F. Industrial Agriculture

Entering into the 21st century, the human population is exploding. With the rapid increase in population comes an equal increase in the demand for food. The issues caused by 7.8 Billion individuals on the planet, and the advanced societies that interconnect them, were caused by industrialization and commercial agriculture. Industrial-Commercial agriculture is the system of using advanced technologies to improve all aspect of the agricultural process. It brought the progressive-possibilitist mindset that with technology and modern science.. ANYTHING is possible.

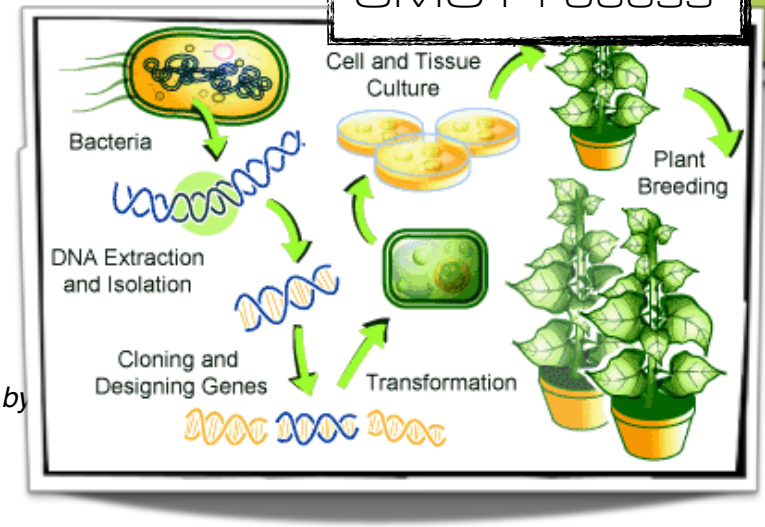
Modern society is less than 200 years into this new phase of industrial agricultural model (and less then 70 into the Green Revolution). This is extremely short compared to the 10,000 years spent in subsistent agricultural practices, or millions of years spent in transhumance practices. Humanity is still finding its footing in this new method of agricultural production: constantly inventing new improvements, while frequently learning about negative unintended consequences.

- **Technology and Technique**. At the center of industrial agriculture is improved technology, in particular the mechanization of traditional crop farming. Modern agriculture revolves around the oil-based engine, in its multitude of uses: tractors, tillers, seeders, scrappers, fertilizers/sprayers, harvesters, bailers, irrigation systems… to name a few. Every aspect of the farming experience has been mechanized. These steel beasts massively outperform any animal or human-powered hand tool in every performance category: speed, efficiency, productivity, reliability, durability, etc. For example: A John Deer plow is 26' wide - the equivalence of 13 people standing side-by-side. The plow can be pulled at 10 mph, which is just below world record pace for the mile, and it can keep that speed of work for hours (as long as there is gasoline available). Plows can till up soil humans cannot. They can seed the ground at the perfect, precision distances. They can harvest wider paths… Every measurable capacity, mechanization dramatically improved humanity's agricultural productivity and potential.

Application #1: Based on the numbers below, how much money did this farm invest in harvesters? Can every farmer afford this?

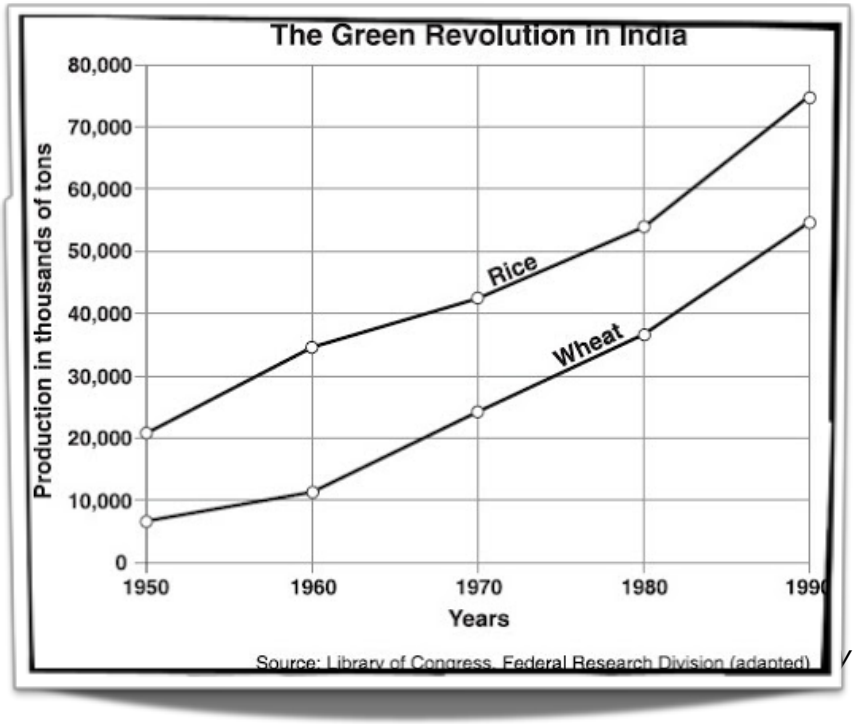
The major barrier of industrialized technology is cost. One John Deere tractor costs $22,000. One used John Deer combine and seeder costs $300,000 each. The harvester costs $600,000 A farmer can easily spend over $2 million just in equipment costs, not including the fuel to run the machines, or parts for repairs. Very few farmers can just pay $2 million for such equipment. But, the farms that are able to afford the machinery can outperform human/animal powered subsistent farms. They can do more work, better, faster. The mechanized farmer can achieve economies of scale with their productivity, dropping their price below what the subsistent farmer can sell their produce. The results are family subsistent farms going bankrupt, opening the opportunity for industrial farms to purchase their competitors and consolidate into megafarms.

During the late 1800s to early 1900s, research universities developed fertilizers, herbicides, and pesticides. Subsistent farmers historically had a problem of the soil experiencing fatigue - getting tired and running out of key nutrients needed for the crops to grow well. Scientists developed fertilizers containing nitrogen, phosphorus, and potassium restored nutrients the land had lost. Fertilizers helped plants to stay healthier and to give a higher yield; giving greater productivity per acre. Over 50% of the proteins consumed in the modern diet have a direct connection with the use of fertilizers. This also expanded the land that could be used for agriculture. Nutrient poor soil could now be fertilized in order to raise crops, where before it had been barren. Pesticides and herbicides removed competitors and diseases that weakened or destroyed the harvests. This meant that more of each years harvest actually made it to market, instead of dying/being destroyed during the process. These chemicals were developed in labs, produced in factories and sold to farmers. They could be sprayed with effectively dispersed with a hand held sprayer or with an airplane crop duster.



In the 1960s, biotechnology scientist Norman Borlaug - the father of the Green Revolution - further unlocked the genetic code of plants to save all of humanity. As discussed previously, the human population was exploding in the industrialized world. The world gained 1 billion people between 1927 and 1961. The world was gripped with the crises of over population. The scientific discovery of genetic modification was the modern miracle. It allowed scientists to create hybrid seeds, mixing the qualities of two crop varieties to make a third, unique species that had never existed before. They scientists altered the DNA of the food crops to possess more favorable qualities: drought resistance, pest resistance, increased yield, flavor… As a result, crops were altered to produce a greater yield, allowing greater productivity from the same amount of land use. GMO corn and soy plants have become resistant to diseases and pests that used to wipe out a large portion of a harvest. As a result of GMOs, more food made it to the people. Some plant's drought resistance and sun response has been modified. This allowed plants to be planted in a wider variety of regions, bringing more food options to more people. Other crops had certain qualities enhanced: potatoes with more starches, strawberries with larger size, apples that are more crisp and sweet. In rice-based cultures, there is an issue with vitamin deficiency that leads to long term health defects. Golden rice was developed that is fortified with Vitamin A, which is the key nutrient for preventing childhood blindness. GMOs are used to create insulin for diabetes medication, as well as the medication for hemophiliacs. Since 1950, GMOs have been specifically responsible for a 262% increase in yield.

