

Agricultural Infrastructure: Environmental Impact and How Consumers Can Optimize Purchase Decisions

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A dust storm during the Dust Bowl, 1936. Photo courtesy of the Library of Congress

Preface

When I was only an infant, my sister, three years older than me, fell into the pool in our backyard twice. Both times, luckily, my father saw and reached her in time. The second time, however, he tore a ligament in his knee jumping into the pool and ended up on crutches for a number of months. Eventually, he made the decision to drain our pool, plug it, and fill it with dirt instead so he could grow fruits and vegetables in our own backyard.

Growing up in an undeveloped, rural area of China, my father had been growing produce and raising animals since birth. As for me, I grew up in the untamed creek directly behind our backyard. While my father and I do not share many of the same beliefs, we share a love for plants, animals, and all things nature. His green thumb bears fruit to produce that tastes incomparably better than produce found in any grocery store. It is something I have always admired about him.

Global population—and consequently agricultural demand—continues to increase, produce prices continue to skyrocket, and the environment continues to deteriorate. Yet of those three overarching themes present in the intricate network of agricultural infrastructure, the only one I am concerned with every time I make a trip to the grocery store is demonstrated through my mental calculations regarding how many hours of work it will cost me to buy my mother the ingredients she asked for. And as prices continued to increase after I received a one dollar pay raise, I began thinking about the vegetables growing in our backyard more.

I cannot single handedly lower the demand for produce. And while it may not be possible to restore the global environment back to its optimal state either, we can make conscious efforts to be more mindful of what we consume.

Where Are Our Groceries Sourced From?

Deforestation & Land Usage

The agricultural infrastructure is built upon the foundation of acreage expansion—deforestation is the basis of agricultural growth and the pillar of population increase. Scientists at the University of Maryland publish annual data sets regarding the state of forestation, in which they found 16,000 square miles of tropical forest were subjected to deforestation in 2020, nearly half of which was a consequence of land expansion for food production. Half of the deforestation resulting from food production was due to commodity crop production.

Large commodity crop production regions, which produce soybeans, palm oil, corn, and cotton among others, often involve clearcutting—a logging system which clears out natural forests and introduces man-made tree plantations that are incompatible with the natural ecosystem. Unlike small-scale agriculture, commodity-driven deforestation is a permanent shift in forest ecosystems and results in the inability for the natural forestation to restore itself, even after cessation of commodity crop growth in the region.

Retailers and manufacturers often buy commodity crops off of the spot market, a public financial market in which commodities can be traded for immediate delivery. As a result of purchasing from the spot market, the region in which the commodity is sourced from changes on up to a daily basis. The scale of the farm in which the commodities are sourced from is therefore often unknown to the retailers and manufacturers.

The short-term failure to follow proper procedure and ecosystem protection requisites often results in the long-term destruction of natural ecosystems and environments. Grassland and prairie environments are particularly susceptible to man-made natural disasters. The over-plowing of land and the excessive planting of non-native produce, such as wheat, strips the land of necessary barriers against wind and dust. As land is overfarmed and soil is stripped of its nutrients, native plants are unable to regrow and protect against drought and wind, resulting in the increased frequency of disasters such as dust storms.

As demonstrated by the Dust Bowl of the 1930s, an accumulation of land strippage particularly through dry land farming can result in the permanent destruction of habitation for plants and animals. While Congress attempted to allocate soil stabilizing resources to the area prior to the Dust Bowl, "suitcase farmers" continued to plow millions of acres of native grasses. Upward of nineteen states in the contiguous U.S. became part of a dust bowl, resulting in the death of thousands due to "dust pneumonia" and the displacement of millions. Despite the passing of nearly a century, a fraction of the affected land is still uninhabitable to this day, with previously native plants still incapable of being successfully reintroduced.

Fertilizer Runoff

Nitrogen and phosphorus present in chemical fertilizers provide crops with necessary nutrients. However, the failure to apply the proper amount of fertilizer or applying fertilizer at unnecessary times of the year results in the runoff of excess fertilizer. Fertilizer runoff occurs as a result of rain, melting snow, and even through absorption into the soil and subsequently into groundwater. Additionally, fertilizer runoff can occur in the form of nitrogen lost through the air. Ammonia, a gaseous nitrogen-based compound, can be deposited from the air to water surfaces, where it is detrimental to aquatic life and acts as a greenhouse gas.

Excessive nitrogen and phosphorus results in eutrophication of water bodies and subsequently hypoxia, a state of insufficient oxygen to maintain homeostasis. Without the necessary chemical balance to sustain marine life, fish and other aquatic life are unable to survive while algal blooms occur in freshwater bodies, which are producers of harmful toxins to animals, including humans, and a further disruptance to wildlife by prohibiting aquatic life from locating food.

