What Caused the Death of Oakdale?

A tale of one Nebraska community destroyed by energy and trade, with the help of the US government.

Oakdale is one of dozens of small towns dotting the Elkhorn Valley of Antelope County in northeast Nebraska. And as pioneers settled the valley in 1870s, a great diversity of products sprang from its fertile soils. The rich historical accounts depicted in *Antelope County History* (Leach 1909) tell of the building of a great American tale. Oakdale once produced an over-abundance of oats, wheat, corn, potatoes, pumpkins, and a great diversity of squash and root crops. "Potatoes were so plentiful as to be of little value," wrote A.J. Leach. And if vegetables and grain were inadequate in any given year, the entirety of Antelope County was rich in oak and cottonwood timber, cattle, wild game, and more. From such abundance Oakdale grew into a thriving community humming with 100's of family farms and their value-added goods and services. So successful was Oakdale that it became the town seat, supporting a great diversity of urban businesses: barber shops, banks, mercantiles, grocery stores, doctors' offices, manufacturers, etc.

From a peak in Oakdale's prosperity in the 1920s, the town entered a slow steady economic slide. Today, any families left behind are tied in some way to the success of one crop: corn. And where dozens of farm families once flourished in the rolling hills and valleys surrounding Oakdale, a single agricultural corporation now exists (Ray Ahrens 2020). Even soil-enriching soy beans, a crop rotation occurring less frequently in recent decades, owes its existence in part to the global demand for corn. Economic diversity has reached rock bottom.

Trees—not children—were growing up through the playground equipment when I visited Oakdale in 2011. While junkyards, rather than serving an economic function, were being reclaimed by forests. A decade later, no entry signs were posted on schools and churches (Figure 1). Entire neighborhoods were blighted, or abandoned completely. Such an socio-economic tragedy is due not to any lack of fortitude, intelligence, or dedication of great Nebraskans, but something sinister: state and federal economic policy. That policy, and its reversal, will be explored later.

Alongside the rise of subsidized agribusiness and global market expansion, hundreds of small Midwestern towns have suffered Oakdale's fate. And in the process a homogenous agricultural bubble has grown, filled by abundant (cheap) fossil fuels and high-tech farming methods requiring little to no labor. At the same time, the very soil fertility upon which America's success ultimately depends is becoming more depleted with each pass of the plow. All to the detriment of America's productive capacity, and by extension its people.

Figure 1. Oakdale Nebraska, June 2020. Top Left: High School. Bottom Left: Main Street. Top Right: local church.

What did cause the death of Oakdale?

When you ask around town, or in neighboring Neligh—which "stole" the county seat from Oakdale—many will say it was the loss of the railroad that blew Oakdale its final kiss goodbye. Others believe it was the day the highway was built through town, which more quickly shuttled the youth out of Oakdale than it could deliver them new opportunities. But from personal observation, and from the evidence of self-regulating ecosystems, here is what I have come to believe.

As the scale of American agribusiness increased between 1940-1970, business diversity plummeted commensurately…if not logarithmically. The youth packed their bags, full of hopes and dreams better realized in a more diverse economy. And who's to blame them. When the landscape engulfing you for hundreds of miles in every direction is dominated by corn-related business, your socio-economic prospects are duly limited. If I were but young in Oakdale, I too

would have fled. For trombone players are no longer sought there, as the community band has long since perished (Figure 2).

Figure 2. Community band of Oakdale, Nebraska. Photo by John Giordanengo, from an original provided under the authorization of the Antelope County Museum.

I cannot help but feel deep sorrow for Oakdale, and those left struggling to survive. Nestled among oak covered hills, as if protecting this once-quintessential American town, a few creeks ripple through Oakdale on their way to the Elkhorn river. Such a splendid setting is not possible to manufacture. And sorrow, for Oakdale is one of those immensely soulful and prideful towns that should be thriving, not dying in America. Why did she go?

Perhaps standing alone in a field of evidence, I believe the fatal blow was more of a slowly moving guillotine. Its blade was released the moment Oakdale's collective drive became focused on an export-based economy—a vision sold to them as America grabbed the torch of global capitalist power from Great Britain. A better railway system. A larger mill. More consolidated and high yielding farms. Such aspirations were embraced by nearly every American farm town. And they were fueled by the growth of highway and interstate systems, the billowing farm subsidy program, and then the Green Revolution—an outgrowth of the post-war boom. Oakdale's collapse epitomized the global market economy on steroids.

Slowly, wealth became concentrated in the next largest businesses, then the next largest towns such as Neligh, and then Norfolk. And finally, wealth entered the hands of Berkshire-Hathoway of Omaha, NE, where investment moguls like Warren Buffett fee predominantly upon the foreign and carry trades…as far away from Oakdale as one can imagine. Certainly, countless other external factors spelled Oakdale's doom, such as the cheap fossil fuels that made the Green Revolution and long-distance transportation possible.