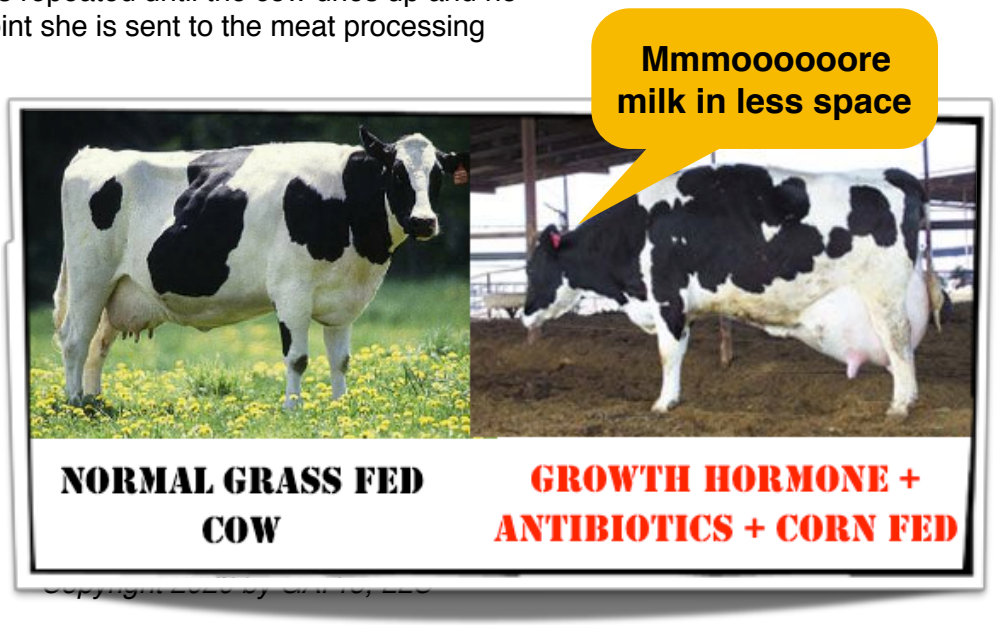
The Green Revolution began in North America with the USA and Mexico before diffusing to the rest of the world. In the 1950s, Mexico had been opposed to the scientific approaches of the USA, but were soon won over by the improved crop production of corn, beans, and wheat. In 1951, there was a 70% improvement in yield, that improved each year. Soon Mexico struggled with the effects of the Green Revolution: sick workers, babies dying during pregnancy, poisoned water wells, and destroyed ecosystems. Also, the tools of the Green Revolution (mechanization, annual GMO seeds, pesticides, herbicides, irrigation) were priced out of reach of the small farmers, so only the big farmers could prosper from it. In 1960, the hybrid rice called IR8 was introduced in the Philippines, to a roaring success. IR8 ("the miracle rice") crossed the best qualities of a rice from Indonesia and a dwarf rice from Taiwan. Philippines production jumped for 3.7 million tons/year in 1960 to 7.7 million tons/year in 1980. IR8 was introduced in India, which caused rice production to be 10 times more productive. India transformed from "apocalyptic starvation" to "exporting 4.5 million tons of rice per year."

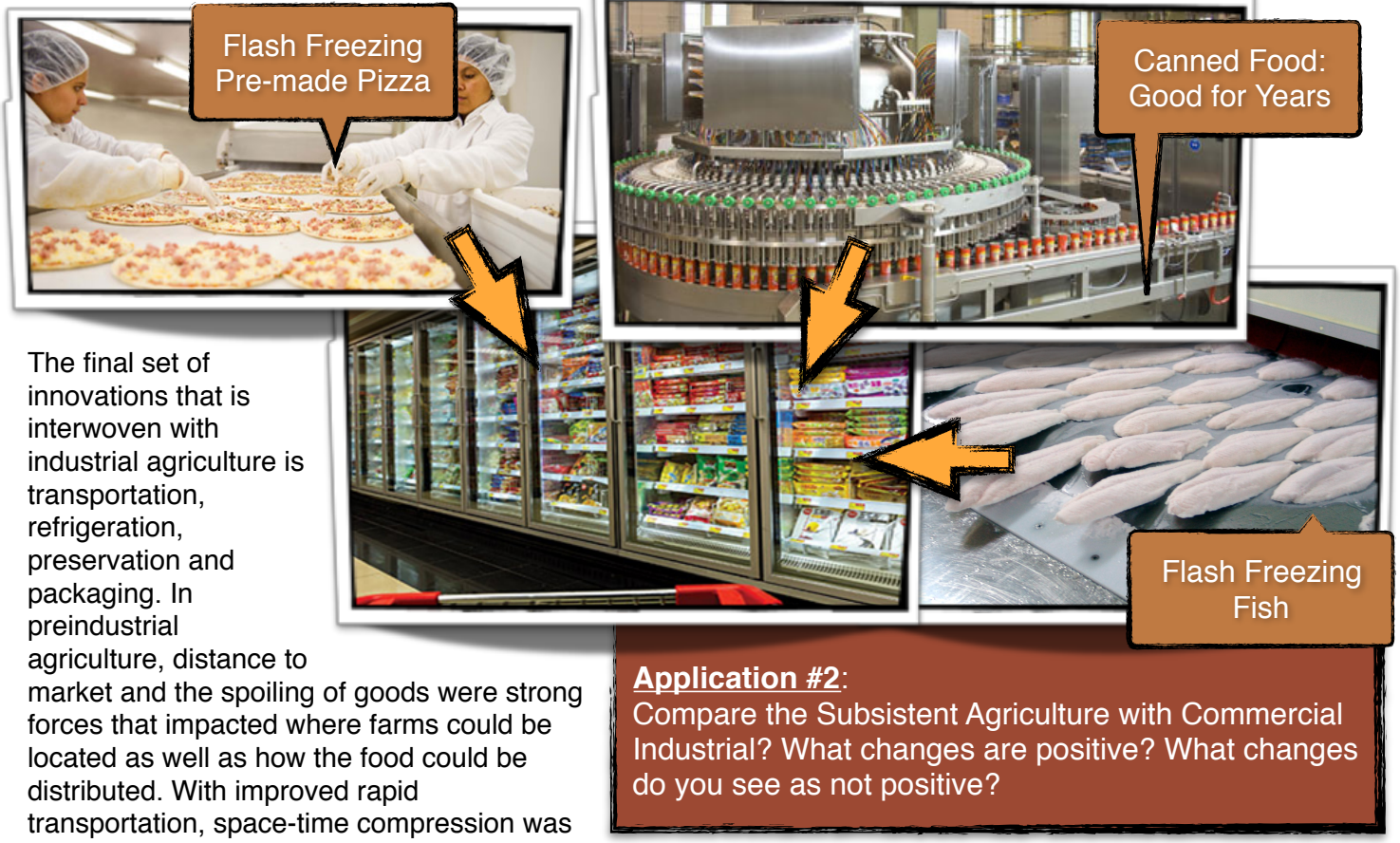


y GAPro, LLC

Mechanization has also made its way into animal and meat production. A vast majority of meat and dairy are now raised in Concentrated Animal Feeding Operations (CAFOs), also known as feedlots. CAFOs were constructed with industrialized material: outdoor pens for animals, indoor ventilated buildings for poultry, dairy cows, pigs, and fish. Mechanized feeding tools provide the food to animals that have special growth chemicals. These chemicals cause the animals to grow more meat on their bodies and develop at 2-3x the normal rate of speed (more meat, faster). Specially designed trucks have been created for the transport of animals from CAFOs to slaughter factories. Slaughter factories use machines to: stun and bleed out animals, de-hiding the animals (removing the hide/skin/feather), suspend and convey the carcass around the factory for meat/organ removal, and finally packaging the meat. As a result, meat production in the USA alone has risen from 9.8 Billion pounds in 1910 to 52.2 Billion points in 2012. While meat production has increased, the amount of land used for cattle has decreased: more food, less land.

In dairy factories, mechanization has altered the process and quality of milk production. First, cows get artificially inseminated (i.e. made pregnant using tubes) and then the baby is aborted. The cows begin to produce milk. They are given rBGH to increase the quantity of milk their utters produce. The cows are hooked up to milking machines that take the lactation into tubes, depositing the milk into bulk tanks for further processing. This process is repeated until the cow dries up and no longer produces milk, at which point she is sent to the meat processing factory. The factories then take the milk, pasteurize it, before bottling it into jugs or turning it into yogurts, cheese, ice cream, etc The factories and machines allow for a higher density of containing animals, allowing feed lots to produce more meat and dairy, but using less land. This has been causing the creation of massive feed lots, poultry farms, and dairy factories; with a reduction the over number of such farms.





Application #2:
Compare the Subsistent Agriculture with Commercial Industrial? What changes are positive? What changes do you see as not positive?

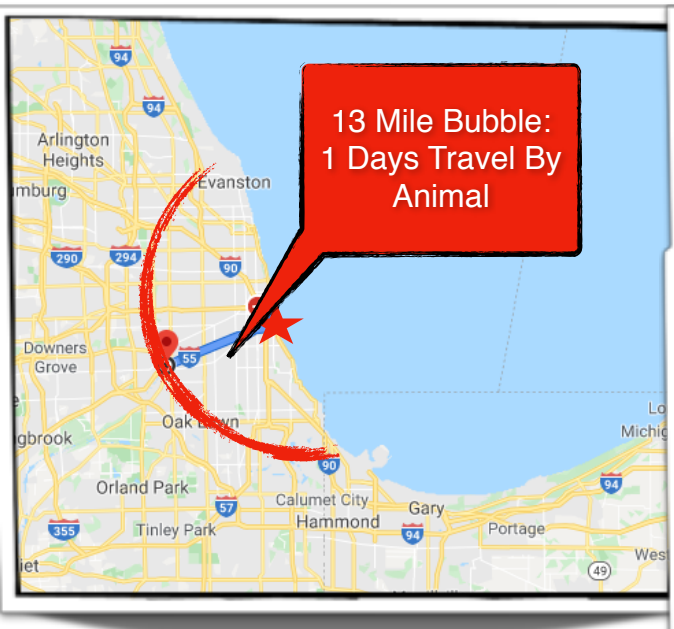
The final set of innovations that is interwoven with industrial agriculture is transportation, refrigeration, preservation and packaging. In preindustrial agriculture, distance to market and the spoiling of goods were strong forces that impacted where farms could be located as well as how the food could be distributed. With improved rapid transportation, space-time compression was reduced, allowing food to travel farther, faster. Flash-freezing and refrigeration allowed meat, eggs and dairy goods to be transported farther distances and stored for weeks to months without fear of rotting. Preservatives, canning, and vacuum sealed packages hindered germs from further deteriorating a food product, prolonging its consumption. Preservative sprays are applied to fruits and vegetables, allowing them to make long voyages without rotting. These technologies, paired with containerization, allowed farms to diffuse food regionally and globally through trains, trucks and ships. The surplus generated by the Green Revolution is now available to be consumed around the world.

