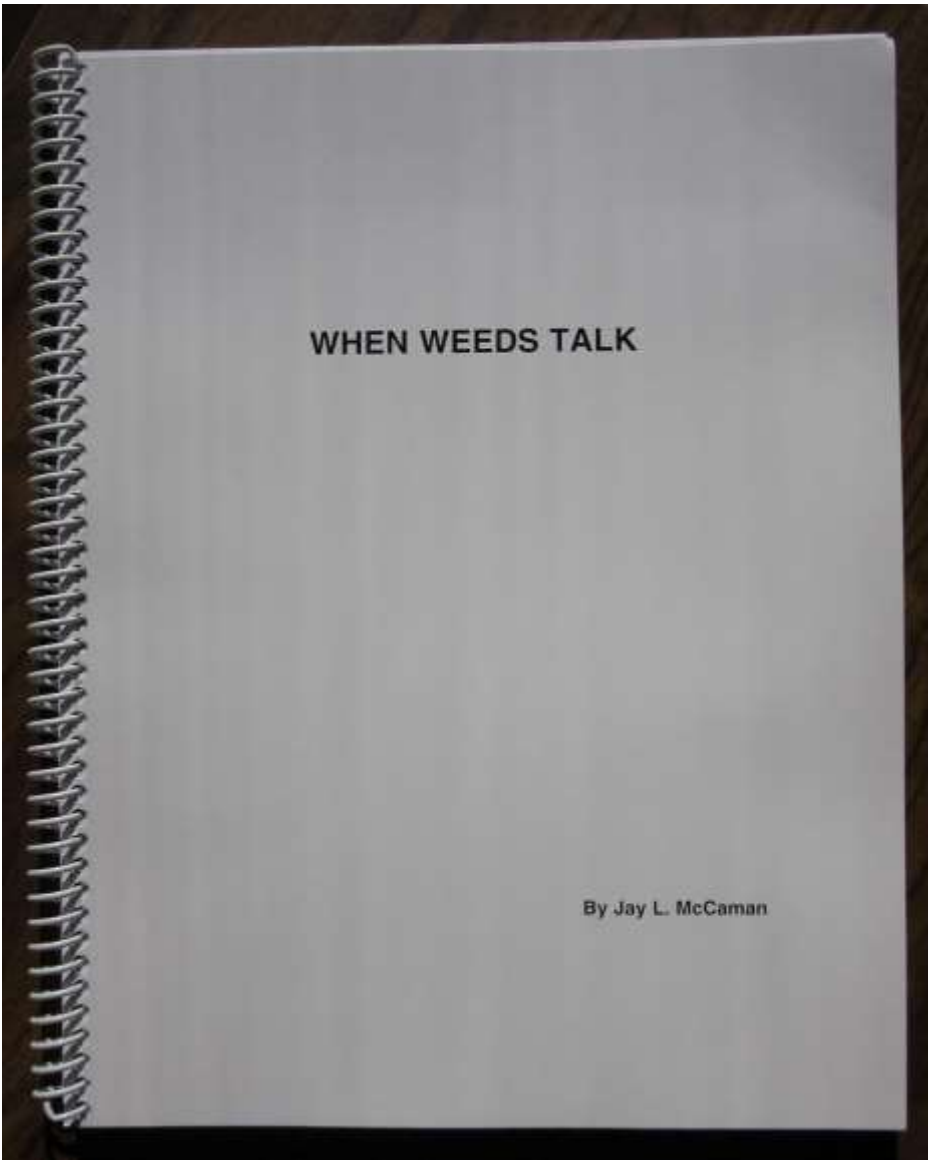


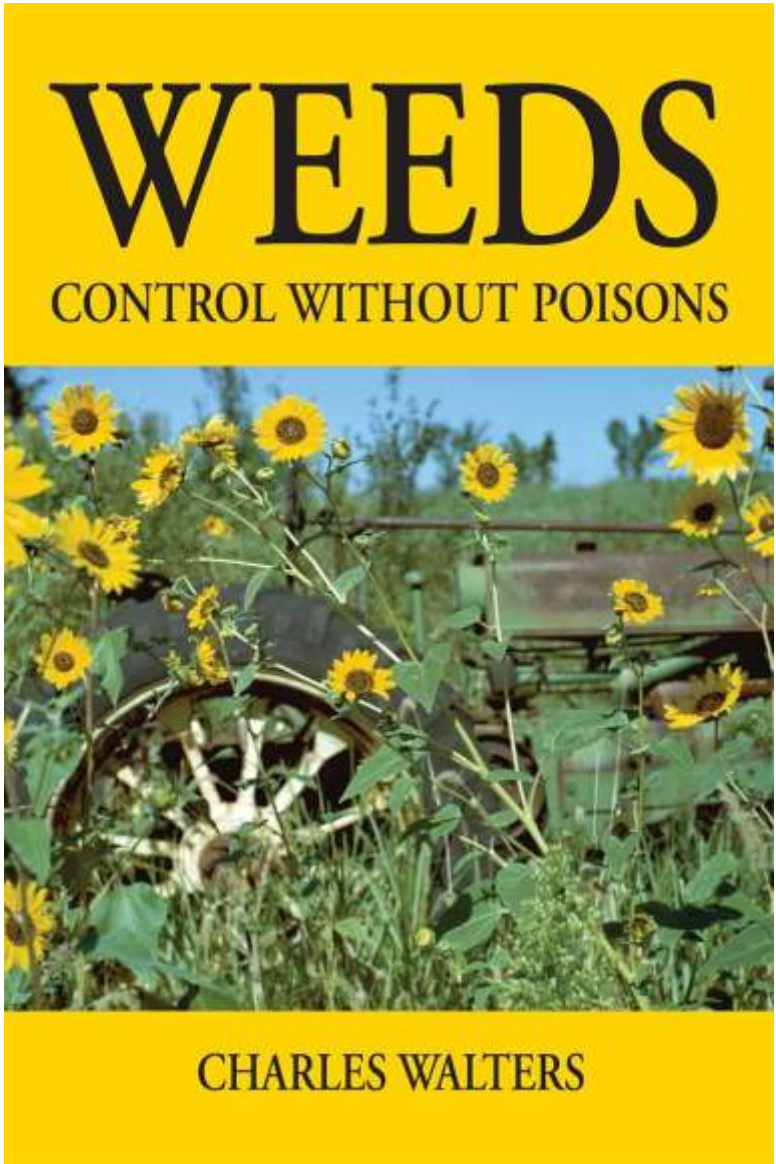
Weeds

- Workers preparing the ground
  - Building up what's missing (ie Ca)
  - Manage for what you want vs what you have



Weeds

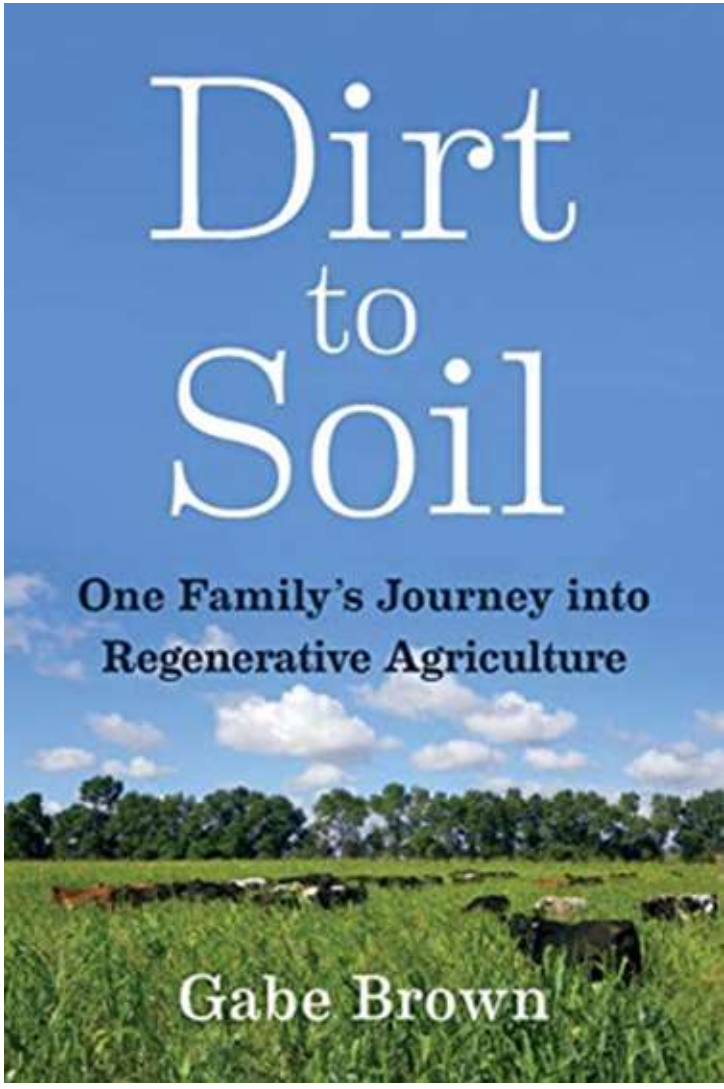

WHEN WEEDS TALK
By Jay L. McCaman


WEEDS
CONTROL WITHOUT POISONS
CHARLES WALTERS

Do This! Regenerative Agriculture

- Farming & grazing principles:
  - Limit Disturbance
  - Armor the Soil Surface
  - Build Diversity
  - Keep Living Roots in Soil
  - Integrate Animals

- Urban Landscaping Too!!



Microbe Farmer

- Become a MICROBE FARMER!!
- Microbiome Needs…
  - Air
  - Water
  - Food
  - Comfort (Shelter)

Bread Dough

- You've been a MICROBE FARMER!!

- Microbes +
  - Air
  - Water
  - Food (Sugar & Flour)
  - Comfort (Warm Place to rise)

Sources of Microbes (Yeast)

