

How a Life Cycle Assessment (LCA) Measures Up With Energy Flows For Our Food System

Figure 1. Life Cycle Assessment (Anctil and Fthenakis 2012).

Understanding methodologies in calculating the energy flows of food systems is an essential part of making systems more sustainable and efficient. Is a good tool to measure the environmental impacts of a food product the life cycle assessment? The first LCA studies in the 1960s researched the impacts of beverage containers like Coca-Cola (Pray et al. 2012).

Within our food system, an LCA analyzes the various stages of the food cycle to prevent a shift to other life cycle stages (Pray et al. 2012). For a candy bar, this could include the impacts of manufacturing it through the production chain, including sourcing of ingredients, fuel to extract material, transportation for ingredients and candy, as well as the resources used in the “cradle-to-grave” life cycle (Pray et al. 2012).

The LCA can potentially measure emissions, water, waste, and help minimize costs but there are many downsides of the LCA model (Pax 2013). A standard life cycle assessment (LCA) has three phases; goal

and scope, inventory analysis, and impact assessment (Pray et al. 2012). A fourth element could be life cycle interpretation (Reap et al. 2007). A survey was conducted on problems with the LCA model and it identified 15 problems concerning this scientific system (Reap et al. 2007). One of the six problems of utmost importance in using the LSA model is that the impact (phase 3) only takes the environment into consideration and not the economic and social impacts of the good that are being manufactured (Reap et al. 2007). Ingredients like corn syrup and synthetic chemicals that are used to flavor and color the candy impact nutrition, and the health of those who manufacture the candy, and unfortunately were not measured.

The functional unit for measuring food is unclear as caloric values, nutrition, and emotional value also play a role (Pray et al. 2012). Others argue that LCAs on food systems measure food systems differently like by mass or volume which makes it challenging to compare different food items (Pray et al. 2012).

We should create policies that provide solutions for methodologies that are more sustainable. In regards to sustainable development, the LCA model doesn't necessarily promote sustainable decision making as sustainable production and consumption are lacking (Reap et al. 2007). These are a few reasons why we should question methodologies behind energy flows in our food systems so that we

can create a smaller footprint for our planet. After I conducted three LCA assessments on an organic vegetable and fruit farm, an organic dairy cow farm, and a goat meat farm, I came to the conclusion that each farm is unique and presents it's own challenges when analyzing data and computing formulas.

Multiple considerations must be taken into consideration when conducting an LCA. Which includes incorporating the availability and access to resources, waste management streams, value added value chains, regional location, marketing channels, the farming operation and management system, and energy measured as consumed by humans and machinery from a cradle-to-grave perspective. Ultimately a farmer, small business, non governmental organization (NGO), corporation, and so forth, must determine if the LCA will add value and improve a company's triple bottom line. Otherwise it can be extremely inefficient due to the lack of accurate data, thus taking an extensive amount of time to conduct an analysis, while it is extremely expensive to conduct a thorough assessment. Therefore conducting a SWOT analysis on a quarterly basis will allow you to measure your targeted areas of opportunity and weaknesses , perhaps in a more efficient manner so that your business enterprise can address alternative solutions for a more sustainable future head on.

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The Dust Bowl Demanded

Sustainable Agriculture

Our first records of weather tracking from the U.S. Weather Bureau were from 1898 for relative humidity, winds and temp. It wasn't until radiosonde initiatives were launched in 1938 that we were able to test temperature, humidity, pressure, and transmit information during inclement weather (Service 2007). But by then it was too late to see what New York City already had (A&E Television Networks, LLC 2015). The **Dust Bowl** was an ecological disaster that hit over 150 million acres and drove "exodusters" to urban life east or as far west as California (Eric Foner and John A. Garraty 1991). In 1931 the drought that swept the plains was the onset of the Dust Bowl (Hurt 2002). The Dust Bowl was a direct result of what happens when you mess with science and nature over a degradingly long period of time.

Several generations of farmers monocropped the grasslands of the Great Plains and planted seed into fertile topsoil which became the means to earn a meager wage. They didn't understand sustainable agriculture, biointensive growing, companion planting, or cultivating drought tolerant seeds. Cattle ranching and wheat farming contributed to the ecological imbalance of earth and sky because they stripped the grasslands dry and left them structureless too. Topsoil stripped of beneficial nutrients and moisture prompted soil erosion. Drought and wind erosion set in parching the dirt even more. After a period of time with no rain, the wind hit the prairies, statically lifting up dust up to 10,000 feet, traveling 65 miles an hour, and causing enough electricity to power NYC (A&E Television Networks, LLC 2015).

By 1934, 300 million tons of top soil had been removed by the Great Plains which touched Kansas, Northeast New Mexico, Southeast Colorado, Oklahoma Panhandles, and parts of Texas (Hurt 2002). Roosevelt enacted "practical measures" to remediate drought, dust, and depression beginning with the Great Plains Drought Area Committee (Hurt 2002). Several organizations were formed to assist with the Dust Bowl and Great Depression including land and social services relief. Most of the Great Plains farmers were in some form of federal agricultural relief program. The AAA, RA, CCC, and FSA couldn't help enough and someone had to pay for it (Hurt 2002).