Other changes revealed themselves more insidiously, the simplest being the redesign of train engines. The moment engines began running on diesel instead of coal, maintenance needs dwindled. In short order, the pre-WWI national network of round houses—hubs for the maintenance of train engines—became obsolete. And the roundhouse Oakdale so desperately fought for in the early 1900s succumbed to the blissful evolution of the fossil fuel industry. If such devastating changes were insufficient to release the guillotine upon Oakdale, trade would deal a final blow. And stark evidence of trade's impacts are evident in an age-old human invention: the milling of grain.

Oakdale operated the first mill in Antelope county. That is, until Neligh developed a larger mill in a more advantageous location…the banks of the Elkhorn. And from booming domestic demand alone, both mills were thriving. That is, until destructive competition from an ever-expanding global economy demanded greater economies of scale. Mills needed to grow larger to survive. And Oakdale farmers that once relied on Antelope County mills began shipping their grain as far away as Minneapolis, the home of General Mills.

The economics not in their favor, the Oakdale mill was the first to shut its doors. And by 1950, the Neligh mill shut its doors permanently. With that, the value-added revenue for local farmers had completely vaporized. The diversity of the Oakdale economy had slid another step backward.

The next assault on Oakdale came from the Green Revolution, fueled by a temporary lull in fossil fuel prices. The cost of fossil fuel energy in the 1960s was US $1.81 per million BTUs, drastically lower than the US $5.50 per million BTUs in 2012 (EIA 2012, in real dollars). In turn, farm diversity took another astonishing hit. And once the vision of the Green Revolution was fully realized, seven million farms in America had vanished from the face of the US economy.

Farm diversity in America plummeted by five million farms between 1930 and 1970, and by another two million by 2015 (USDA, 2017). And in response, Nebraska cattle producer and former state senator Al Davis summarized the trend in an interview with Time Magazine (Semuels, 2019): "Farm and ranch families are facing a great extinction." Representing the sentiments of hundreds of American farmers, Davis highlighted a sark reality facing the US, that "If we lose that rural lifestyle, we have really lost a big part of what made this country great." Specifically, the health and diversity of a nation's agricultural communities forms the foundation of its productive capacity. Which is nothing new. Adam Smith made a similar observation nearly a century before Nebraskans began tilling the earth (Smith 1776).

And between the Second (British) Agricultural Revolution and the Green Revolution, the socio-economic impacts of decreased agricultural diversity have struck repeatedly. The most famous of these was the potato famine of the mid 1800s—the Great Hunger of Ireland—that afflicted those who relied upon a single crop for sustenance, including England, Scotland, France, and Belgium (Mann, 2011). And in Ireland, the famine causing the death of nearly one million men, women, and children (Baker 2017, Mokyr 2020), forcing millions more to flee to America. By the time the famine ran its course, a quarter of Ireland's people had vanished.

Failing to observe the lessons from the potato famine, ten percent of America's homogenized corn harvest was destroyed in in 1970 by the southern leaf blight. While America has done well to develop rust-resistant strains of corn and diversify corn varieties throughout the country, monocultures of corn still dominate 90 million acres (Economic Research Service 2020). This is an area equivalent to the size of California. And concerns far beyond crop diseases and economic instability have grown alongside this homogenization.

In single-industry economies such as monoculture farm communities of the Midwest, those who can flee do. Or when the inevitable downturn arrives, unemployed residents have no choice but move to where a strong job market exists, whether or not those jobs are fulfilling. America's heartland has experienced a mass exodus of young bright minds since the 1950s, fracturing their communities to the point that once thriving towns are in fact dead today. In Oakdale, NE, the High School—once the pride of the community—is boarded up, and warning signs are posted outside of crumbling churches.

Many of those souls that are left behind turn to drugs or suicide, the height of which is occurring in the wake of our auto industry collapse. While in America's rural areas, overdose from opioids and other illicit drugs has surpassed that of urban centers (CDC 2017). And such a tragedy has occurred due to an underperforming national economy, but rather at the zenith of America's economic performance.

As America has grown into a service-based economy, with its wealth concentrated into ever-fewer hands, the agricultural industry has been left far behind. And the revenue of commodity-based agribusinesses is now tied to the whims of foreign interests and a wide variety of social and economic fluctuations at regional, national, and global scales. If such risk is not enough to spoil one's appetite for farming, external factors such as the costs of fuel, fertilizer, and migrant labor suffer equally unpredictable swings.

Add to this uncertainty the constant risk of floods, droughts, insect outbreaks, rusts, etc., and it is difficult to imagine how America's current monoculture farming system can survive another decade. Beyond the losses in human fertility, soil fertility, and agricultural diversity, another threat has arisen. The bread basket of America is expected to suffer significant increases in heat stress, flooding, and drought in coming years (Pryor et. al. 2014). And to believe such uncertainty will not afflict America's low impoverished farmlands is nothing short of irrational exuberance.