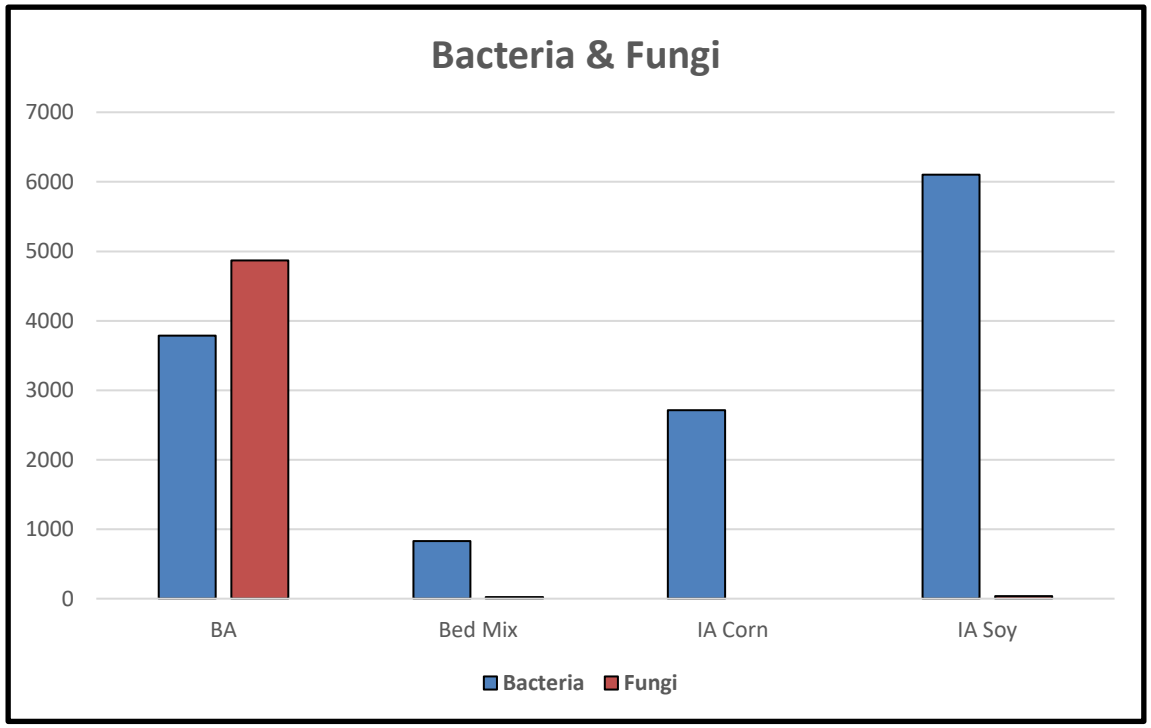
- Livestock & Manure
- Earth Worms
- Static Composting (Leaves, grass clippings)
- Vermicomposting (Red Wiggler Worms)
- Thermophilic Composting
- Dr David Johnson/Su Bioreactor
- Korean Natural Farming
- Raw Milk
- Commercial Products

