



Which Future Do you Want?

We Choose Every day

One Bite at a Time

Here is what you can do

A Comprehensive Solution

Premise

I love living in California. My son and I regularly go tide-pooling, and my husband and I scuba in the chilly nutrient rich waters off California's Central Coast. We enjoy hiking the invigorating peaks of Big Sur and other inland vistas. Simply put, we love this magical and inspiring area, but I am scared, deeply, deeply terrified. In a very short time I have watched the Kelp disappear before my eyes, and I have watched in horror as fires, increasing in severity and frequency, ragged up the tree that was the nesting place of our favorite California condor chick. I have stood back and witnessed our top soil being washed out to the ocean as our increasingly infrequent and intense deluge events occur. During my very short period of observation I have witnessed these events in greater frequency and intensity. This area had existed, evolved and regenerated, in all this majesty for thousands of years, and it is currently imploding. Peering outside my little pocket of the world becomes even more overwhelming as similar issues are plaguing each and every corner of our world. I am done watching, I am done being an inactive bystander, and it is time to do SOMETHING!

This devastating reporting is not new, it has monopolized our news cycles for years. There are endless documentaries, endless discussions, and endless agreements illuminating the problem. Yet it is still there, our legacy load of carbon, that is the carbon in the atmosphere that my son and his kids will have to live with because of our actions or inactions, and it is increasing every day. Scientist have predicted that the 1.5 degree Celsius global temperature rise that signifies the tipping point for a myriad of devastating irreversible climate changes is just five years away. An atmosphere full of carbon is not the legacy I want to leave my child. The conversation needs to be changed from stopping the devastation to repairing the damage already done. Ceasing all carbon emissions today is no longer enough, we need drawdown NOW!

So what have I done? Like most people, I have changed some bulbs to LED's, I drive a fuel efficient car, and I grow a garden, but all of these seem infinitesimal in comparison to the problem. I am exhausted hearing about the problem without a clear solution. This frustration has driven me to action.

What have you done? Do you know what you could be doing? Well read on my friend, in the pages that follow I will outline a plan for what can be done, starting now! I invite you join me in this pursuit to help our earth heal from the damage that we have done. I invite you to join me in leaving all of our children a home where they and their kids can experience the inspiration and beauty of this earth. But the situation is more dire, I invite you to join me in leaving our future generations a planet on which they can breathe, be healthy, feel sheltered, be fed, and in short, one where they can LIVE!

“In our every deliberation, we must consider the impact of our decisions on the next seven generations.”

- Ancient Iroquois Philosophy

Saving the Earth One Bite at a Time

Using Regenerative Agriculture to reduce Greenhouse gasses while preserving our ability to grow food for generations to come. Educating and Empowering others to create food, Regeneratively!

The way we feed the world has changed and it is having a profoundly negative effect. The current method of creating food is damaging the planet while simultaneously robbing the earth of its ability to heal from this damage. The solution is achievable and urgent, and lies just below our feet. Our soil is the largest carbon sink on earth, capable of sequestering vast quantities of Carbon. Repairing the soil and cultivating the natural carbon sequestration abilities of our planet has the power to not only halt climate change but reverse it, the tangential effects are immense. Think about that. Drawdown. Not only will we be able to stop watching the temperature of the earth rise, within our lifetime we could also see it start to cool!

This is not new, scientists have known about this problem for years, and the solution is as old as life on earth. A top down approach, through legislation and incentives, has proven unsuccessful in effecting change at the time scale that is necessary to evade unmitigated doom. The power of consumer driven change is immense, only through a consumer driven approach will change happen in the time frame necessary to save our planet from irreparable damage.

Key Takeaways:

We Can:

- Reverse Climate Change
- Prevent and protect against extreme drought, Replenish our Aquifers
- Protect and clean our waterways and ocean
- Reduce erosion, agricultural runoff and top soil loss
- Feed our communities & revitalize rural economies
- Increase nutrient density in food, Reduce obesity and disease
- Restore morality to the consumption of animal products
- Preserve biodiversity, protect native habitats

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Nutrients in Soil are disappearing

Synthetic fertilizers

Desertification

Water run off vs sequestration

Removed the Animals from the Land

Pollutants from livestock

We Can Fix This?

Change must be consumer driven

Consumers must be given a choice

Establish a blueprint farm

Fund and mentor an next generation

What you can do, JOIN US!