Instability and uncertainty are just part of the problem. More importantly, corn, wheat, soy, and other commodity farmers are experiencing ever-rising production costs alongside ever-declining income, according to a half century of US Agricultural Census data (Dreibus, 2019). America's agricultural industry has been sucked into a vicious downward spiral of decreasing capacity, crumbling economic diversity, and a monumental lack of resilience.

As the global market economy churns, the foundation of America's productive capacity—agriculture—only grows weaker. And when the next global market swing arrives, neighboring towns will follow in Oakdale's footsteps. Ray Ahrens of the Antelope County Historical Society readily foresees neighboring Neligh's future based on the trends of today. "The youth are leaving, and the drive to succeed is just not there like it used to be", Ray shared with me on a quiet summer day in 2020.

Monumental Change is Needed

When the homogenized agribusiness bubble pops it will affect not simply a few cities, but—akin to the auto industry—a multi-state region in the heart of America will suffer. But should the next revolution to strike America's heartland be of a different breed—one of increased domestic trade, farm diversification, and energy neutrality, few if any global market forces will shake the pride of the brightest and hardest working people I have ever met—Nebraskans.

And it will not be government bailouts, exogenous energy, and foreign trade that restore Oakdale, as such efforts have already inflicted more harm than good. Instead, it will be the entrepreneurs of the land and the factory that restore their communities, and in the process restore an economy in which all of America can take pride.

Regenerative Agriculture and its Allies

Gabe Brown, a straight-talking farmer from Bismark, North Dakota is one such entrepreneur. In Gabe's talk, "Regenerative Agriculture: Details of a Profitable Journey," he reveals some growing realities about "Regenerative Agriculture". Through a strategy of increasing plant diversity and eliminating tillage, Gabe has vastly reduced inputs and maximized profits (Brown 2020). Such a strategy, of course, is tied inextricably to the management of endogenous energy. The more diverse Gabe's farm is, the greater the surface area of leaves covering the ground, with which to capture more energy.

Gabe is not the first farmer to master such a strategy. For farming methods that diversify the landscape and build soils are ancient. Modern farmers simply use different terms, such as *sustainable farming* or *regenerative* agriculture. In the comprehensive article, "Agricultural sustainability: concepts, principles and evidence," Jules Pretty (2008) uses the term *sustainable farming* to describe those practices "that aim to make the best use of environmental goods and services while not damaging these assets." Such practices include biodynamic, community based, eco-agriculture, agroecological, farm fresh, free range, low input, permaculture, etc. Such diverse terminology reflects the context in which each system exists. For instance, Agroforestry is more likely to occur in the jungles of Costa Rica than in the prairies of Colorado.

The term regenerative agriculture is even more specific, and is more likely to be encountered in Colorado than Costa Rica. Regenerative agriculture refers to practices that increase plant diversity (i.e., photosynthetic capacity) in farm fields and build soil health. And fundamentally, soil health stems from an increase in soil organic matter. Organic matter, in turn, increases under no-till farming, cover cropping, crop rotations, compost and manure applications, rotational grazing systems, and other practices. Such practices help build biodiversity both above and below the soil surface, while creating soil conditions that can better receive and hold rainwater.

Ultimately, such practices restore the plant/soil microbiome to promote the development and cycling of essential soil nutrients, while sequestering carbon at greater depths beneath the soil surface. This leads to greater productivity, and hence more resources being transferred from the soil to higher levels in the food web. On Gabe's 5,000-acre farm, over 20 food products are generated, including six different animal products. In the end, such regenerative practices improve the resilience of a farm, and produce foods with greater nutrient density

And the best part, from a tax payer and economic sense, is that Gabe's farm does not require a single government subsidy. And with respect to other resource transfers, diverse regenerative farming systems demand far fewer inputs of exogenous energy, fertilizers, pesticides, and other inputs (Pretty 2008, Altieri *et al*. 2012, Capra and Luisi 2014). And such diversity pays dividends beyond the ecological landscape. There was a time when Gabe and his wife were over a million dollars in agricultural debt. And as Gabe puts it, "it was diversity that got us out of the hole."

Rebuilding Soils

The degrading impacts of modern agriculture on soil fertility are outlined well by the works of Pimentel (1995), Ontl (2004), Capra and Luisi (2016), and volumes of research conducted by the US Department of Agriculture (nrcs.usda.gov). And while communities around the globe grow more dependent upon the global market economy for food, the fertility of their soil continues to diminish under the pressures of fossil-fuel-intensive agriculture. Only, it is the soils of those developing countries that have suffered the greatest degradation (Pimentel 2006). Much of the fertile lands that might remain in those countries have been converted to monoculture crops for export markets.