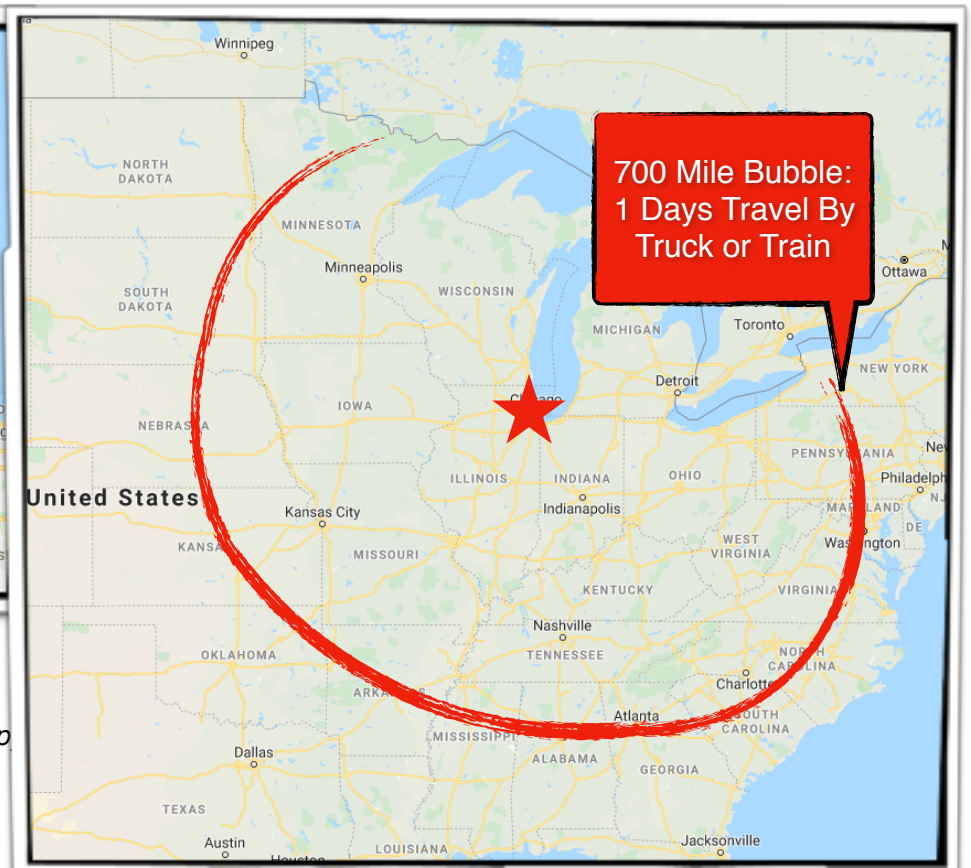
- **Landscape**. The first landscape impact of industrial agriculture was farm consolidation. Tractors and biotechnologies - such as fertilizers, pesticides, and GMOs - provided a sizable competitive advantage to the commercial farmer compared to the subsistent family farmer. Also, the equipment and biotechnologies were very expensive, causing many farms to accumulate massive debts, go bankrupt, and have to sell their land. This is especially true because GMO seeds must be purchased EVERY year. In subsistent farming, farmers collect seeds and holds onto them until the following year. But, with GMO and hybrid plants, the seeds are not replanted because the quality of the harvest is not as strong. Everywhere the farmer turned, there were new expenses to pay for in order to keep up with the competition. The result was the birth of megafarms and agribusinesses with the wealth to stay up-to-date with the latest in technologies, while the family farmers have drastically reduced. In the US population, the population transformed from 90% farmers in 1900 to >5% in 2000. The Homestead Act and the township range survey model had already setup up American farm land as dispersed, isolated settlements. The Green Revolution consolidation made the farm buildings even more dispersed and more isolated, as the landscape became littered with the shells of unused old barns.

Farm consolidation and the Green Revolution led farmers to begin mono-cropping. While some farm equipment can be universally used, other equipment changes based upon the crop. For example, the attachments for harvesting corn can only be used for corn. The attachment for soy beans can only be used for soybeans. The same is true for fertilizers, pesticides and herbicides, as certain plants need specific nutrients in the soil. For example, tobacco has different soil needs than wheat or potatoes. This commercial modern led many farms to specialize, primarily growing one crop at a time; also known as monocropping. Monocropping allows the farmer to focus on one set of seed, equipment and chemical purchases, and then utilize the megafarm acreage to achieve economies of scale. The farmer then relies on modern transportation to sell their crop to regional and global markets to earn their living.

Transportation and refrigeration drastically altered Von Thunen's Land Use Model. Originally, Von Thunen had assessed rural land use in a pre-industrial world based on animal and human power. Because of transportation costs and perishability, all farming activity and land use was determined by distance to market, forming 360* rings around population hubs. The new mass transportation networks and refrigeration radically evolved the way societies used their land.

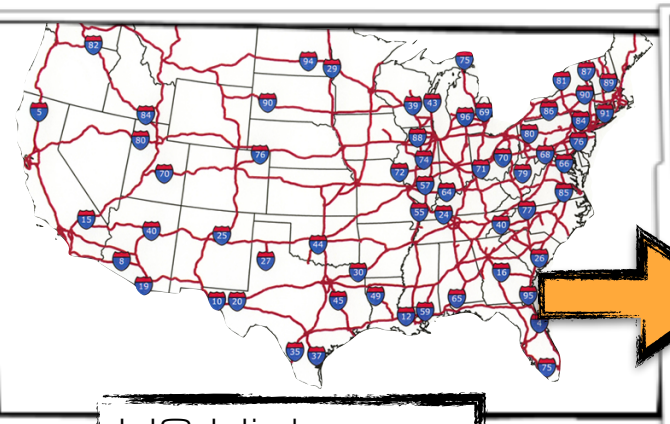
- *Transportation*. In the preindustrial world, locomotion mainly relied on animal power. If the conditions were right, an ox, bull or horse could pull a cart thirteen miles into town over a ten hour day - including rest and feed breaks. An eighteen wheel truck or a freight train can travel 60-80 miles… per hour. The truck or train travels 600-800 miles in the same ten hours it took the animal to go 13 miles. For example: An animal powered dairy or market farmer would need to be located near the now-suburbs of Chicago, or else his produce would spoil. The same farmer could transport his goods by truck or train from Washington DC to Chicago during that same time frame. Spinning the ~700 mile radius, farmers from Charlotte, Atlanta, Nashville, Kansas City and Minneapolis could all get their goods to the Chicago market within 1 days time.



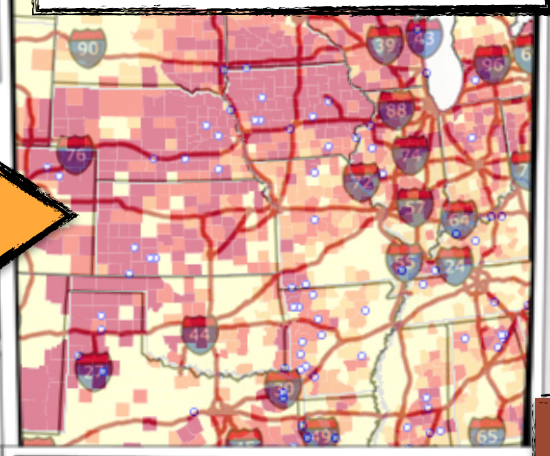


-*Refrigeration & Preservation*. In the pre-industrial model, perishable food had a problem with spoiling. Dairy farms, slaughter houses, and market gardens had to be close to their markets. The advent of chemical preservatives, vacuum seal packaging, industrial canning, flash freezing and refrigeration radically changed the way food could be stored and shipped. This was especially impacted by the innovation of the refrigerated shipping container. These chilled containers allowed frozen foods to stay frozen while they travelled. Once items were secured in the refrigerated container, they could be transported on any major form of transportation, anywhere in the world. These forms of preservation transformed the perishability of food from "hours" to "months/years." Food could now be grown/raised in one location and shipped across the state and around the world.

When merged together, refrigeration, preservation and transportation radically altered where a farm could be located while still getting their product to market. Dairy farms, poultry farms, and slaughterhouses that had once been in close relation to urban centers could move far away from major population centers, as long as they were connected to major transportation corridors (near the major highways and railways). As a result, farms and food processing factories rushed to get away from the city centers. They wanted to take advantage of the fertile land AND transportation intersections that was significantly lower costs because of its distance away from the urban centers (*think Bid-Rent Theory on a Regional-National Scale*). Slaughter houses left downtown Chicago, New York, and Cleveland and headed out to Iowa, Nebraska, Kansas and Arkansas. Farmers and processing factories agglomerated, or grouped themselves together, in similar regions so they could share the benefit of common resources. Beef/Cattle feedlots agglomerated in Nebraska/Kansas/Oklahoma/Texas. Hog feedlots agglomerated in Iowa/Missouri/Minnesota/Illinois. It was more profitable in this new model to agglomerate with farmers growing/raising similar crops/animals to share the unique costs (transportation, tools, resources, labor, feed, processing) then to be isolated and on your own.