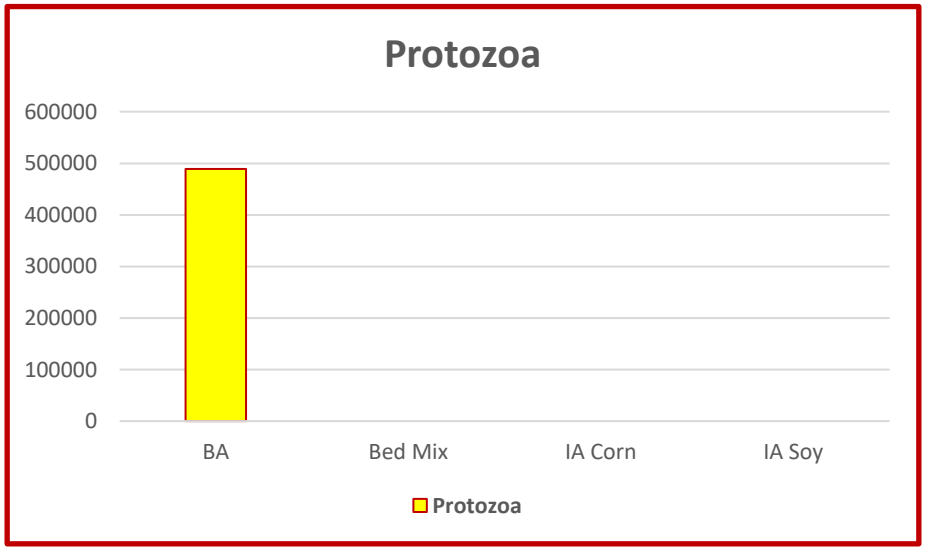
Extract Demo

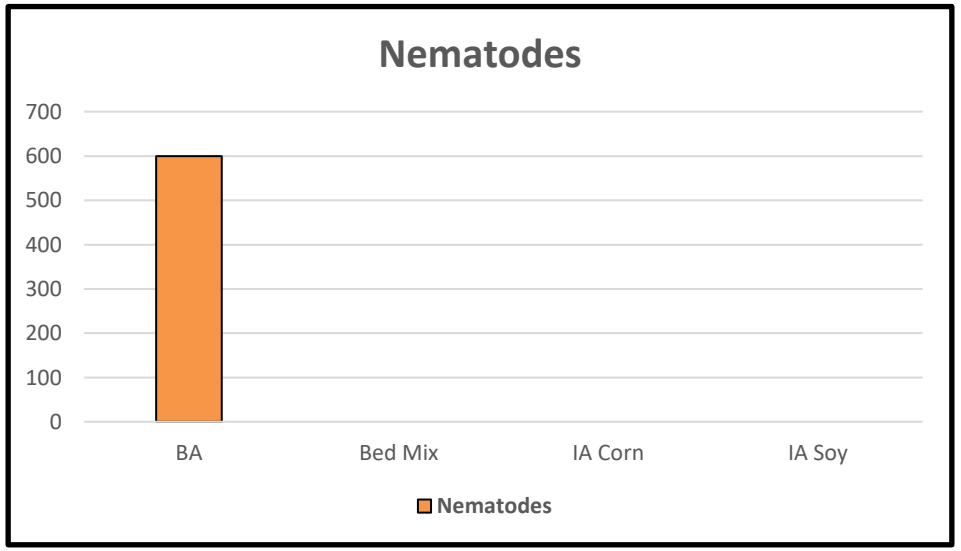

MAYTAG

AFExtractDrenchResults_2022-04-11

Beneficial Microorganisms	Sample Results
Bacterial Biomass (µg/g)	724.142
Bacterial Standard Deviation Biomass (µg/g)	87.835
Bacterial Standard Deviation as Percentage of Mean	12.10%
Actinobacterial Biomass (µg/g)	0.167
Actinobacterial Standard Deviation Biomass (µg/g)	0.16
Actinobacterial Standard Deviation as Percentage of Mean	95.90%
Fungal Biomass (µg/g)	851.77
Fungal Standard Deviation Biomass (µg/g)	882.451
Fungal Standard Deviation as Percentage of Mean	103.60%
Fungal Average Diameter - Weighted Mean (um)	6.881
F:B Ratio	1.176
Total Beneficial Protozoa (number/g)	136953
Flagellates (number/g)	61629
Flagellates Standard Deviation (number/g)	19519
Flagellates Standard Deviation as Percentage of Mean	31.70%
Amoebae (number/g)	75324
Amoebae Standard Deviation (number/g)	22968
Amoebae Standard Deviation as Percentage of Mean	30.50%
Bacterial-feeding Nematodes (number/g)	21
Fungal-feeding Nematodes (number/g)	0
Predatory Nematodes (number/g)	0
Detrimental Microorganisms	
Oomycetes Biomass (µg/g)	0
Oomycetes Standard Deviation Biomass (µg/g)	0
Oomycete Standard Deviation as Percentage of Mean	0.00%
Oomycetes Average Diameter - Weighted Mean (um)	0
Ciliates (number/g)	3424
Ciliates Standard Deviation (number/g)	4688
Ciliates Standard Deviation as Percentage of Mean	136.90%
Root-feeding Nematodes (number/g)	0
Total Beneficial Protozoa Standard Deviation (number/g)	35807
Total Beneficial Protozoa Standard Deviation as Percentage of Mean	26.10%


Bacteria & Fungi
7000
6000
5000
4000
3000
2000
1000
0
BA
Bed Mix
IA Corn
IA Soy
Bacteria
Fungi


Protozoa
600000
500000
400000
300000
200000
100000
0
BA
Bed Mix
IA Corn
IA Soy
Protozoa