Water Wastage

Irrigation contributes to 40% of produce grown in the world and at least doubles agricultural production in comparison to agriculture reliant on rainfall. Agriculture accounts for around 70% of freshwater consumption worldwide, around half of which is wasted through inadequate irrigation and drainage systems.

The Impact of Grocery Retailers & Manufacturers

Greenhouse Gas Emissions

The accumulated greenhouse gas emissions resulting from grocery shopping extend to many factors, including the distance in which a product is shipped. On average, produce in the U.S. is shipped 1,500 miles from its growth point to its final destination. The extensive distance produce is shipped is largely due to the growth of out-of-season produce in foreign regions such as South America. Produce that is grown out of season and shipped into the country is also typically grown in greenhouses that produce a significant amount of greenhouse gasses in order to replicate the natural environment the produce is supposed to grow in. The necessity of artificial lighting and humidity control among other factors contribute to an increased consumption of energy and fuel. Another hidden factor of greenhouse gas emissions is the freshness of the produce. Frozen produce leaves a carbon footprint that is three times greater than fresh produce, due to the further processing required where additives, particularly preservatives, are often integrated into the produce.

One of the largest sources of greenhouse gas emissions in grocery retailing is packaging, which is often overlooked due to the consumer focus on the product itself. Packaging involves the creation and discarding of refined plastics—as an example, the greenhouse gasses emitted from creating a yogurt container is twice that of the remainder of the production process. Of course, material makes an impact on the sustainability of the packaging as well. Contrary to popular belief, plastic bags for holding groceries are associated with lower carbon emissions than paper bags, a factor of which is its reusable nature.

Food Waste

Around a third of food produced ends up wasted in the U.S., approximate to around 133 billion pounds of food. Excessive food waste in the manufacturing and retailing stage can result from improper storage and transportation methods, making produce susceptible to insects, rodents, bacterias, and other pests. Equipment malfunctions, often resulting in the failure to store food at the proper temperature, also results in excessive spoilage.

Following the manufacturing and retailing stage, around 80% of consumers in the U.S. discard unspoiled and edible produce due to misunderstanding the expiration label, which can have differing phrases such as “best by” and “sell by”.

Discarding food waste involves processing, transporting, and storing the waste, resulting in the emission of greenhouse gasses. Additionally, food waste present in landfills produce nitrogen, which can escape into the atmosphere in gaseous form or travel into water bodies through rain or melted snow, contributing to eutrophication and algal blooms. As a whole, the greenhouse gas emissions that result from food waste contribute to 11% of global emissions.

Social Disparities in Relation to Produce

Food insecurity is prevalent among millions of households in the U.S. Food insecurity is the social and economic condition of having inadequate access to food of satisfactory quality. Food insecurity materializes as a result of many factors, including income, race or ethnicity, disability,

and neighborhood. A 2020 census found black households to be twice as likely to suffer from food insecurity.

Many supermarkets and grocery store chains, particularly high-end businesses that sell fresher produce, deliberately avoid establishing locations in low-income neighborhoods due to a lesser profit margin or belief of a higher risk for theft. This then contributes to a cycle of food insecurity in impoverished neighborhoods.

Solutions

The everlasting environmental impact of agricultural infrastructure is often disregarded as a necessary factor to consider in the consumption of produce. However, being conscious of what we consume is the first step in combating the economic, environmental, and social detriments that result from irresponsible food cultivation and distribution.

Organic Produce

While the FDA and USDA continually establish new regulations for produce and requirements for environmental protection among agricultural suppliers, a large fraction of produce is sourced from suppliers that bypass such regulations. Therefore, understanding where your produce is grown is the first step to protecting the environment. Purchasing organic produce ensures that your produce is coming from an inspected and well-regulated farm. For a source to be USDA organic certified, they must comply with required practices of cycling resources and conserving the ecology and environment of the surrounding area.

Fresh Produce

While frozen produce provides consumers with convenience and oftentimes a lesser cost, in addition to increased greenhouse gas emissions, frozen produce typically undergoes a large amount of nutrient loss during the freezing process. Artificial ingredients, and more often preservatives are added to the produce prior to being frozen. Instead, if needed to elongate the

shelf life, fresh produce can always be frozen and preserved at home, which ensures the produce does not undergo any chemical processing prior to being frozen.

Seasonal & Local Produce

Purchasing produce that is in season is an effective method of ensuring your produce is fresh and locally sourced, and therefore has a smaller carbon footprint. The cost of transporting produce, particularly from out of the country, can add to the cost of the produce once it reaches the shelf, and therefore purchasing from local suppliers can often be cheaper as well.