Even in America, where farmlands experience some of the lowest rates of erosion in the world, 90% of farms are still losing soil faster than the natural rate of soil formation (USDA 2000, Pimentel 1995). In an attempt to compensate for such losses, a plethora of modern farming software, improved soil fertility and pest mapping, and improved soil moisture/weather predictions, etc. has certainly helped the modern farmer reduce inputs required of large-scale monocultures. Yet fundamentally, such technology cannot address the economic impacts of

reduced crop diversity or decreased soil organic matter. Rather, such technology can only attempt to compensate for such losses.

Soil organic matter does more than increase the capacity of soil to retain water and nutrients. Soil's that are rich in organic matter can better withstand the erosive forces of wind and water (Brady and Weil, 1996). As the public is becoming more aware of, the annual tilling required of high yield monocultures and other practices only exacerbate soil organic matter losses. Fundamentally, organic matter is broken down by microbial and fungal communities, which are stimulated by tillage, irrigation, and nitrogen additions. At the same time, modern agriculture demands substantial yields be attained absent continual inputs of organic matter. And solutions such as hauling in compost or manure from even thirty miles away (i.e., a nearby city) are far more expensive than applying chemical fertilizer, at least under the current economic model. And therein lies the challenge. The existing system cannot survive without destroying soil fertility.

We have created a downward spiraling food production system, with an associated feedback loop not only via social unrest, but via climate change. Briefly, here is how high yield farming systems affect this change. The amount of carbon stored in soils (2.5 trillion tons) vastly exceeds the 560 billion tons of carbon stored in all living plants and animals (Lal 2004, Brady and Weil 1996). That is, 80% of all terrestrial carbon is stored in the soil. Rampant losses of soil organic matter under modern agriculture, coupled with the burning of fossil fuels needed to support high yield farming, are large contributors of atmospheric carbon dioxide (CO_2). While carbon sinks—areas around the globe where carbon dioxide can naturally be stored (i.e., to reduce CO_2 concentrations in the atmosphere)—are degraded with every pass of the plow.

However, the same mechanisms that created this system can also operate in reverse. For instance, the research by LaCanne and Lundgren (2017) showed that the profitability of diverse regenerative agricultural systems is positively correlated with the organic content of soils, not with yield. And those regenerative systems build more carbon than they destroy. By extension, profitability has the potential to drive the building of soil organic matter in farmlands.

In the face of stark climate shifts acting upon Midwest farmlands, uncertain global food markets, decreasing nutritional content of high-yield foods, and continually dwindling fossil fuel reserves, conventional farming systems must become obsolete. This, of course, represents a tremendous opportunity for practices such as regenerative agriculture. And like other social and environmental movements, regenerative agriculture will succeed only to the extent the greater agricultural industry is restored. And to the extent it can nourish the hungry.

Farming for Nutrition, Not Calories

One crisp fall morning of 2020, I had a chance to sample some heirloom wheat from Moxie Bread Company, a small Colorado-based company with old world impacts. Literally, the crepes I made for breakfast were the best my 10-year-old daughter had ever received from our kitchen. And I take little credit. For it does not require a skillful chef to solicit a delicious smile, as much as it takes great ingredients. And modern US farmlands have suppressed a great litany of quality ingredients. Which, of course, provides tremendous opportunity for companies such as Moxie to build an entirely new market. And in the process, people are not merely fed; they are nourished.

In part, nourishment stems from nutrient dense foods, which are high in nutrients but relatively low in calories. More specifically, nutrient dense foods have a higher concentration of micronutrients and amino acids, the building blocks of protein. And as more evidence surfaces on the nutrient dense foods of regenerative agriculture, companies such as General Mills are taking notice. They have recently reached out to Gabe knowing full well the plants and animals his family raises provide higher nutrient density for customers.

To the contrary, wheat varieties bread for high yields contain significantly less iron, magnesium, zinc, and other micronutrients as compared to historical varieties (Murphy et al. 2008). While pastured chickens produce eggs with higher nutrient density than conventional eggs (Brown 2020). And such levels of nutrient density and diversity are essential to maintaining thriving immune systems in humans.

The Debate Over Organic, Sustainable, and Conventional Farming

To back up a little, it is important to differentiate organic farming from any form of sustainable farming. For organic farming does not by definition require a diverse landscape, or low till operations. And in recent decades, large organic farms have been battling against large conventional farms for national and global market shares. This, in turn, has stimulated debate over energy inputs and crop yield between organic vs conventional vs sustainable farming—an unfortunate diversion to meaningful progress in our greater agricultural industry.

There is ample evidence that monoculture farms infused with chemical fertilizers and herbicides can produce more of a single crop (e.g., corn, rice, wheat, etc.) per acre than similarly sized organic monoculture farms (Treu et al., 2017). However, most studies of this nature examine only yields, rather than broader soil fertility, biodiversity, exogenous energy, and other social-biological impacts of conventional vs organic farming (Hayo et al. 2020, Pretty 2008).