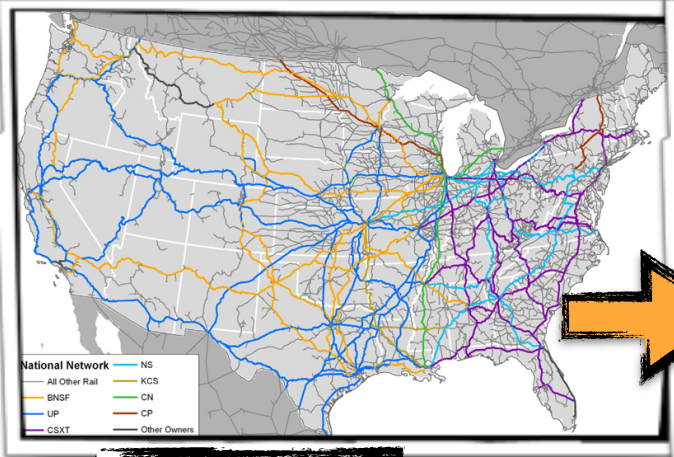


US Highways



Meat & Highways

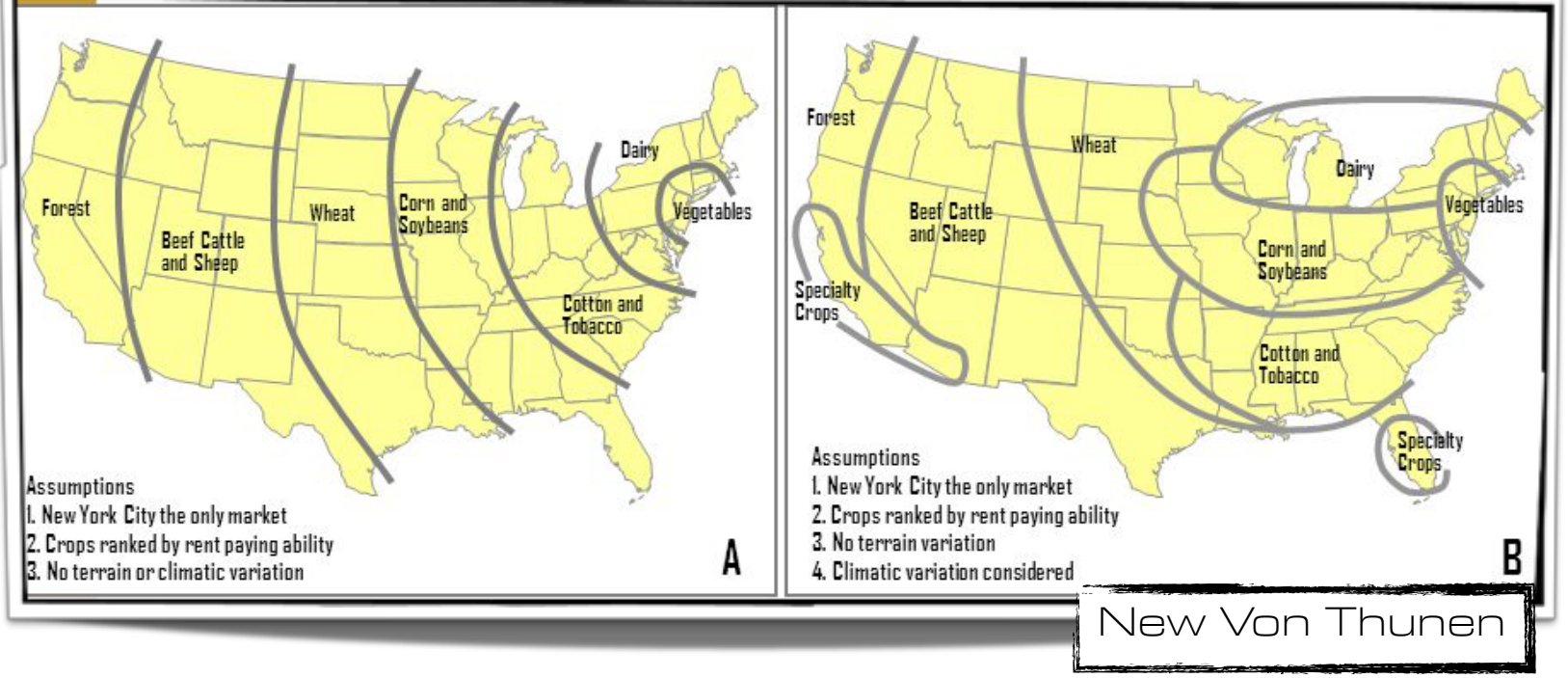
These maps show where animals are raised for meat. The darker **Red** == more animal farms. **Yellow** == Few/None. The **Blue**/White circles are the processing factories. The colored lines represent the transportation corridor.



US Trains

Meat & Trains

Application #3:
What is the relationship between:
- The Animal farms (Red areas) & the Meat Factories (Blue circles)?
- The Factories (Blue Circles) & the transportation lines?



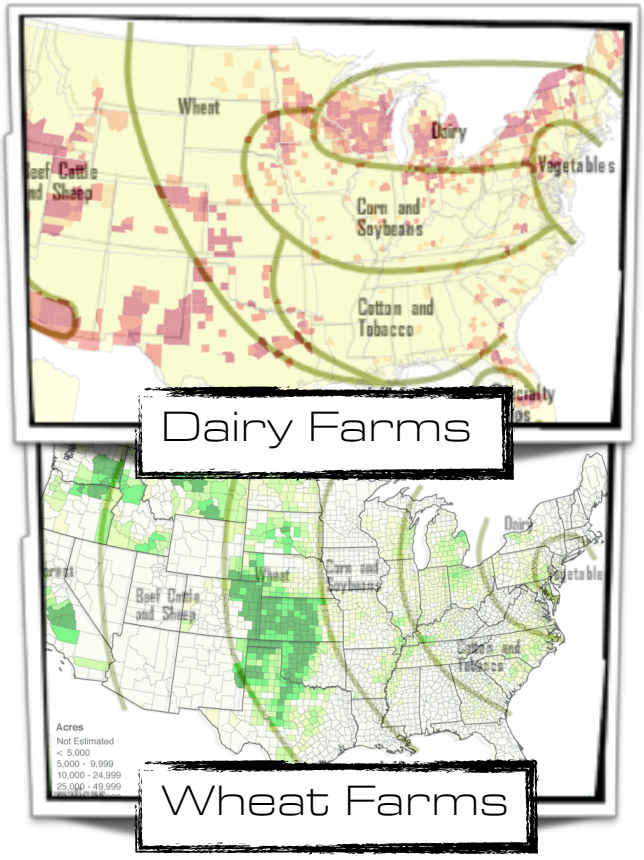
New Von Thunen

As a result of transportation, preservation and refrigeration, food delivery has gone global. Nebraska beef now travels 7,000 miles to be consumed in China. Columbian coffee travels 30,000 miles to be consumed in NYC. The average tomato travels 1,500 miles from vine to plate. Broccoli, grapes and lettuce travel and average of 2,000 miles. Packaged food contains ingredients from multiple states. The local grocery store now provides a taste of the world (as long as you have the infrastructure to connect to the network).

In the age of industry and globalization, Von Thunen's model transitioned from being relevant on a local scale to explaining rural land usage on a national/state scale.

- *The Market*. The largest, most densely populated regions now serves as the "Market" or "Central Business District." In the case of the USA, the CBD is the Bosnywash (Boston-New York City-Washington) region. In Europe, is London-Paris-Brussels-Amsterdam-Copenhagen areas. Using the bid-rent theory, these highly populated and profitable areas have the highest demand for the land, and thus the highest land value. The further away a person goes, the lower the cost of the land. For example, in NYC a 3 Bedroom-2 Bathroom (1,182 sq ft) home costs $630,000. In Columbus, Ohio that hour costs $200,000. In Columbus, Nebraska it costs $150,000. A second Market/Population hub has developed in California - from Los Angeles to San Fransisco. This has begun to reshape rural land use in the west as a result.
- *The Milkshed & Garden*. In this new model, the labor intensive Milk and Market Garden still choose to locate themselves closer to the population centers. In the USA, this is New York, Pennsylvania, and Virginia (some models include Michigan and Wisconsin). A second milk shed/garden region has formed in California, as a result of the second - smaller population hub. This zone is effected by the Rocky Mountains, which reshapes where farmers are able to farm.
- *The Extensive Crops*. The extensive crops all moved to the West of the Appalachian mountains, where the land cost is significantly less expensive. Extensive crops dominate the landscape along the Mississippi, Ohio and Missouri Rivers - because of their low-cost land AND easy access to water.
- *The Extensive Cattle*. Cattle Ranches and feed lots have agglomerated between the Mississippi River and the Rocky Mountains - especially the Western side. These highlands are not as fertile for crop farming, but still support animal grazing and feedlots. Mixed-crop farms are common in the transition areas of Nebraska and Kansas. Both are "home" to large corn, wheat, and cattle farms and processing factories.
- *The Forest*. In modern times, wood is important but has been largely replaced in daily life by electricity. People no longer rely on wood for daily cooking and fires. Any wood needs for building are served by timber mills located on the far West Coast in Washington and Oregon. The processed wood is put onto trains and trucks, and shipped across the USA to wherever there is a need.