Introduction

Living in the central coast of California we are surrounded by agriculture. It is nearly impossible to get to this idyllic spot without driving through massive swaths of land that is void of all forms of life except the one that has been contrived to produce. Miles and miles of open dirt turned into an empty substrate to support a single, monocrop. This is not natural, this is not the way the earth is designed to support plant growth. When our food stops growing we further assault the land with more chemical inputs to manipulate the dead dirt to produce yet another crop, one more year. In 2014 the United Nations reported that we have only 60 years left of top soil. The past seven years have seen no measurable efforts to reverse this, the needle has not moved. We now have only 53 harvests left on earth to feed ourselves, and the clock is still ticking.

Degradation of soils has resulted in the collapse of the greatest civilizations on earth. The rich soils of the Tigris and Euphrates created the Fertile Crescent, an area so abundant it is known as the cradle of civilization. Depleting the soils resulted in the land being stripped of its life giving abundance and the civilization collapsed. What is there now are the war torn countries of Iraq, Syria, Lebanon, Egypt and Iran. According to Archeo-anthropologist Joseph Tainter, the Mayan civilization, just before its fall, ended up with a "high-density, stressed population, practicing intensive agriculture, living largely in political centers, supporting both an elite class and major public works programs, and competing for scarce resources." This quote draws a chilling similarity to our current society. Unlike the human race during these times, we do not have other land to move to, the current environmental collapse is worldwide. We have no back up planet, as Secretary-General of the UN, Ban Ki-moon, said "there is no Plan B ... as there is no Planet B."

Growing up my father worked as a mechanical engineer trying to get the world to use hydrogen and fuel cells as an alternative for transportation fossil fuels. He would always tell us that the transportation sector is responsible for 30% of the carbon released into the environment. He has been fighting his crusade for over 40 years. While fuel cells and other more sustainable methods of transportation are on a rise, what do you drive? What is fueling the car in front of you this morning on your commute? As a child, I always wondered where did the other 70% of CO₂ come from, and what happened to the 30% that accumulated during the past 40 years of his career? Agriculture is responsible for one-fifth of greenhouse gas emissions, electricity and heat generation account for another 25% with the balance being produced from industry, and other sources, including food waste which makes up a surprising 6.7%. The greenhouse gasses that accumulated during the last 40 years contributed to the legacy load. If we stop all greenhouse gas emissions tomorrow that legacy load will still be there, heating the earth, increasing extreme weather events, participating in mass extinctions, increasing the frequency of forest fires, which in turn release more CO₂.

Somewhere along the way Carbon has become the enemy. Carbon is the basis for all life on earth. We need carbon, just not in our atmosphere. The world's soils have been losing carbon at an alarming rate. The cultivated soils of the world have lost between 50 and 70 percent of their carbon stock. Earth's soils contain more than three times the carbon in the atmosphere (Oelkers & Cole 2008). The Carbon in the soils is also what allows it to support nutrient dense crops, reduce erosion, increase water retention, prevent rainfall runoff to recharge our aquifer, support transpiration to increase local rainfall, filter excess nutrients before they get into our water ways and ocean, creates drought tolerant growing conditions and many more benefits. The solution is simple, the carbon came from the earth; we need to return it there.

Soil Carbon Cycle

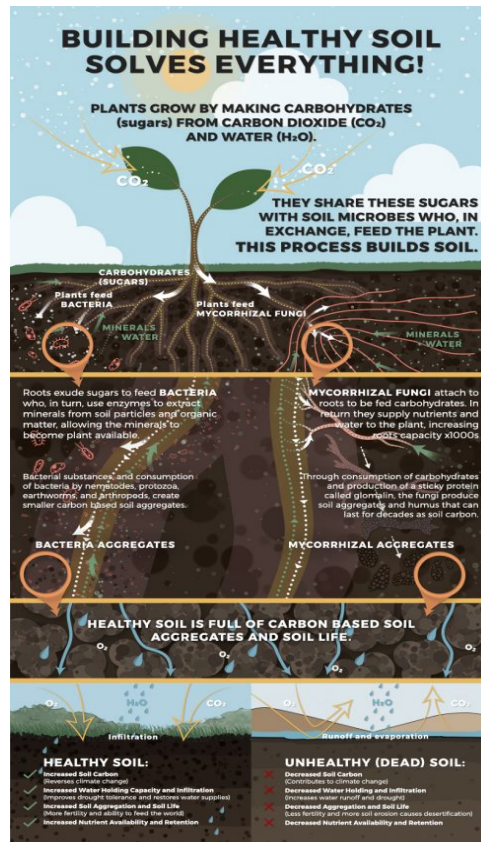
Soil is a living, breathing thing, and carbon is the backbone and the currency. Through photosynthesis a plant uses light and water to convert the CO₂ in the environment into carbohydrates. It is from the atmosphere that a plant gets nearly all of its carbon, the substance it needs to build and power itself. The plant trades up to 40% of the carbohydrates that it produces to feed the soil microbiology. This trade sequesters the carbon out of the atmosphere into the soil where it is stored in the bodies of the microorganisms there. When those microorganisms die, the carbon is safely locked up in the soil, where it belongs.