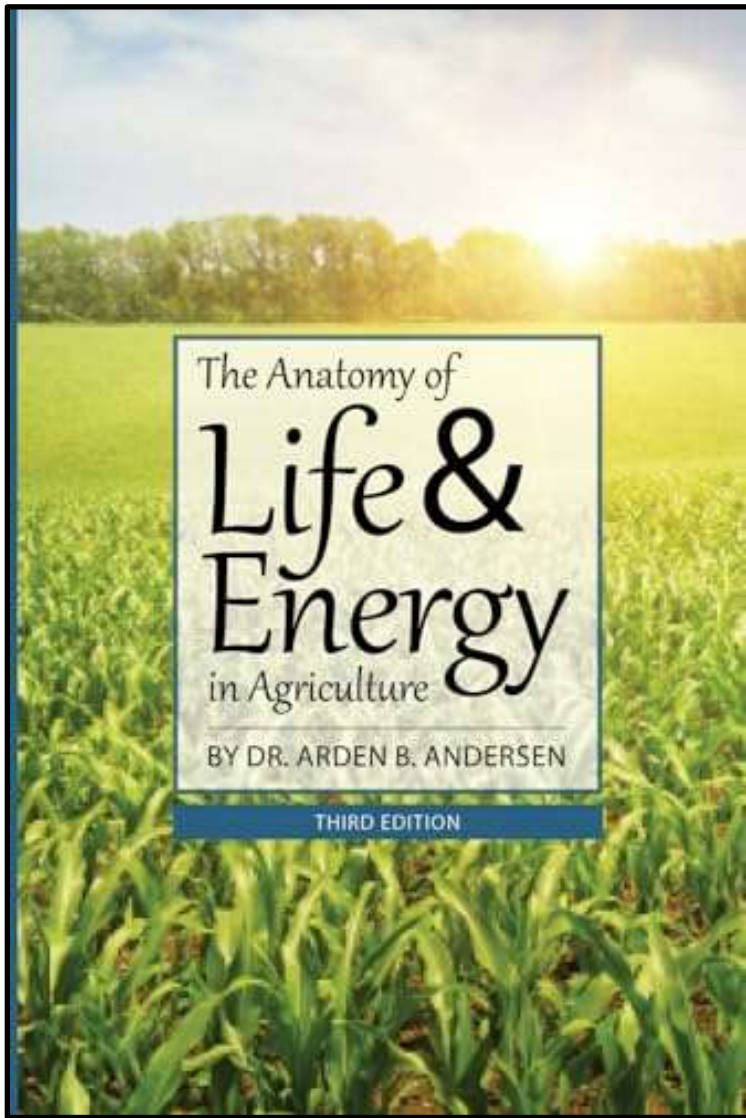

Nematodes
700
600
500
400
300
200
100
0
BA
Bed Mix
IA Corn
IA Soy
Nematodes

Garden Repair

Garden Repair

Dr Arden Andersen

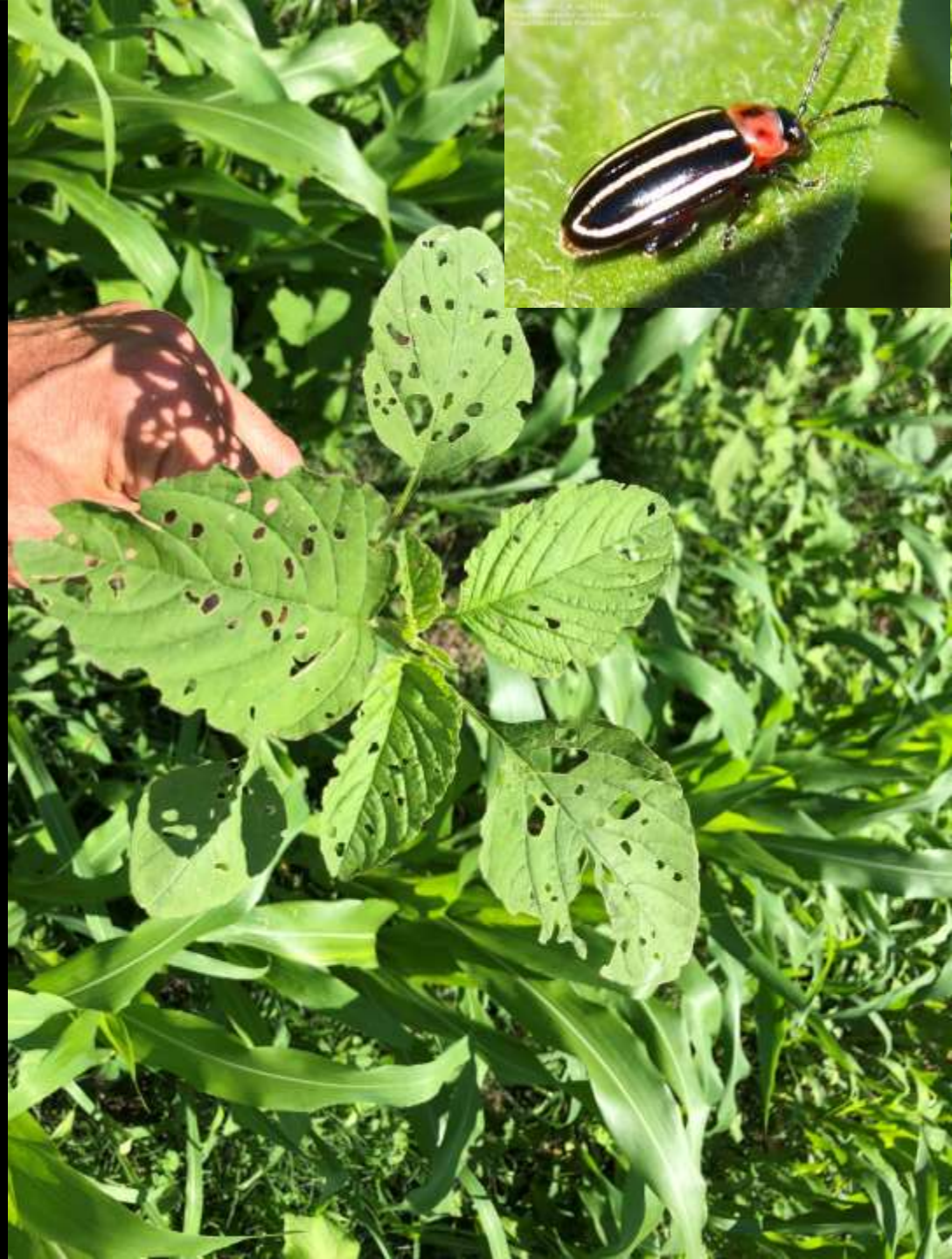
- (All per 1000 $ft^{2)}$
- Soft Rock Phosphate 12 lbs
- High-calcium lime 23-46 lbs
- Ammonium sulphate 2.3 lbs
- Compost 12-184 lbs



Foliar Sprays--KNF

From Scratch

- Build soil from ground up!
- Easy Recipe: Carbon (microbiome food)
  - Wood chips, old hay, straw, bedding, etc
  - Inoculate with biology
  - Cover plants



From Scratch—David Yarrow (Article: Soil Carbon Sink)

- Better Recipe: Lasagna—alternating layers
  1. Rough biomass (wood chips as much as 12”)
  2. Manure
  3. Biochar & Minerals
  4. Soil or dirt
  5. Finer biomass (leaves or hay)
  6. Repeat Layer 2
  7. Repeat Layer 3
  8. Repeater Layer 4
  9. Water and inoculate top layers (Boron, bone & blood meal, volcanic rock dust, Azomite, Sea Salt)

Biochar

- Like charcoal, but pyrolysis process
- Not a fertilizer but a facilitator
  - "Coral Reef" for microbes & minerals
- Terra Preta soils in the Amazon Basin

Cardboard, Log Chunks (Hugelkultur)