- *Specialty Zones*. There are speciality zones that do not conform to Von Thunen because of the unique environmental situation. One example is the special growing region of Florida. Florida's distance to market would suggest that Florida would be a location for extensive crop and animal agriculture. However, Florida's climate makes it ripe for growing oranges, which does not conform to the model. Similarly, California's central valley is a unique growing region for Mediterranean Agriculture because of its unique climate. As a result, the Central Valley grows tomatoes, grapes, olives, dates/figs, amongst other specialty foods that do not grow anywhere else in the USA due to the special climate circumstances.

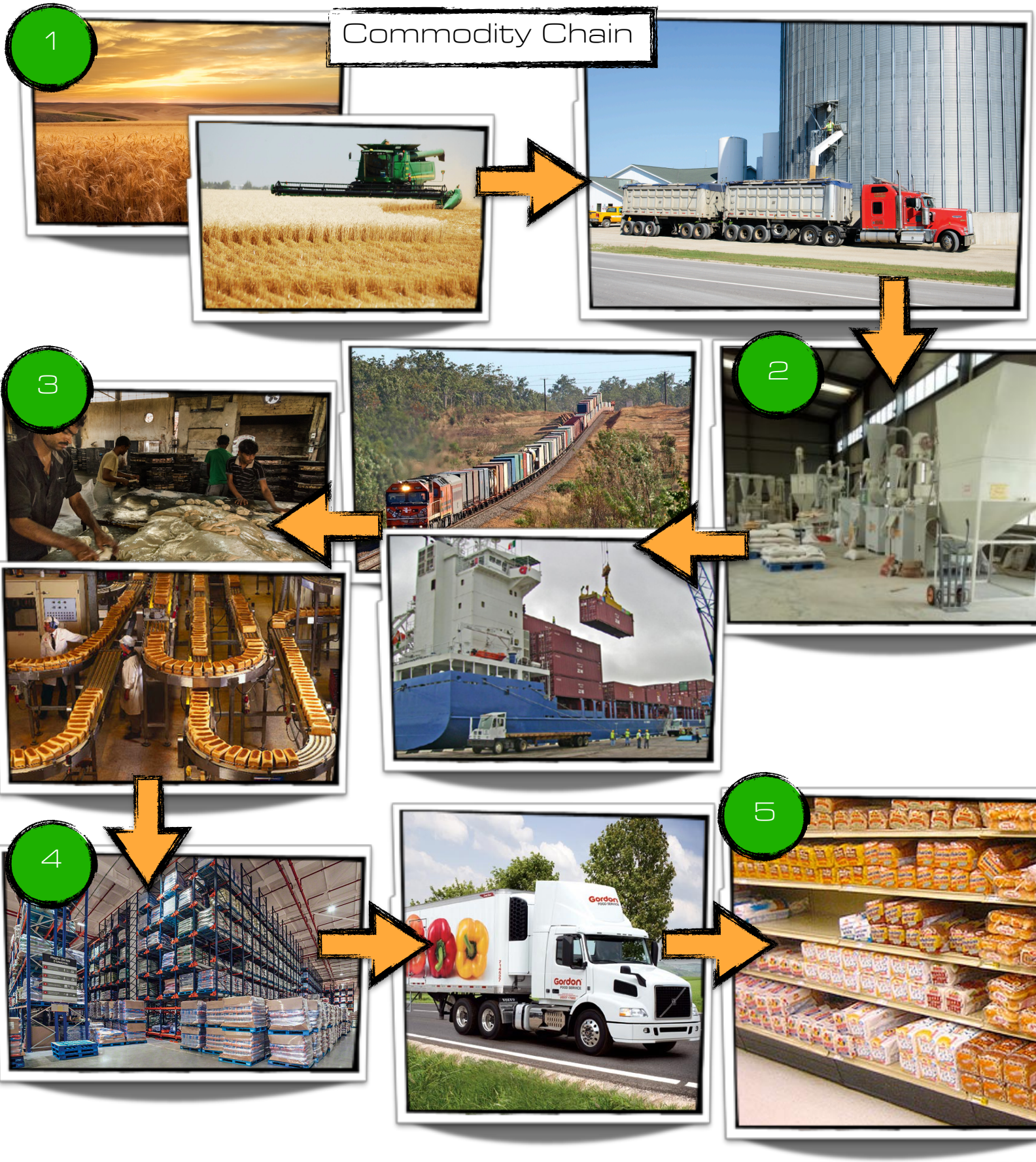


- **Economy**. Commercial Agriculture is profit driven, with the goal to make as much money as possible. The result is economies of scale - megafarms that mass produce their crop(s) in order to have the lowest price on the market and selling the most goods. Because the economies of scale floods the market with cheap goods, only other megafarms can compete; pushing smaller farms out of the market, or out of business all together. As a result, 55% of farmers in the USA are making less than $10,000 per year from their farm sale. This mindset of economies of scale results in the megafarms and feedlots becoming specialized, focusing on one crop or animal. Everything on that one farm is geared towards maximizing the yield and profit of that one commodity.

  Because of the immense cost of industrial production, groups specialize in each step of the commodity chain. A commodity is a raw material or agricultural project that is sold - like crops or animals. A commodity chain is made up of steps or "links in the chain" that are needed to bring the commodity to market.

  [Chain Link 0: The Tools] This step produces the tools, seed, fertilizers, machines needed to farm.
  [Chain Link 1: The Farm] Where seeds are grown into plants & than harvest. Where animals are born and grow until adulthood (or until the right size for slaughter). The food is stored in warehouses or shilohs until transportation is available to ship it to…
  [Chain Link 2: The Processing] The commodity is transported using shipping containers by truck or train to a bulk loss factory. At the bulk loss factory, the commodity is broken down into its usable parts. Corn is husked and all the kernels removed. The seed of the wheat is removed, with the stem being discarded. The meat is cut from the animals' bodies. The product is put into a shipping container.
  [Chain Link 3: Assembly] The commodity is transported using shipping containers by truck or train to a bulk gain factory. In a bulk gain factory, the commodity is mixed with other commodities to assemble the final, consumable product. The liquified corn gets mixed with chemicals to become ethanol (an additive to gasoline for cars). Wheat flour gets mixed with eggs, yeast, and salt to become bread… The product is put into a shipping container.
  [Chain Link 4: Warehouse] The final product is transported using shipping containers by truck or train a ware house/ distribution center (if it is a foreign country, the product may have been shipped overseas). This is where the product sits until either a store or customer purchases it.
  [Chain Link 5: Store & Customer] The commodity is transported using shipping containers by truck or train to the store where it gets put on the shelf that the company has rented. Customers then go to the store to purchase the product to take home. Companies like Amazon have made their business model around shipping from the warehouse directly to the customer - skipping the store front all together.

Commodity Chain



Application #4:
What role does machinery and energy play in the production & distribution of commodities? What role does transportation play

In this environment, Agribusinesses were are born. Each link in the chain became controlled by a different company. These agribusinesses purchased all the specialized equipment, trained the specialized labor, and stationed themselves at all the strategic locations to achieve economies of scale. Each step, each link, in the chain purchased the low-cost product from the one before it, adding value to the product each step of the way way, until it is finally sold to the customer. As the resources moved through each step, it became more expensive as each business wanted to make a profit.

However, as the companies grew more and more wealthy, the brands grew to have substantial power over their supply changes. Companies like McDonalds, Wendy's, Chick-Fil-A, Dominos, Pizza Hut, and Starbucks have used commodities to create a brand that people want to buy. In a high mass consumption society, the brands generate the demand from the customers with their products, that generates the demand for the commodities, that keeps each step of the chain in business. For example: if people stopped buying McDonalds french fries, that would not only impact McDonalds, but also: the ware house that stored the fries, the factories that cut and flash-froze the fries, and finally the farmer who grew the potatoes (not to mention all the truck and train companies).