And using the “sustainable” can be highly misleading, as exemplified by high-yield proponents such as Paarlberg of Harvard’s Sustainability Science Program. Paarlberg argues modern agriculture is “better, because it uses low impact, ‘precision’ techniques that require less land, less energy, and fewer chemicals for ever bushel produced. (Paarlberg 2021)” However, his article “The Environmental Upside of Modern Farming” in the Wall Street Journal is full of falsely drawn conclusions. For instance, his article indicates that irrigation systems have become more efficient, because less flood irrigation is being used in modern systems. However, the degraded soils of the modern agricultural systems Paarlberg refers to hold less water than soil-regenerating systems.

Certainly, there have been some gains in modern agriculture that result in less water and fewer chemicals being applied today than 70 years ago, as pointed out earlier. To be clear, however, Paarlberg is comparing modern agriculture (i.e., the Green Revolution) to an already inefficient, resource intensive, soil degrading, unstable, and low diversity agricultural system. One that cannot be sustained without exogenous water, energy, and chemical resources being applied. By his logic, one can also claim that fewer people are dying today from each modern laser-guided missile, and so warfare is good. Of course, if more missiles are being launched today than before, the argument disintegrates.

For those cheerleaders of high-energy high-yield farming systems—organic or conventional—there are a few details that must be unveiled. First, far more food is sent to our landfills today than before the Green Revolution (USDA, 2010). Second, America’s current agricultural system (i.e., subsidies, exogenous energy, export focused, etc.) operates such that crops are tilled under when commodity prices decline far enough. In turn, much of the energy efficiencies claimed by proponents of high yield agriculture are diminished by the waste embodied by the system. The low soil organic matter of such systems cannot hold rainfall and nutrients well, demanding significant additions of both be made to prop up yields.

Finally, organic and conventional farming may take the form of large-scale monocultures, which consume large quantities of exogenous energy so as to cater to export markets. And as we know from the New Belgium brewing case, such large scales of production (e.g., beyond what is needed for an economic zone such as South Platte) cannot be sustained by endogenous energy resources. Such systems will always demand exogenous energy be applied.

Can Regenerative Agriculture Feed the World?

Before answering the question, let's put it into the context of modern agriculture. While there is no doubt that modern technology has allowed industry to grow more food per acre, has such technology resolved our food security needs? Several studies suggest that, like the second agricultural revolution, the Green Revolution did not actually translate to food security. For instance, the extensive review of the literature by Pingali (2012) revealed that "…although overall calorie consumption increased, dietary diversity decreased for many poor people, and micronutrient malnutrition persisted. In some cases, traditional crops that were important sources of critical micronutrients (such as iron, vitamin A, and zinc) were displaced in favor of the higher-value staple crops."

And even if the modern system could meet the world's food security needs, it cannot be sustained at its current scale absent exogenous energy transfers. For instance, while America's energy-intensive monoculture systems effectively maximize the yield of a single species per acre, the yield lasts only a few weeks. For instance, the average cornfield has the potential to deliver over 15 million calories per acre annually, enough to sustain 14 people (Foley 2013). However, considering the amount of corn consumed by ethanol plants and animals, only three million calories per year end up consumed by people, mainly as dairy and meat products, enough to feed three people. The majority of sweet yellow kernels are instead exported, used to produce ethanol, manufactured into spoons and cups, or fed to domesticated animals; with a significant portion of the energy lost along the way.

Similar findings have been reported by the Food and Agriculture Organization of the United Nations (FAO 2019), and the World Food Program. And according to the work of Frances Lappé of the Institute for Food Development and Policy, in many countries that experience rampant hunger issues, agricultural exports exceeded imports (Lappé *et al*. 1998). That is, the country is a net exporter of food, even though their population goes hungry. Similarly, Capra and Luisi cited the work of Mulder-Sibanda et al (2002), that "…in the Third World 78% of all malnourished children under 5 live in countries with food surpluses."

As outlined well in the work of Schnepf (2004) and Pingali (2012), the economics of high yield farming demands higher application rates of fertilizer, herbicides, fungicides, insecticides, irrigation, and other inputs, all of which require exogenous energy. In turn, countries like Mexico—the poster child of the Green Revolution—are more dependent upon imported fuel, fertilizers, pesticides, and farm equipment to feed their citizens. Even considering their vast oil reserves, Mexico cannot meet its own fertilizer and farm equipment demands, while many of their citizenry flee to the US for jobs and a better life.

Fundamentally, single-minded solutions such as "high yield" agriculture cannot resolve the food security concerns of any country. And as a result, developing countries—targeted

beneficiaries of the Green Revolution—are less self-sufficient now than they were prior to the Green Revolution. Or were commodity farmers the targeted beneficiaries?