Wood Chips, Chicken Manure

Biochar, Compost & Topsoil

Leaves, Manure, Compost & Topsoil, Water

Biology, Compost & Topsoil, Meals/Dust/Salt

Biology, Compost & Topsoil, Meals/Dust/Salt

Richard Cleve’s Pasture Garden

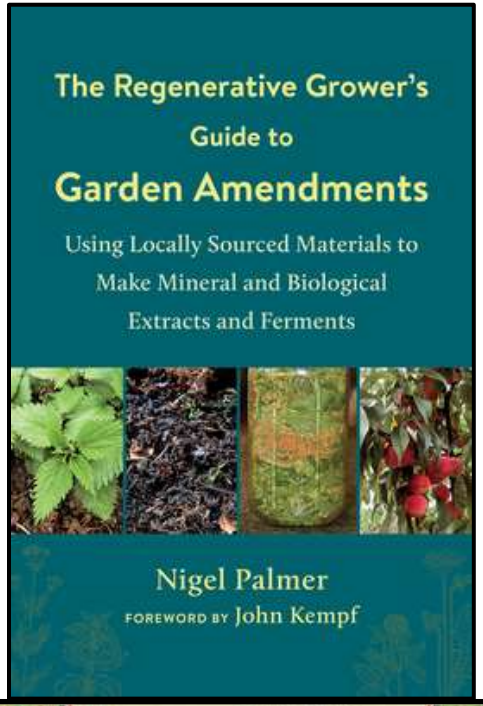
Caution for Materials

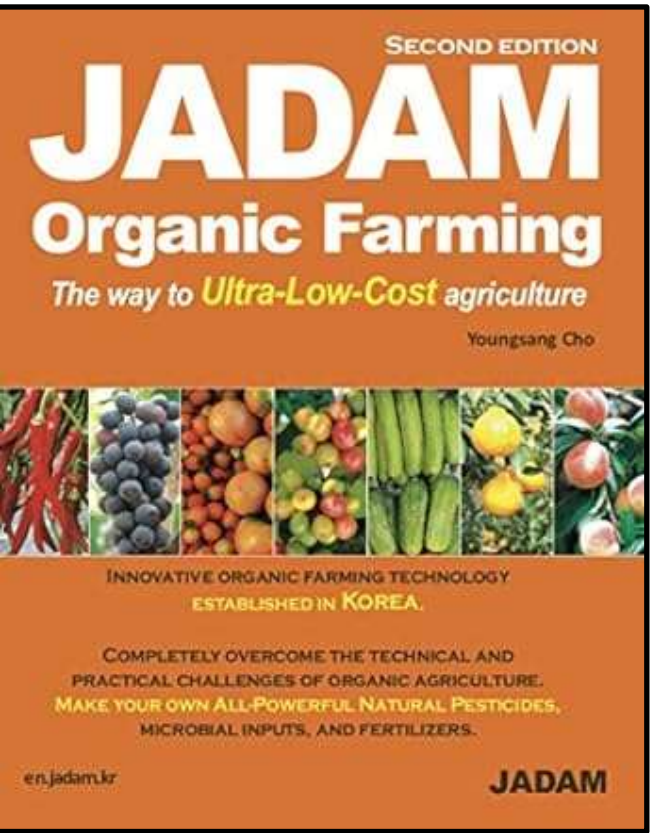
- Gather “organic” foods
  - If it’s lived once, it can live again!
- Bacteria & Fungi take it from there!

- CAUTION—Persistent Herbicides
  - NC State “Herbicide Carryover in Hay, Manure, Compost, & Grass Clippings”

Persistent Herbicides

- Corteva's Grazon® (Aminopyralid)
  - Broadleaf weed control in pasture


The Regenerative Grower's
Guide to
Garden Amendments
Using Locally Sourced Materials to
Make Mineral and Biological
Extracts and Ferments
Nigel Palmer
FOREWORD BY John Kempf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INNOVATIVE ORGANIC FARMING TECHNOLOGY
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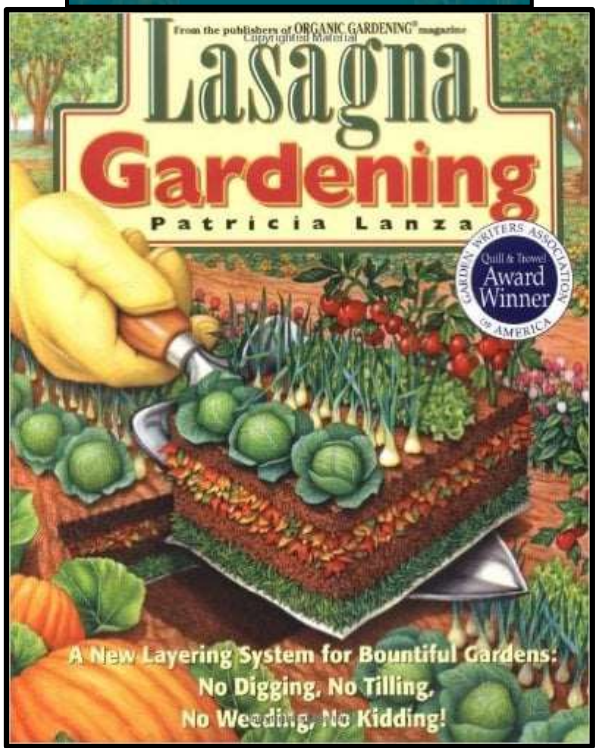
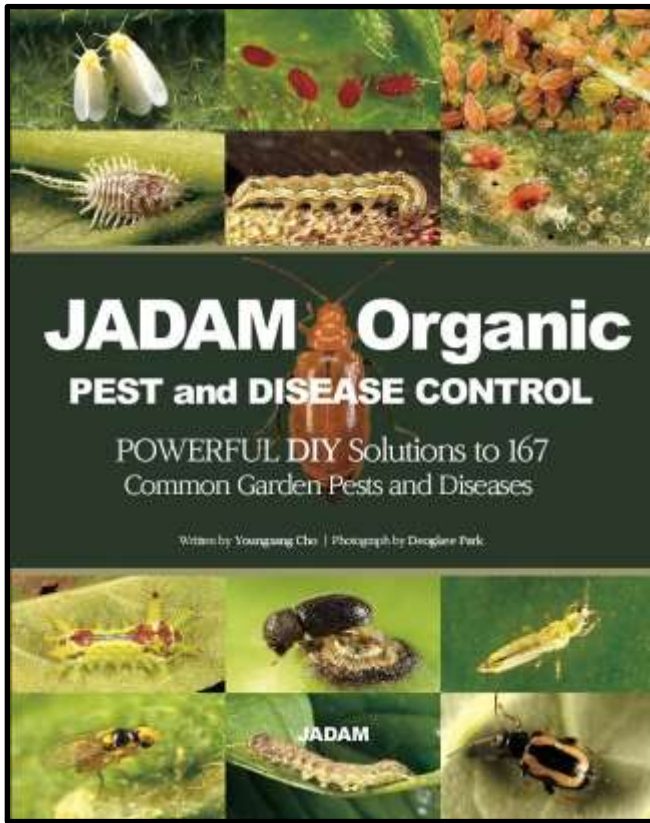