In a symbiotic relationship, bacteria around the roots provide a multitude of valuable resources to the plant. These bacteria mine minerals from the soils and present them to the roots in a form the plant can absorb. The very presence of the rhizobacteria forms a cluster around the root, preventing disease causing bacteria from entering the plant. These bacteria also secrete substances that help the plant deal with stress, that act as root antifreeze, and compounds which help the plant use water more efficiently to aid in times of drought. Without these rhizobacteria a plant can grow for a short period of time, but will be unhealthy, lacking the nutrients it needs to sustain life. Likewise, the vegetables and fruits created by that plant will be nutrient deficient. An unhealthy plant lacking rhizobacteria will be susceptible to diseases and pests.

Fungi also provide an important role in plant health. The rhizobacteria cannot move from the minerals to the plant roots, the roots of the plant cover a very limited space, as well they are too large to penetrate the smaller spaces between the soil particles. Most of the soil nutrients that plants and the rhizobacteria need are outside the absorption reach of the roots so the plant, and the bacteria form another relationship with mycorrhizal

fungi. Fungi can grow extremely fast. Mycorrhizal combine rapid growth, a tiny diameter and a dense branching structure to create a rapidly deployed sponge which that absorbs nutrients from the soil. The mycorrhizal network can expand the absorptive capacity of the roots but up to 1000 times. These networks are also comprised of carbon, which the plant draws out of the atmosphere. In a single teaspoon of soil there can be over a mile of these mycorrhizal hyphae.

Animals and the rest of the plant work to sequester Carbon as well. When parts of the plant die or animals leave droppings, the soil microbes feed on this litter as well. Earthworms are particularly adept at drawing these carbon deposits deep into the soil. They will come to the surface to feed on the litter, then burry deep underground where their deposits provide nutrient rich humus. This humus further increases the soil carbon. Humus also acts as a sponge holding nutrients, such as nitrogen in the soil where the plants need it, preventing in from running into our waterways. Humus also absorbs water, preventing it from flooding and running off the land, increasing plants. All of these structures create a strong soil that resists erosion.



PHC Film: Soil is a living organism
<https://www.youtube.com/watch?v=8ugaL6wsXME>

These bacteria, fungi as well as the nematodes, earthworms and all other life found in the soil comprise the soil organic carbon (SOC). The further down these carbon deposits go, drawn down by deep roots or soil life, the better sequestered they are. The amount of carbon the soil can hold in the form of these organisms and humus is astounding. The soil is capable of holding 2,500 Gigatons of carbon (Lal 2008) that is three times what is in the atmosphere. The world cultivated soils have lost between 50 and 70 of their carbon. The answer is simple, put the carbon back where it belongs, in the soil, and feed the world while doing so.

Regenerative agriculture!

What's Gone Wrong?

Tilling kills the microbiology of the soil. Exposing carbon to the air allows it to oxidize forming CO₂. For every ton of soil carbon lost nearly four tons of CO₂ is created. Direct carbon deposits in the form of dust are aerated and float into the atmosphere. Water that is in the soil evaporates. In one single pass the entire ecosystem of the soil is destroyed, leaving empty dead dirt as a substrate in which we try to plant crops. On the scale of big agriculture the amount of carbon released into the atmosphere is immense.

Without the microbiology in the soil, industrial agriculture turns to chemical inputs and more water inputs which bathe the roots in an excess of nutrients. In response the plant does not feed the microbiology as it no longer needs these inputs from the soil microbes. Without its natural disease and pest deterrents, industrial agriculture supplies the plant with chemical pesticides which further degrade the soils. Once the biome is gone the crops need more and more inputs to survive.

"A Mere 2% increase in the carbon content of the planet's soils could offset 100% of all Greenhouse gas emissions going into the atmosphere"

- Dr. Rattan Lal

As the soil dies it becomes more compacted and destroys the soil sponge resulting in deeper and deeper tilling. Deep tilling releases even more carbon into the atmosphere. More chemical inputs are added, and absorption abilities of the soil are further stripped. The soil becomes hydrophobic, lacking the ability to absorb any water or hold any nutrients. Without the soil absorbing the inputs and due to the limited reach of the roots without their mycorrhizal fungi allies, the vast majority of the water and chemical nutrients are unavailable to the plant. These then run off into our water ways where they cause unmitigated damage to the natural ecosystems of our waterways and oceans.