But can a system of diverse and soil-building agricultural landscapes do better? Can it fully nourish a population of eight or nine billion people? To address this question, let's begin with the most rudimentary Midwestern agricultural system: hundreds of species of plants producing carbohydrates and proteins in a tallgrass prairie, absent fossil fuels. Data from The Prairie Power Project of Northern Iowa (2015) reveals how a diverse prairie of even just 15-32 species of grass produces far more carbohydrates than a less diverse plot of prairie. While a study presented in Nature (Zuppinger-Dingley et al. 2014) showed how diverse prairie communities produced higher yields than monocultures. Though these rudimentary agricultural systems produce fodder for domestic animals, they underscore the basic relationship between plant diversity, energy capture, and sustained yield for agricultural systems. That is, diverse communities sequester more energy than less diverse communities.

More importantly, Pretty's research of 286 farms across 57 countries revealed that sustainable farming practices were able to produce crop yields up to 145% greater than the yields on those same farms under conventional methods. And the relationship between diversity and energy holds true for more complex farming systems, including the production of multiple crops in the same space.

The "three sisters" food system (i.e., corn, beans, and squash) that sustained ancient Puebloan's of the Americas is one well-understood example. While Gabe Brown's diverse agricultural fields provide another example from the furthest northern latitudes of America. While in tropical regions the cultivation of coconut, black pepper, cacao, and pineapple in the same field has been a long-standing tradition. And the non-timber forest products grown in the tropics harvest solar energy from three or more forest canopy levels in a single space.

Taken to the extreme, the 'Baranaja' cropping system of the Himalayas produces 12 different crops in the same plot of land (Kala 2010). Besides the soil fertility and economic resilience such systems can produce, these multi-cropping systems create jobs throughout the growing season, and can produce more stable income streams. Of course, the profitability of any farming system hinges on the strength of markets, and the business acumen of the farmer. And in a future of decreasing fossil fuel reserves and an expanding human population, the most profitable system will likely be that which captures the most sun.

Agricultural Restoration: Beyond the Farm

A working definition of *Agricultural Restoration* is "Methods that increase the diversity, productive capacity, and profitability of farmlands." Such methods are similar to regenerative agriculture, with the exception that Agricultural Restoration must result in increased profitability for the farmer and the industry. For it is profitability that attracts investment, and from such investment restoration methods may be implemented on a larger scale.

In the face of modern agriculture, hundreds of communities across America have been increasing the diversity and productive capacity of domestic farmlands. And there are a few drivers of this shift. First, the local food production trend is a testament to an essential feedback loop inherent in complex self-regulating economies. People are demanding better food—more nutritious, tastier, and local.

Second, the potential profitability in systems such as regenerative agriculture is stimulating new entrants into the industry. For, on the whole, the post-Green Revolution farmer receives far less money in their pockets for every dollar of food purchased than earlier generations of farmers (Center for Sustainable Systems 2019). That is, high yield does not translate to high profitability.

Should the practical experience of farmers such as Gabe Brown be doubted, a growing body of research backs up their claims. In a study of 40 midwestern farms, LaCanne and Lundgren (2018) showed that farmers using regenerative farming experienced 78% higher profits over traditional corn production systems. There are a few key takeaways from their study that potential entrants into regenerative farming should note. Farmers who build healthier organic soils are more profitable. Further, regenerative farmers required fewer insecticides and fertilizers—costly inputs. Literally, the diverse farm fields in their study had substantially lower degrees of pests than did the monoculture fields. And the most profitable farms had built diversified income streams, and marketed their products differently than conventional farmers.

Finally, even without a degree in economics, sociology, or ecology, the critical mass of consumers and regenerative agriculture farmers understand one important thing. It's the right thing to do. For agricultural restoration to provide greater economic stability, enhance the productive capacity of an economy, increase profitability, and yield other socio-economic benefits, the following actions are needed:

- *Increased the number and diversity of farms,* which can lead to increased job diversity, greater productivity, and regional economic stability;
- *Increased investment in applied research,* to refine the knowledge and practice of diverse regenerative farming systems;
- *Integrate sustainable farming systems* with strong local and regional markets, to build resilience in the face of year-to-year climatic and market variability, globally destructive competition, trade wars, or other external forces.

- *Restructure the agricultural industry to be energy neutral*, which requires agricultural markets be far more local, and far less global.

Recent trade wars, pandemics, and climate change have lit a match below the drive for agricultural restoration. And the ultimate reason for such a renaissance is quite simple. We are social beings at our core, yearning to forge connections with one another. Local food production fuels that connection in ways unmatched by the crate of tomatoes and peppers arriving from 1,000s of miles beyond our community. And due to such basic tenets of human behavior, not to mention our base Pavlovian needs, agricultural restoration is perhaps the most profound economic achievement for any economy to fulfill. And when we rise up to witness the vast sea of monoculture commodity farms across the heartland, the degree of opportunity awaiting the entrepreneurial farmer is mindboggling.