From the publishers of ORGANIC GARDENING® magazine
Lasagna
Gardening
Patricia Lanza
Quill & Trowel
Award
Winner
A New Layering System for Bountiful Gardens:
No Digging, No Tilling,
No Weeding, No Kidding!


JADAM Organic
PEST and DISEASE CONTROL
POWERFUL DIY Solutions to 167
Common Garden Pests and Diseases
Written by Youngsang Cho | Photograph by Deoglare Park
JADAM

Is it Nutrient Dense?

- Taste
- $20 Brix Meter/Refractometer
- Dr Carey Reams (1903-1985)

Refractive Index of Crop Juices -- Calibrated In % Sucrose Or ºBrix

	Poor	Average	Good	Excellent
FRUITS				
Apples	6	10	14	18
Avocados	4	6	8	10
Bananas	8	10	12	14
Blueberries	8	12	14	18
Cantaloupe	8	12	14	16
Casaba	8	10	12	14
Cherries	6	8	14	16
Coconut	8	10	12	14
Grapes	8	12	16	20
Grapefruit	6	10	14	18
Honeydew	8	10	12	14
Kumquat	4	6	8	10
Lemons	4	6	8	12
Limes	4	6	10	12
Mangos	4	6	10	14
Oranges	6	10	16	20
Papayas	6	10	18	22
Peaches	6	10	14	18
Pears	6	10	12	14
Pineapple	12	14	20	22
Raisins	60	70	75	80
Raspberries	6	8	12	14
Strawberries	6	8	12	14
Tomatoes	4	6	8	12
Watermelons	8	12	14	16
GRASSES				
Alfalfa	4	8	16	22
Grains	6	10	14	18
Sorghum	6	10	22	30

	Poor	Average	Good	Excellent
VEGETABLES				
Asparagus	2	4	6	8
Beets	6	8	10	12
Bell Peppers	4	6	8	12
Broccoli	6	8	10	12
Cabbage	6	8	10	12
Carrots	4	6	12	18
Cauliflower	4	6	8	10
Celery	4	6	10	12
Corn Stalks	4	8	14	20
Corn (Young)	6	10	18	24
Cow Peas	4	6	10	12
Cucumbers	2	3	4	5
Endives	4	6	8	10
English Peas	8	10	12	14
Escarole	4	6	8	10
Field Peas	4	6	10	12
Garlic, Cured	28	32	36	40
Green Beans	4	6	8	10
Hot Peppers	4	6	8	10
Kale	8	10	12	16
Kohlrabi	6	8	10	12
Lettuce	4	6	8	10
Onions	4	6	8	10
Parsley	4	6	8	10
Peanuts	4	6	8	10
Potatoes	3	5	7	8
Potatoes, Sweet	6	8	10	14
Romaine	4	6	8	10
Rutabagas	4	6	10	12
Spinach	6	8	10	12
Squash	6	8	12	14
Sweet Corn	6	10	18	24
Turnips	4	6	8	10

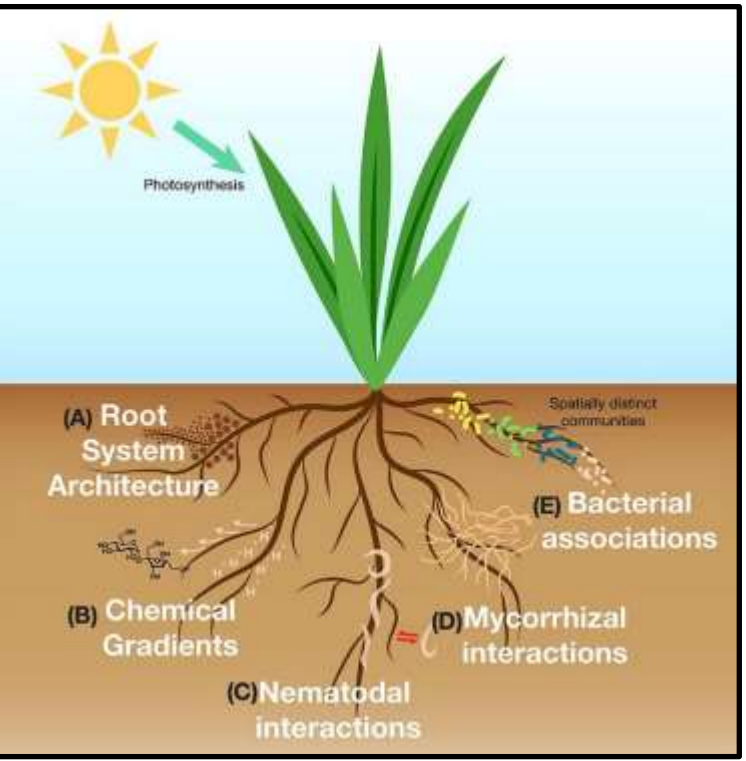
Within a given species of plant, the crop with the higher refractive index will have a higher sugar content, higher mineral content, higher protein content and a greater specific gravity or density. This adds up to a sweeter tasting, more minerally nutritious food with lower nitrate and water content, lower freezing point, and better storage attributes.