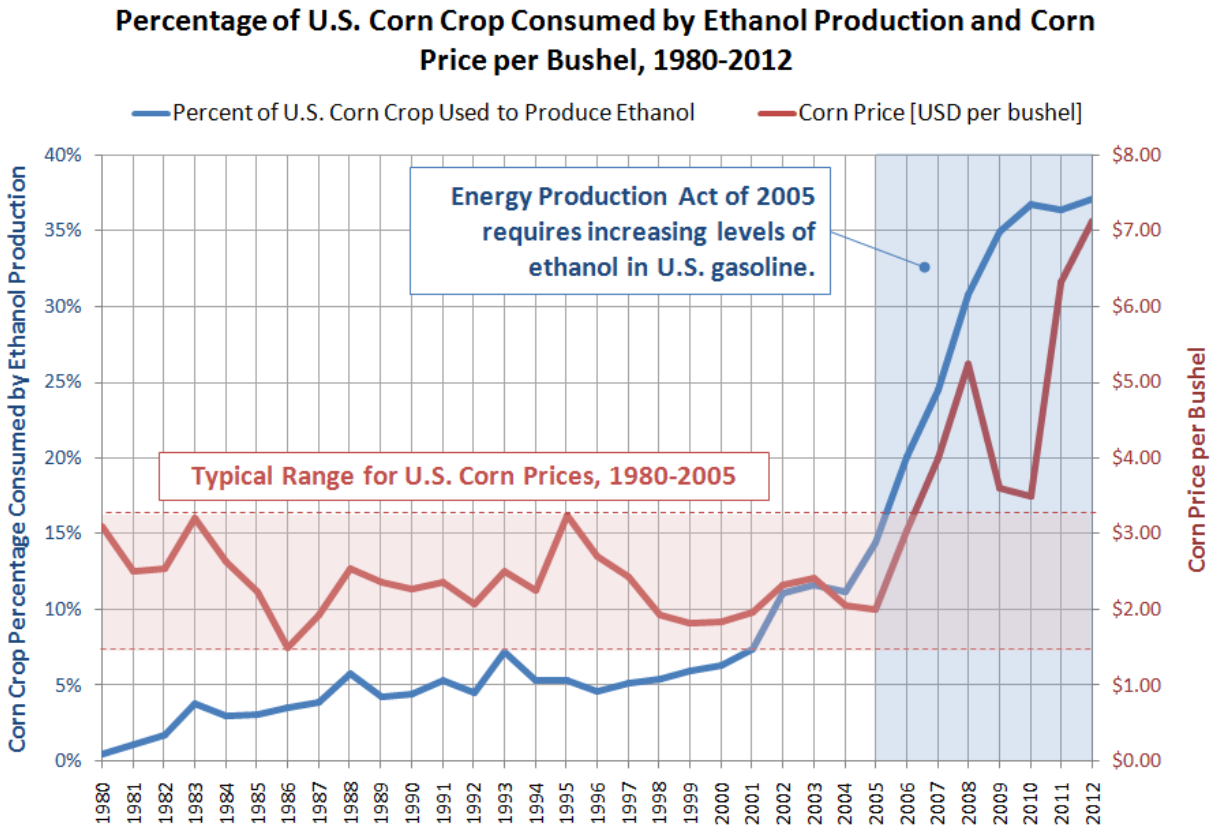
The end result has been the creation of mega-multinational corporations, who have hundreds of millions of customers, who have extraordinary control over the supply chain. Let's continue to use McDonalds for the example:

- McDonalds sells 3.4 Billion pounds of Russet potatoes each year globally. There are ~3 potatoes in a pound which means McDonalds buys, cooks, and sells ~10,200,000,000 potatoes. When customers show up, they expect a certain quantity of potato, with a certain taste and texture for a certain price. How will McDonalds make sure that every fry they sell meets their brand standard around the world?
- McDonald's CEO standardizes the product McDonald's needs for its system: They need the exact type of potato, at the exact size, with the exact taste/texture qualities. Anything that does not fit the standard will not be accepted. They tell the farmers in Idaho and Washington that they want to sign an annual contract for 3.4 Billion pounds of potatoes of a certain size and quantity, grown in a certain way. They tell the potato/fry processing factory, they are placing orders for 3.4 Billion pounds of processed, cut, and flash frozen potatoes. What do you think their response is? They are ecstatic!
- Now… McDonalds wants to sell their small fry for ~$1 and their medium fry for $1.50 (varies by the city). The small fry uses one potato and the medium uses two potatoes. If McDonalds wants to be able to sell that fry for $1 for a profit… and the ware house, the potato processor/freezer, and the truck driving companies all want to make money in the supply chain… how much of that $1 will the farmer get? How much will they be selling that potato to McDonald's for? The farmer sells each potato for literal pennies. How many potatoes will the farmer need to grow and sell then to make a profit? How much will the farmer be able to pay the farm hands for their help? What about all the expensive equipment? Can these farmers afford to have small farms or good paid workers with McDonalds selling their fries for $1?

- You are the farmer. You are trying to make ends meet. You are very grateful to McDonalds for their guaranteed contract that buys your entire field's harvest each year... but making pennies per potato requires a massive farm. A McDonald's calls you and says they will only continue to buy potatoes from farmers who use this certain type of fertilizer. That fertilizer is more expensive than the one that you use currently. What do you say? The following year, McDonald's says they will only buy from farmers who are using a certain type of pesticide/herbicide that you don't currently use. What do you say? McDonalds calls the next year and says "Sales are down. We want to buy your entire harvest of potatoes, but for ___ less then last year." What do you say? What happens to your farm at the start of the potato commodity chain if you don't?

This small example demonstrates the power big brand, multinational corporations have upon the agricultural supply chains. What does this mean for the cattle farmer to be able to sell $1 hamburgers? Or the Chicken farmer to sell a $3 chicken sandwich? Those who go along with the corporations get the contracts, stay in business, but lose their autonomy. Those who don't accept the contracts and conditions struggle to even stay in business, because there is so little business that is NOT tied to the big contracts. The global corporate culture, especially those created by fast-food restaurants, has completely reshaped the way food is produced, distributed and consumed.

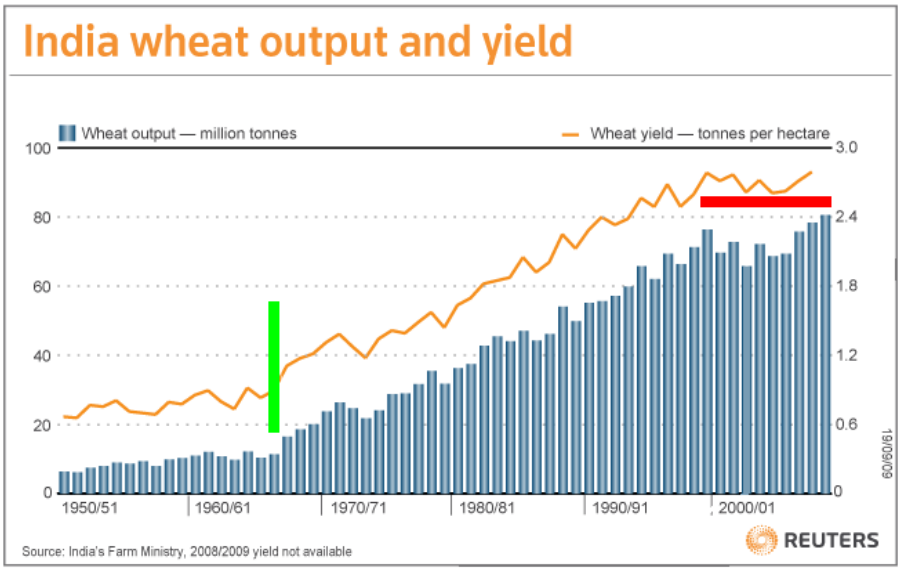
Agribusinesses also control the commodities used for non-consumable products. The rubber latex from rubber trees can be made into tires, tubes, gloves, flooring, mats, etc. Cotten and hemp is turned into clothing. Corn is the the number one largest crop grown in the world, but less the 1% is consumed by humans. 99% is used for either ethanol for gasoline or to feed livestock. When food commodities are used for non-food products it artificially increases demand for those products. When demand increases, prices increase. While that is good for the farmer to be able to sell for a higher price, that is bad for the customers - especially those in poverty. Higher food prices reduces the people's purchasing power and can lead to greater food insecurity.



- **Government**. The government has roles it is supposed to play regarding agriculture and economics.
  - *Zoning*. First, the government is responsible for zoning land and labeling conservation areas. When the government zones more land for agriculture, it creates greater wealth opportunities for farmers and (in theory) could decrease food costs for people because of the increased supply. On the flip side, when government's zone land as environmentally protected, it decreases the farmers productive potential and increases demand for the commodities that are already produced. When demand increases, prices increase.
  - *Health & Safety*. Second, the government is responsible for health and safety of its citizens and what they eat. The government is responsible for regulating agribusinesses and farmers to ensure that the food products meet health and safety standards. This also includes giving guidance and frameworks for food labels, telling the consumer what is in the food they are about to consume, where it came from, etc.
  - *Subsidies*. Third, the government can provide subsidies to corporations. Subsidies use tax money to pay or support businesses. Subsidies are primarily used to help stabilize the farmers income and ability to produce. Economic markets are wild and vulnerable. No one can predict what demand and weather will be from year to year. Yet, the cost of producing the food stays relatively the same from year to year, no matter how the rest of the economy is doing. n domestic and help keep the price of their goods low on the global market.
  - *Trade Agreements.* Governments negotiate international trade deals, setting tariffs and quotas or seeking free trade agreements. Tariffs and quotas can be used to protect a domestic business from cheap imports. Free trade agreements can allow a government to flood a foreign state with cheap exports. For example: with the USMCA (formerly known as NAFTA), the USA's amazingly cheap corn flooded into Mexico and Canada's market places. In 2018, USA put a tariff on Chinese imports - including textiles and technology. China put a tariff on US soybean and port exports, costing American Farmers close to $15 billion in sales. Plus, China created agricultural trade deals with Argentina, Brazil and Canada. When the tariffs did lift, the US farmer had to compete with foreign farmers for the lucrative Chinese food markets. The US government subsidized $15 billion to the farmers to help them get through the crisis created by the trade war.