The Path to a Restored Agricultural Landscape

While there are dozens of actions that will assist an economy in restoring its agricultural industry, there are at least three fundamental steps that define the restoration path. First, an economy must restore diversity to its agricultural landscape, including timber, vegetables, grains, pasture, animal products, and other crops relevant to their SEI context. Second, agricultural knowledge must be refined such that agricultural systems are capable of producing ample products absent applications of exogenous energy. Third, America must dedicate itself to restoring local and regional markets for agricultural products. That is, domestic markets for local agricultural products must be thriving.

And precisely what those markets are producing must vary depending on the SEI contexts across America. In many Midwest regions, the great distance to markets may require a large portion of farmlands be restored to prairie to support gras-fed beef, bison, pigs, chickens, and dairy. Or wood and fiber production may account for a larger portion of many midwestern landscapes, to feed regional paper mills at the same time they may support mushroom production and a diversity of other products. Such a transformation would not only place upward pressure on profitability, but yield substantial watershed benefits, high levels of biodiversity, and vast increases in soil fertility. Under other SEI contexts, a greater variety of grains (wheat, rye, rice, oats, etc.) will be required, including heirloom varieties that fetch higher revenues in boutique bakeries. And where distances to markets are short, a diversity of vegetable crops is more likely.

Agricultural Restoration: With or Without Subsidies?

Oddly, to stimulate agricultural restoration across America a force from within must be overcome. That is, a full reversal of damaging national farm policies. Besides the significant exogenous inputs that US farm policy has demanded, farm subsidies have amounted to US $90 billion between 1995 and 2010 alone (Foley 2013). Economically speaking, it appears America's subsidized agricultural lands work only for a handful of corporations who lean more fervently toward capitalist than farmer. The bounty is then exported more often to feed China, or to fuel automobiles. In the process, America's entire agricultural system has been retooled around the global market economy, such that the vast majority of corn raised today is not even edible to humans.

The Farm Bill would best serve America by reconstituting its post-depression goal: to preserve America's diverse agricultural landscape. Certainly, countless industrial-scale capitalists will fight agricultural reform to the bitter end. But they are few in numbers, some of which may learn from the success of a country that bares the same name as its national fruit—the Kiwis.

Indeed, a profound example of agricultural diversity and productivity comes from New Zealand, where government subsidies amounted to 40% of farm income in the 1970s (Ross & Edwards, 2012). Regardless of what farmers wanted, politicians were forced to act responsibly to a serious national budgetary crisis. And so New Zealand's farm subsidy program was ushered through fields of protesting farmers to the chopping block. By 1984, the farm subsidy program was gone. And despite thriving subsidy programs in America and the European Union—competitors of New Zealand farmers—the result was not as farmers feared. As Ross and Edwards reported,

> *When the subsidies were removed, it turned out to be a catalyst for productivity gains. New Zealand farmers cut costs, diversified their land use, sought nonfarm income, and developed new products. Farmers became more focused on pursuing activities that made good business sense. Official data supports on-the-ground evidence that New Zealand greatly improved its farming efficiency after the reforms. Measured agricultural productivity had been stagnant in the years prior to the reforms, but since the reforms productivity has grown substantially faster in agriculture than in the New Zealand economy as a whole.*

The elimination of New Zealand's farm subsidies also led to reductions in fertilizer use, and lowered the cost of several other inputs that had essentially been "encouraged" by the subsidy programs.

But would the elimination of farm subsidies in America yield similar results? Conservative politicians such as Dan Hill of Nebraska believe so, as do economists such as Milton Friedman, and countless others. But based on the principles of self-regulating systems, and in light of the monstrous expanse of monocultures currently dominating the US, I would argue an elimination of farm subsidies would produce even greater benefits than what New Zealand witnessed.

The exorbitant subsidies to America's agriculture industry, and the negative impacts to jobs, stability, and profitability, was described earlier. And such subsidies, just like energy inputs and other resource transfers, naturally support the development of large scales of operation while decreasing diversity within the industry. It was for such reasons that Don Obershaw, life-long farmer in Oakdale, begrudged agricultural subsidies to his dying day. So does Nebraska Senator Dan Hill, and economists such as Milton Friedman, Adam Smith, Dudley North, and countless others.

And financial resource transfers often produce unintended economic consequences. In America, the increased cost of food following subsidies of the corn ethanol industry is one infamous example. As the demand for ethanol rises, the cost of corn is driven upward.

Another unintended consequence is volatile consumer prices resulting from over-reliance on long (global) supply chains is another. In the Wall Street Journal article, "Wheat and Rice Prices Surge in Coronavirus Lockdown", Maltais and Wallace (2020) detailed the global disruption in farm supplies as multiple countries restricted agricultural exports. "The result," they reported, "is that prices of wheat and rice, two of the world's staple grains, are rising sharply." They went on to explain, "difficulties moving grain within countries and across borders, coupled with frenzied buying, could exacerbate the impact of the pandemic on the global food market."