Scale Up to Pasture

Dr Ream's 80/20 Rule

- 80% of plant mass comes from the air
- 20% from the soil



Organic Matter:
100 lbs above & 100 lbs below
- 160 lbs air & 40 lbs soil

Cover Plant Diversity

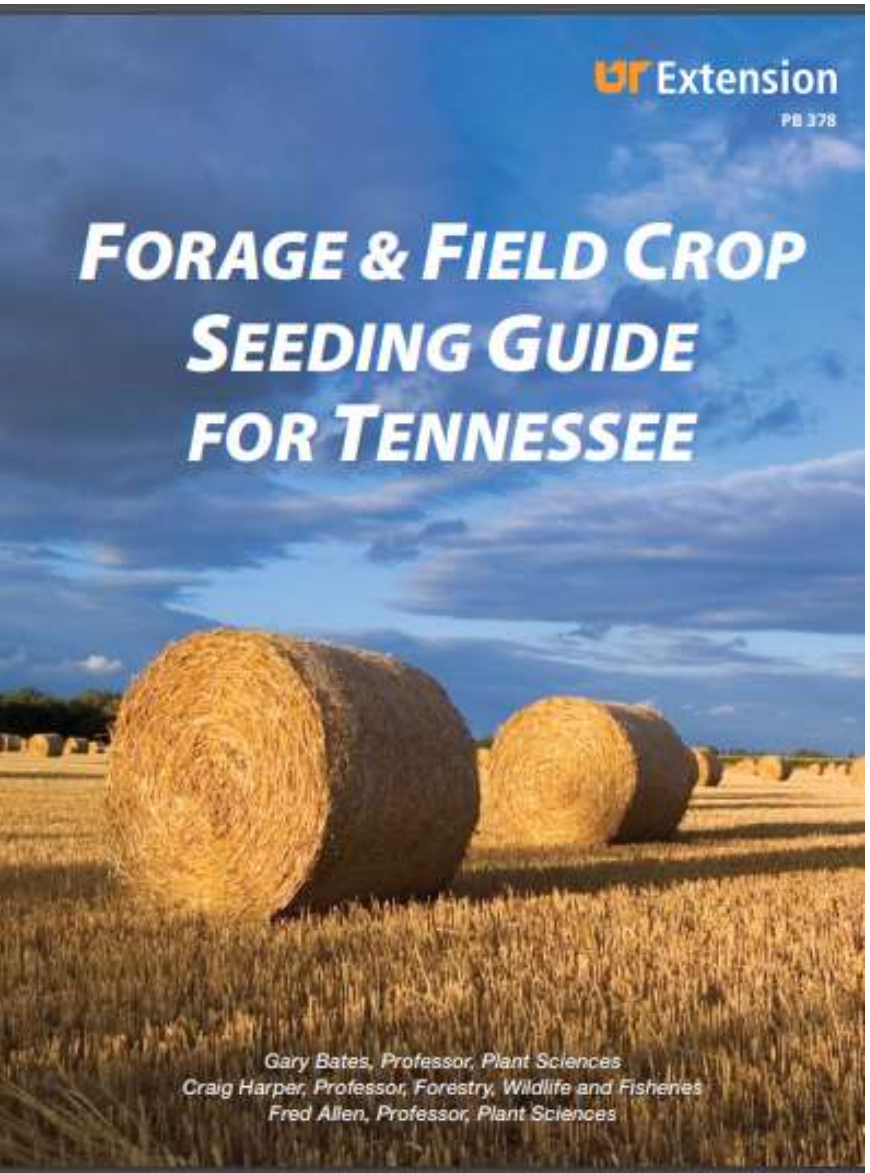


Photo Source: Soil Science Society of America

My Favorites

- Cool Season
  - Hairy Vetch, Austrian Winter Peas
  - Red & White Clover (4 & 2 lbs/acre)
  - Cereal Rye & Wheat
  - Orchardgrass

- Warm Season
  - Sorghum/Sudan
  - Buckwheat

- Green Cover (Greencover.com)

Rotational Grazing

Before: Broomsedge Bumper Crop

Scale Up to Row Crops

- Rick Clark in Indiana (7000 acres)

More Info

- www.Libertytracefarm.com
  - Book/Resource Tab
  - Classes on website & Social Media

Conclusion

- Recipe for Nutrient Density
  - Microbes + (Air, Water, Food, Comfort)
  - Plants + (Chemistry, Physics, Biology)
  - Nature takes care of the rest

- Go produce Nutrient Dense Food or support someone who does!