Because of the level of influence the government has over agriculture, agribusinesses send business representatives to lobby the government, seeking to persuade the government through kind words, campaign donations, gifts, or threats to make policies that favor their business interests. For example: research studies of the past decade have shown the importance of limiting red meat because of the saturated fats. The government's FDA (Food, Drug Administration) was going to issues a statement, for "Americans to limit red meat consumption." A number of key farms and businesses lobbied congress and it was changed to, "Be careful and limit saturated fats." Agribusinesses also work to get representatives selected into important positions in government agencies. They use their position to influence the creation of rules and the level of enforcement… or better stated, the lack of enforcement. One important piece of agricultural legislation was the 2008 Farm Bill. The Farm Bill provides key subsidies and safety nets that directly benefit the largest agribusinesses; taking much of the risk and responsibility off of the farmers if the crops fail, and putting it onto the government and tax payers. This is part of the reason why grains, meats and cheeses are proportionally cheaper then fruits and vegetables; because the grains and meats are backed by subsidies that do not support the commercial truck gardeners.

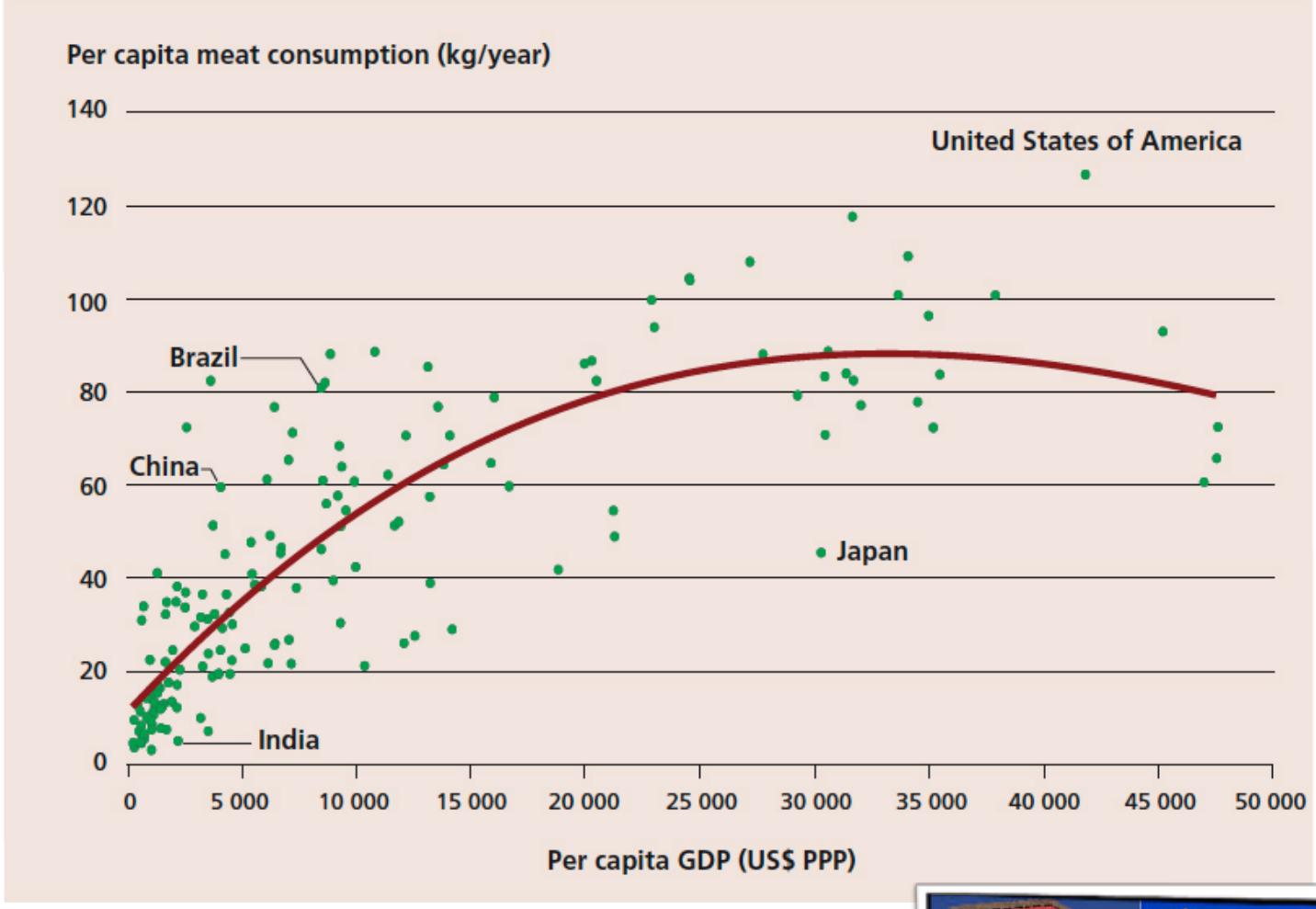
- **Quality of Life**. Industrialized agriculture has had an immense impact on the quality of life for people in the MDCs/Core economies. As industrialized agriculture generated more food with less effort, there was a rapid change in the demographic transition. The crude death rate and infant mortality rate decreased, causing an explosion in the population. Because of GMO technology and fertilizer, this population explosion has been able to avoid the Malthusian fear of out growing the food source. Despite having 7.8 billion people on the planet, enough food is grown for each person to eat 2,8000 calories each day.



Mechanization of agriculture altered the shape and nature of the economy within the MDCs. Because of the power, speed and efficiency of the tractor, the creation of large scale megafarms, the result was a massive drop in primary sector jobs and agricultural density. The farmers and farm hands who were displaced by machines moved to urban areas to work in the secondary and tertiary industries. Their children were able to go to school, receive more advanced educations, and further contribute to the growth and advancement of society.

The primary sector jobs that are still available have a wide inequality gap. There are the agribusiness jobs and being a megafarm owner who are making over $1 million per year. Then, there are the low-wage seasonal workers and the (often illegal migrant) butchers at meat processing factories. The seasonal workers do the intensive labor that is still required in commercial truck gardening that has not been automated yet, especially picking fruit. The meat processing workers spend 12-14 hour days carving meat, being exposed to unimaginable amounts of animal blood, and sharp machinery. These jobs have a high injury rate, as well as long term health consequences from high levels of exposure to the blood, germs, and antibiotics. Because agribusinesses are in constant competition to race to the bottom and to sell their product for the lowest profitable costs, these migrant workers tend to be underpaid farmers from Rostow Stage 2 or 3 states. Many of those migrants had their own farms closed down because of cheap imported commodities that their intensive subsistent farm could not compete with in term of cost and efficiency from the commercial agricultural system.

Per capita GDP and meat consumption by country, 2005



The shift in agribusiness focus has changed the diet patterns in the MDC. No longer is the average families making meals from local sourced foods. Instead, they are relying on globally traded foods and restaurant prepared meals. Where hunters and gathers were eating from hundreds or thousands of plants, the modern diet consists of five to eight. This trend of restaurant eating has caused a massive spike in meat consumption in the USA and around the world. To put the numbers in perspective, in just 2013 the American meat industry produced:

8.6 billion chickens — 38.4 Billion pounds of chicken
33.2 million cattle — 25.8 billion pounds of beef
239.4 million turkeys —5.8 billion pounds of turkey
2.3 million sheep — 286 million pounds of lamb and mutton
112 million hogs — 23.2 billion pounds of pork.