The goals for New Deal Agricultural Conservation included removing excess and marginal acreage from crop production, preventing soil erosion with improved agronomic practices, rural zoning, grassroots involvement, eliminating farm poverty, and practicing ecological resource management (Worster 1979). Conservation efforts that were enacted on behalf of the government to plant 220 million trees through the Shelterbelt Program of the Forest Service or let land grow fallow through the Taylor Grazing Act, were just a few attempts to help the Great Plains flourish again (Danbom 1995).

Rexford Tugwell, Lewis Gray and Henry Wallace were detrimental towards sustainable improvements during the 1930s (Worster 1979). Although there were a lot of initiatives in place to alleviate the pressures at the time there wasn't a consistent foothold in all acts because different people were in control of governmental legislation. The Soil Conservation Service (SCS) was initiated to teach about soil conservation but one had to sign a five year contract

in order to reap rewards. Sustainable education on behalf of agriculture and the environment should have been included in all relief efforts and initiatives. That would have helped prevent future reliance on government assistance and fueled a more sustainable economy. Perhaps they would have been more prepared for a “fundamental environmental reform,” if they were educated along the way (Worster 1979). If our government continued to integrate conservation with sustainable agriculture as part of the New Agricultural reform then and implemented it into sustainable mandated policies to this day, our country would be a lot better off. We’ve come a long way since the Dust Bowl, but our sustainable challenges in agriculture in the twenty first century are far more difficult.

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Benefits of Using the Polyface Farm Model in Central Texas

Organic Red Hard Wheat growing in our largest garden bed and planted as the first crop to build the soil! We purchased this seed from [Thayer Feed and Seed LLC](#) at the Mother Earth News Fair in Kansas 2014.

There are many benefits to the Polyface Farm model. Joel Salatin isn't caught up in labels but believes in the essence of husbandry practices and stewardship (Salatin, *A New Old-Fashioned Food System* 2015). His model aides the local community with access to affordable food and he shares his knowledge with those willing to learn how to incorporate biodiversity while turning a profit. Central Texas is a difficult region to be a "grass farmer." Land varies depending on the ecoregion and is a mix of rocky cavernous ridges, limestone, savannah, piney woods, and blackland prairies (Library of the University of Texas n.d.). Drought and a hot climate bring about other challenges that Salatin doesn't necessarily face in Virginia.

Salatin claims that his beef is "[salad bar beef](#)"

because of the variety of leafy greens that are found in his fields (Salatin 2014). So every day he provides a different polyculture, diversified, paddock for nutrition which consists of dandelions, Kentucky blue grass, onion, narrow leaf plantain, wide leaf plantain, orchard grass, fescue, red clover, white clover, and buttercup (Salatin 2014). Although our region has the capacity to produce a variety of forage crops, different seasons really dictate what is grown but rebuilding the soil is a necessity.

Native grass seed by **Native American Seed** company would be introduced to the grazing system because it's what the buffalo used to forage, is extremely hardy, requires minimal watering and does well in Central Texas. We have access to organic feed from a local mill just a few miles away so it is ethically important we purchase soybean free, Non GMO feed from **Coyote Creek** as the most sustainable option. However gleaning food from other farmers and businesses is another great sustainable feed source that works well in a zero waste system.

A mixed farming system is sustainable as long as the number of animals and crops produced stays in balance with nature and production demands. A grazing pasture management system must be in place on any farm with livestock. Efficiently maintaining a sustainable pasture requires incorporating the forage-producing capacity and stocking rate to achieve the target level of animal performance over time without causing deterioration of the pasture's ecosystem (David L. Greene 2002, 1).

Salatin grows on a large scale farming system and a smaller scale farm could; be more attainable; require less labor input; be more manageable; be financially

feasible and sustainable. I also believe that food crops should be integrated in order to be more self sufficient. Salatin raises beef, chicken broiler meat, chicken eggs, rabbits, and pigs on between 100-500 acres (Pollan, Joel Salatin's Polyface Farm 2006). By reducing farm scale to accommodate smaller percentages of livestock while encouraging heritage breed diversification is imperative to the preservation of endangered species. In my experience, raising heritage breed chickens in Central Texas creates more resilient food systems. Reducing farm size would allow the farmer to have a better quality of life. (Pollan, Joel Salatin's Polyface Farm 2006). There is a demand for access to healthy and affordable food in Central Texas as well as markets to sell value added products through CSA, farmers markets, and restaurants (Austin Energy Depletion Risks Task Force, Roger Duncan 2009).

Austin needs to minimize food security issues in order to be more sustainable but Austin only represents a fraction of Central Texas. Having access to a farm store and being able to visit the farm to understand where your food comes from plays a crucial role in establishing a better food system. Building a farm brand using a sustainable whole farm model will encourage community members to become a part of the food movement. Educational opportunities aid in the development of future farmers which is essential to making our bioregion more sustainable.

"When we say we are grass farmers, what we're saying is we are honoring and producing the most historically normal, carbon cycle, nutritive cycle, energy cycle that is solar driven in real time and actually builds soil like nature has done forever (Salatin, Episode 516 – Polyface Farm 2014)."

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