Technological limitations in the primitive plow slowed this damage, but the tractors of the industrial area have become

more and more efficient at ripping into the land. Modern day tractors are monument to destructive efficiency.

Once the land has been so depleted that it can no longer

support crops, industrial agriculture moves on to the next swath, leaving vast areas of desertification. According to the UN over 1/5 of the earth's entire land area is degraded and by 2050 over 90% of our agricultural land will be degraded.

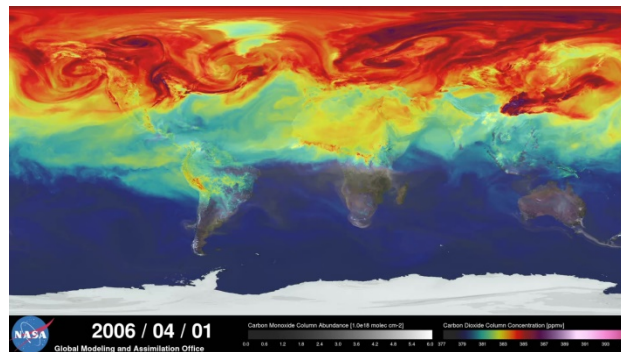
Once the land is degraded and the dirt hydrophobic, it repels water. When water does fall the land is unable to accept that water, the natural root pathways for the water to run down are gone, the water is repelled by the soil, resulting in surface run off. This causes massive erosion. Since the water never percolates through the soil, the aquifer never recharges. Most of these processes are focused around agricultural lands which are also the areas that are pulling water out of the aquifers in the greatest quantities. As aquifers get depilated and destroyed native vegetation starts to dry and forest

fires become hotter and more prevalent, releasing even more CO₂ into the environment. You don't have to look to the Middle East or Africa for examples of desertification, every farm land that is devoid of all life but a single supported crop is in some form of desertification. Nearly every farmed acre in the world is becoming desertified. Without the chemical inputs providing life support even those crops would die in the soil.

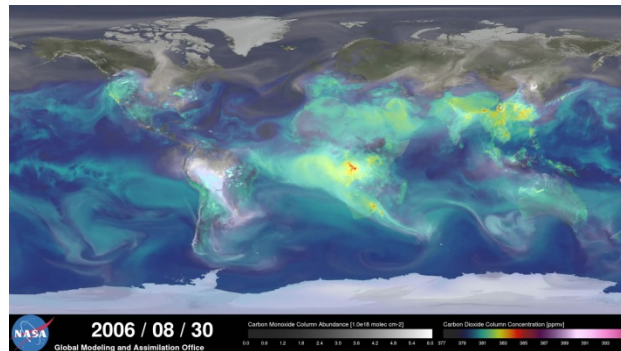
The natural forces that spurn the development of the soil microbiome have also been removed, preventing any hope of restoration. The ruminants that used to roam the lands in great herds of buffalo have vanished in favor of vast empty corn fields. Manure from animals such as cows, pigs, sheep, chickens and other live stock is full of the nutrients and microbes needed to recharge the soil biome. The roaming buffalo built the deep topsoil of the Great Plains. It takes 1000 years to build three centimeters of healthy soil, and only moments for it to blow away. These soils are still being lost at an alarming rate.

"if current rates of degradation continue all of the world's top soil could be gone within 60 years"

- Senior UN official, 2014



The destructive nature of tilling is apparent, after a season of tilling the CO₂ concentrations in the atmosphere surge



The regenerative capacity of plants to sequester carbon is immense. After a 5 month growing period the plants have sequestered enormous amounts of Carbon back into the soil.

With the livestock removed from the fields and placed in confined on concentrated animal feeding operations (CAFO), nutrients that are so desperately needed by our depleted soils are also concentrated. These concentrations of waste are so vast they overwhelm the ecosystems, poisoning waterways and oceans. The large amount of mismanaged waste also produces enormous amounts of greenhouse gasses. The deplorable conditions that the animals are forced to suffer through their entire lives is immoral.