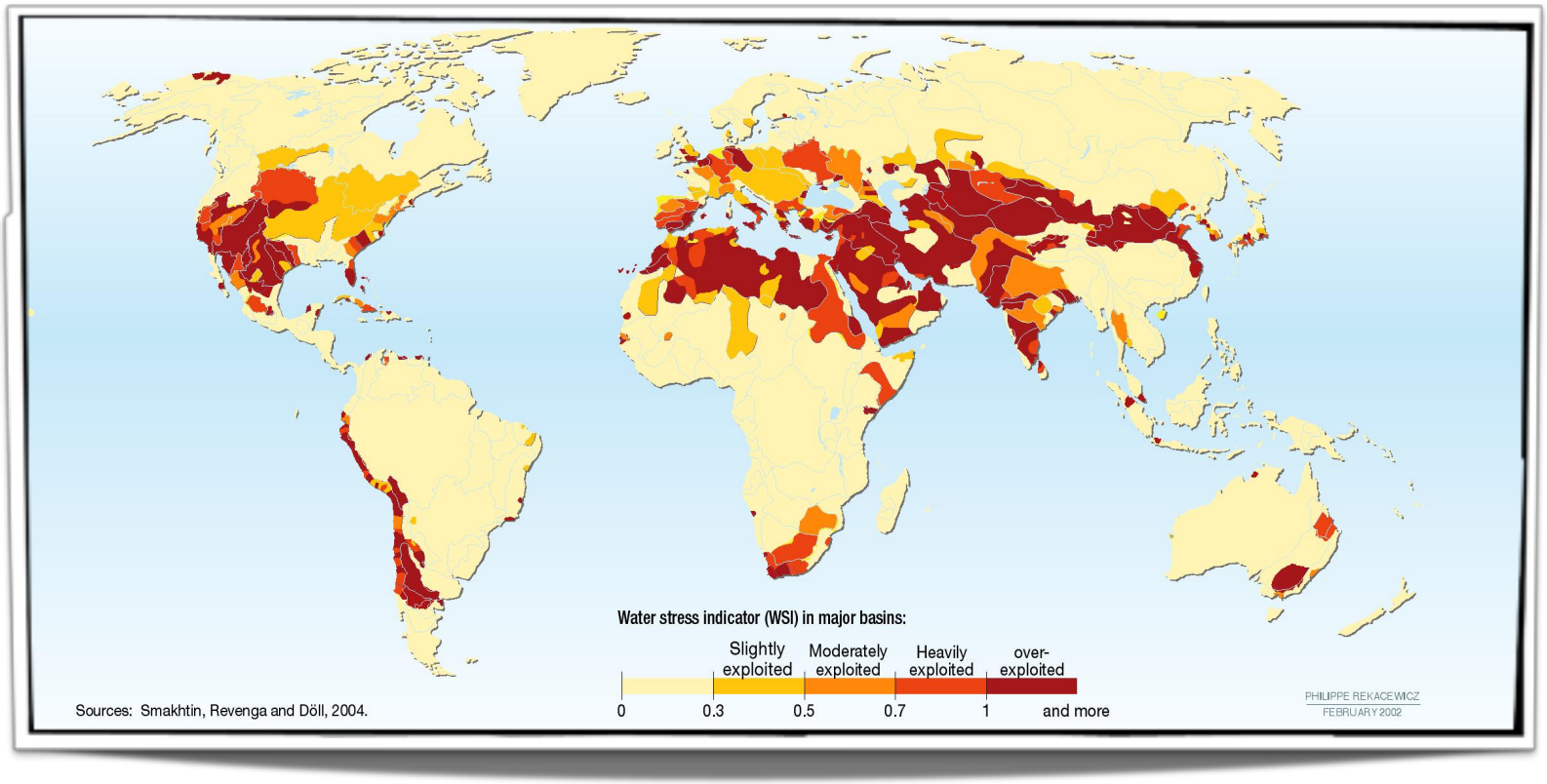
Within this group, chicken is the fastest growing meat being consumed in the USA. While population growth plays a role in the amount of consumption, the improvement in feedlot/CAFOs for chickens has drastically reduced the price while increasing availability. Chicken also gained the reputation of being a safe and healthier meat, in comparison to beef or pork. This has helped increase its availability in supermarkets as well as at popular fast food chains like Chick-Fil-A, Bojangles, KFC, Popeyes, Zaxbys, and PDQ (to name a few).

- **Environmental & Other Consequences**. Industrial and Commercial agricultural practices raise a number of environmental concerns:

Air Pollution. The air quality in commercial agricultural regions suffers. The tractors and other fossil fuel based farm equipment blast exhaust fumes into the air, as well as stirring up tremendous levels of dust. Both making it difficult to breath and have higher case loads of asthma the surrounding region. Most of the herbicides and pesticides applied to farm fields are spread through mechanized sprayers or by crop dusting airplanes. Scientist estimate that as much as 90% of these chemicals get carried away by the air, being breathed by the local communities. These chemicals have been linked to increased cancer rates, dementia/Alzheimers Disease in people exposed to the chemicals. The CAFOs and large scale feedlots have immense amounts of animal waste laying around. This causes horrific air quality in the regions surrounding CAFOs, which can be smelled well before they can be seen. The methane from the animal feces is a deadly greenhouse gases and a key contributor to climate change. CAFOs/feedlots are the world's leading emitter of greenhouses gases; producing more pollutants than all cars in the world combined.

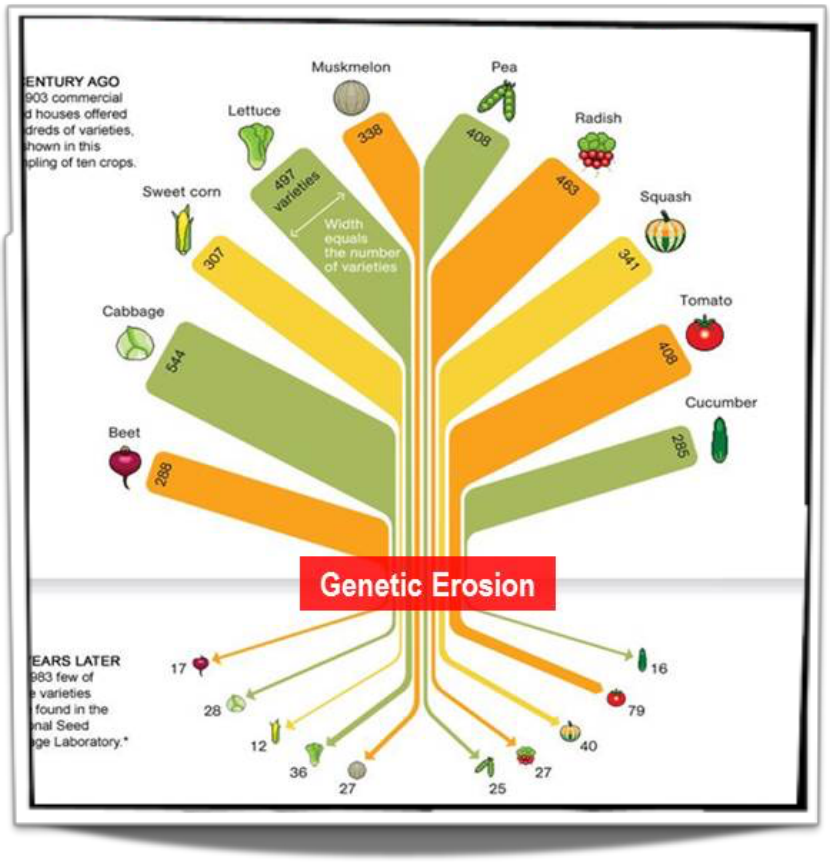
Water Pollution. Fresh water is a necessary, precious and limited resource. Industrial agriculture creates two main fresh water crises. The first is the pollution of water. The fertilizers, pesticides and herbicides runoff from the farms, into the local water sources - nearby rivers or underground aquifers. This poisons the fish as well as the drinking water; causing harm to the plants, animals and people relying on these water sources. Dead zones are being created in rivers and lakes, where nothing is capable of growing or existing because of the toxicity.

The second issue is the amount of water used. Commercial farms and feed lots use an immense amount of water to irrigate crops and in sustaining cattle. For example: 2,000 gallons of fresh water are needed to create one pound of beef from one cow. In 2013, 25.8 billion pounds of beef were produced in the USA alone; 69 million pounds a day. This amount of water consumption puts a heavy strain on the local ecosystems, draining underground water aquifers and nearby water sources. Neo-Malthusians fear the increased population with their changing diet to being more meat based will cause a global catastrophe.



Soil Quality. Industrial agriculture has had devastating impacts to soil quality in farming regions. Due to tractors and heavy farm equipment, there is a massive erosion crises occurring: 64 tons of nutrient rich top soil is eroded per acre, per year. The focus on monocropping, cash, and speciality farms is decreasing the biodiversity within the soil. This is exhausting the land, causing the soil to increase in salinization (saltiness) and decrease in key nutrient levels. Both cause farmers to further increase the use of fertilizers and other chemicals into the soil.

Loss of Biodiversity. The biodiversity in the soil is also being harmed by the use of pesticides and herbicides. The chemicals kill both the harmful insects as well as necessary insects such as worms and bees. Without a change of course, the world is heading towards a bee crises, where there will soon not be enough pollinators to pollinate plants. No pollinators would crush the harvest and cause a food crises.



The use of pesticides and herbicides are creating superstrains of pests and bacteria. The herbicides and pesticides eliminate a large number of the weeds and insects that harm crops. The weeds and pests that are left multiply, creating a new wave of pests that are resistant to the chemicals being sprayed. This results in the use of even more chemicals, or of crop invaders that farmers are unable to control.

Animals and Disease. The CAFOs and feedlots have causing a number of societal concerns. The feedlot animals are fed corn based diets, which their bodies did not evolve to digest corn. This causes viruses like e-coli to develop in their digestive system, and come out in their feces. CAFOs are jammed packed with animals where they can barely move - standing in the the groups feces all day. Instead of switching off of corn, agribusinesses give large doses of antibiotics and growth hormones. This has caused concerns about the nutritional value and safety of the meat and dairy being consumed. E-Coli and other meat-disease outbreaks are becoming more frequent. There is also the growing fear of superstrains of diseases in animal meats that are resistant to the antibiotics. Furthering the fear, the lobbyists promote the government to minimize regulations, inspections and food recalls; which saves the reputation of companies while putting consumers at risk.

The global trade in animals is causing concerns for animal-to-human disease transmission. China has “wet markets" where exotic animals from all over the world are brought in order to be sold as meals at fancy restaurants. The urine, feces, blood and puss of these animals interacts, sharing viruses and bacteria from multiple continents. Because interaction creates blendedness, this forced interaction of animals creates new mutations of the viruses that had never existed before (and that no one has immunity to). Because it is a market, humans interact with the animals and the intermixed bodily fluids - opening the door for viruses to mutate to infect humans. This has happened in 2003 with SARS and in 2010. It happened again in 2019, in the Wuhan province of China. Evidence is pointing to Wet Markets being the source of the Cover-19 mutation that, because of trade networks and transportation interconnectivity, rapidly spread around the world; infecting and killing thousands.