Maltais authored several other articles for the Wall Street Journal in April 2020, highlighting supply chain weaknesses the pandemic unveiled (not caused) within the corn ethanol market (Maltais 2020). From the global oil glut that stemmed from a vast reduction in driving, the price of corn plummeted. This in turn placed downward pressure on the price of other farm commodities. Maltais also documented the USDAs bailout of Pork Farmers, who were to euthanize hogs in the wake of large-scale processing plant closures (Bunge and Maltais, 2020). As many as 105,000 hogs a day were to be left with no factory floor to be processed on, and hence no product would reach market.

Resource transfers such as bailouts produces at least two deleterious outcomes. Like energy transfers, they have a tendency to perpetuate the existing system (i.e., large scale industry); one whose ability to evolve with consumer needs and economic conditions is sluggish. In essence, financial resource transfers—loans, bailouts, subsidies—have a tendency to maintain archaic industrial systems that have become oversized for the economic space in question. Or they suffer from other structural problems that lead to a lower productive capacity. For instance, the MOSES economic model of Sweden (Eliasson et al. 1995) showed that government subsidies in the early 1990s simply propped up their lowest performing industries

(e.g., steel and shipyards), many of them utilizing obsolete equipment and production processes.

Second, financial resource transfers such as bailouts and subsidies tend to fortify barriers to new business entries into the market. And new business entries in an industry are essential following economic downturns. Not only do they stimulate growth (Eliason??), but they better represent industries relevant not to the economy of the past, but of the future. America's behemoth subsidized agricultural industry, for instance, provides substantial obstacles to new farmers interested in rebuild rather than degrading the productive capacity of US farmlands.

Similarly, bailing out farmers to (for instance) euthanize hogs during the pandemic provided a financial disincentive to those businesses who could develop a more ingenuitous approach to the pandemic pork problem. An approach that would not only bring food to market, but support a commensurate number of jobs throughout the supply chain.

Rather than make bailouts a standard operating procedure, America could take a clue from Italy. In the aftermath of the Modena earthquake, which rocked a critical industrial region of northern Italy in 2012, innovative was allowed to quickly solve a critical supply chain problem. Here, the leading producers of high-end Parmigiano-Reggiano experienced a near complete destruction of about 360,000 wheels of cheese—an estimated loss of over US $200 million (Puno 2017). Thankfully, the Italian government did not step in. Instead, world renowned chef Massimo Bottura, a native of the region, took his creativity out of the kitchen. Sans bailout, Massimo worked with a cheese consortium to launch a global campaign revolving around a classic Italian pasta dish, "Cacio e pepe."

The plan worked flawlessly! There was a near immediate sale of every wheel of cheese to pasta lovers around the globe. Were such an incident to unfold in America, government intervention would have likely ensured a delivery of cheese not to the mouths of people, but to the bowels of landfills. It is doubtful the damaged cheese would have even been fed to hogs.

Time will tell if America's political and corporate elites will find the collective courage to end farm subsidies. In the meantime, there are ample avenues for local governments, community leaders, and local business leaders to restore America's agricultural landscape:

- Increase the level of food processing and value-added products at the local and regional economic level, such that related production and profits are maximized in-country;
- Expand the trend of farm-to-table programs to showcase local food in all cuisine;
- Create a table-to-farm program, delivering compost from urban centers to re-build soil fertility in local farmlands;
- Invest in research to improve the effectiveness (yield, diversity, nutritional outputs, profitability, etc.) of multi-cropping systems in all environmental contexts of the country;

- Extend sustainable grazing practices to marginal agricultural lands, including America's Conservation Reserve Program (CRP) lands, as well as on millions of acres of existing corn fields whose best use would be restoration to prairie; and
- Improve small farmer access to regional markets.

And among the many paths toward profitability for farmers is the monumental *niche* remaining in value added products. Such niches include locally milled flour, salami and sausage, baked goods, eggs, granola, etc. Even during the 2019 trade wars and 2020 pandemic that afflicted subsidized commodity farmers, farmers locked into local markets remained resilient and profitable…all things considered. And in turn, such profitability attracts capital investments required to help expand the system.

Yet access to markets remains a short-term hurdle for many small farmers. Amidst a lavish fossil-fuel- and government-subsidized farming system, is it any surprise that small farms have trouble competing on supermarket shelves? Of course not. And this leaves the profound benefits of diverse farming systems unrewarded by the current food system. Which is why the restoration of a diverse local agricultural industry must be accompanied by a greater economic restoration movement. Free economic zones must forge essential advancements in broader economic diversity, domestic energy acquisition, and their home trade. And in so doing, additional opportunities for profit and sustainable economic development emerge.

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