Our health also pays a high price for the agricultural system. Proponents of a plant based diet have been heralding and the health benefits of eating more plants for a long time, and the science behind these benefits is undeniable. Most of the fruits and veggies available to the consumer are not the ones our grandparents grew up consuming. Our current vegetable options have been bred for ease of transport and to facilitate traveling an average of 2500 miles before it reaches the consumer. Delicious nutrient dense foods are not available to us in the store, and health crises are on the rise. It is estimated that in 2024 the multivitamin industry will swell to \$300 Billion. These are nutrients that have throughout the eons been bio available to us through our food, food which is now deficient.

“Healthy soil equals healthy food, equals healthy people, equals healthy ecosystems and equals a healthy planet.”

- Dr. Rattan Lal

There is a solution to all these problems. It's the soil! We have a powerful ally in this fight. Nature! We can rebuild this system and feed the world while doing so.

We Can Fix This!

So what's stopping us? In 2019, agriculture, food, and related industries contributed \$1.109 trillion to the U.S. gross domestic product (GDP). That is a lot of money that could be spent on producing food re-generatively. But were you given a choice in how you wanted your food dollars to be spent? Was there a regenerative carrot, next to the conventional carrot? Would you know the difference? Would you know where to find a regenerative carrot?

While legislation is currently being evaluated and will be helpful it will not do enough, fast enough. It is irrational to believe that we are going to change the established agricultural system that is set in their ways. The change needs to be consumer driven, and the American consumer is primed for this change. The effects of climate change are becoming undeniable. Every aspect of American life is being bombarded with these effects from flooding in the Midwest, hurricanes of increasingly devastating strength, tornados unrepresented in severity and frequency and massive forest fires in the west. If there was a solution that people could participate in to mitigate these calamities, the public has shown again and again they would. What we need is a regenerative carrot (many regenerative carrots, and some peaches and kale too)!

Regenerative agriculture does have a certification but it is in its infancy. There are very few farmers carrying this certification, and even fewer vegetables in the market with the certification. The average person does not even know the certification exists or why it is important. We want to get regenerative carrots in front of people give people the option to do what it will take to save this planet. This is going to require education for both the public and a next generation of farmers. It is also going to take financial support for a new generation of farmers wanting to overturn the status quo of farming to preserve a food system for 61 years and beyond.

We are Saving the Earth One Bite at a Time, a 501(3) non-profit, a group with a fervent drive to fix the problems humans have created on this earth, and to leverage our extensive backgrounds in science, agriculture, ancient farming practices, livestock

management and business to effect change for a better planet.

We envision a large fully regenerative farm, with a strong agritourism element, that can act as a blueprint to be emulated. While there are several pioneers that implement regenerative techniques, there is not one place that is using a holistic all-encompassing strategy. Leveraging our knowledge of regenerative techniques to sequester carbon in the soil and water in the aquifer, while also implementing sustainable energy generation through onsite solar and wind, and implementing a fully sustainable fleet zero emission farm equipment.

This is a farm that can act as a learning ground for the next generation. It will also be a reach out site for the public to visit and understand the power and strength of regenerative agriculture, cultivating a consumer driven demand for such food sources. The farm would also be a place for science to further track and research the enumerable benefits of regenerative agriculture. Such a place would also serve as prototype for many methods of sustainability and regeneration, upon which governments could reference in making new climate safe policies.

One farm is a start but won't change the world. Having lower input costs means this type of agriculture actually has higher profit margins, we intend to use these profits to fund a new generation of farmers wanting to farm regenerative. Through mentorship, education and funding we will leverage the success at our home farm to propel this type of agriculture in to main stream.

We invite you to join us in this endeavor. These pages are intended to be about action, not an armchair discussion of the problems. We are currently seeking initial donors and grants to get the farm established. We are also interested in members that join us through monthly donations. Please visit our website savingtheworldonebiteatatime.org to see more ways you can participate. Or reach out by phone (831).... If you found these pages compelling please send copies to everyone you think would be interested. As we start to get regenerative products to market, invest your food dollars in a carrot that is certified regenerative organic (kale, peaches, chicken and corn too!). Make choices to support an agricultural system that is working to benefit the plant, not destroy it!

More Inspiration

Below are a list of videos and books that I have found to be very informative and inspirational.

Books

Paul Hawken – “Draw Down”

Nichol Masters – “For the Love of Soil”

Gabe Brown – “Dirt to Soil”

Kristin Ohlson – “The Soil Will Save Us”

Michael Pollan – “The Omnivore’s Dilemma”

Masanobu Fukuoka – “The One Straw Revolution”

Mark Shepard – “Water for Any Farm”

Movies

The Biggest Little Farm

Kiss the Ground

Fantastic Fungi

The Organic Life

Sacred Cow

Food Inc.

King Corn

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