Farmer's Markets

Visiting a local farmer's market is an exceptionally environmentally conscious way to purchase produce. Produce sold at farmer's markets are locally grown, fresh and in season, unpackaged, and frequently USDA certified organic as well. They do not contribute to the greenhouse gasses emitted from grocery stores required to store or distribute the groceries, and because produce sold at farmer's markets go through a shorter supply chain, avoid retail markups, and require less resources, the produce is typically more inexpensive.

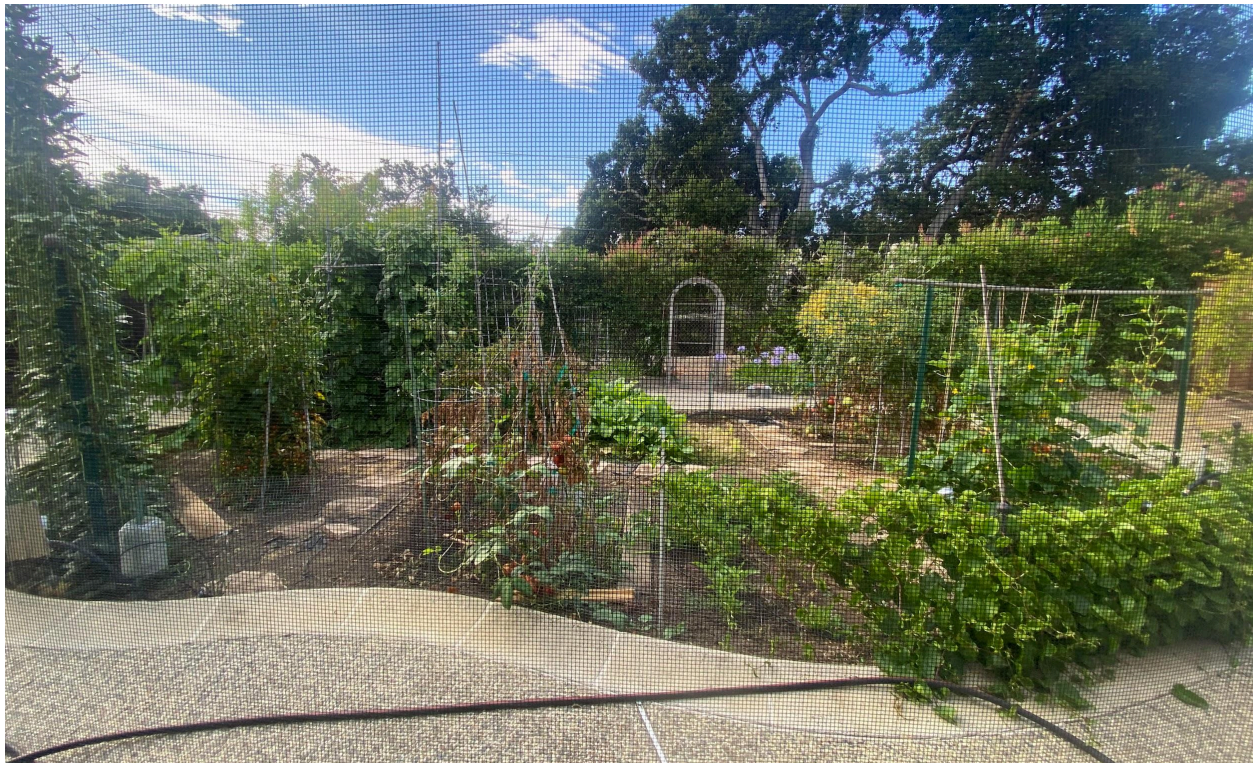
Expiration Labels

Prior to tossing out produce that has been sitting on the shelf for an extended period of time, double check the expiration label. For foods that have a "sell by" label as opposed to a "best by", research the shelf or fridge life of the specific product, keeping in mind that unopened and opened foods have different shelf lives.

Do It Yourself!

The final and possibly most rewarding method of obtaining produce sustainably is to grow it yourself! To many, including myself previously, it may sound overwhelming. However, growing your own produce does not mean buying a plethora of seeds and planting an array of fruits and vegetables in your backyard pool which you plugged up and filled with dirt. It could mean planting a few tomato seeds in your backyard or purchasing a small basil plant to grow in a pot

on your kitchen counter. Despite the assumption of many that maintaining plants requires frequent care and watering, most plants, especially vegetables, are extremely resilient. Taking proper care of your plants will of course yield more and better tasting produce, but there are endless varieties of fruits and vegetables to choose from, some of which are easier to care for than others. Especially in neighborhoods where fresh produce is expensive or difficult to obtain, even growing one or two vegetables can save both time and money necessary to purchase fresh produce.



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