ABSTRACT

The Origins and Consequences of the American Feedlot System

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This thesis examines the history and the consequences of the American feedlot system. Until this system came into place, cattle were rarely eaten as they were more valuable alive for their milk and labor than they were for meat. The change that this system facilitated has transformed the American diet, as well as the diet of much of the industrialized world. Industrial advancements and government policies were instrumental in the development of the feedlot system. To examine this history, this thesis studies primary sources from agricultural, business, and industrial history, human and veterinary medicine, newspaper/magazine articles, biographies of influential industrialists and government officials, and government documents. Further, the thesis uses contemporary studies in the field of environmental science.

The Origins and Consequences of the American Feedlot System

by

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A Thesis

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TABLE OF CONTENTS

PREFACE:

Humans and their Food

Humans, as animals, must eat. Since humans are omnivores, we have greater choices in what we may eat than many other animals. Further, because of our large brains we are afforded more methods of obtaining food than most. For humans, there are two primary ways to get food: production and gathering. Food gathering can be defined as collecting food from an existing environment without any manipulation to change food production. For example, a very hungry early human is walking through the woods and spots a berry patch. He had nothing to do with the growth and sustainment of that berry patch, but he will gather and, along with his kin, consume the fruit produced from it.

This system has its advantages and disadvantages. The major advantage being that the person did not have to put forth any effort into producing this food other than searching for it, thus freeing his time for other pursuits. The major disadvantage to this method is the uncertainty that goes with it. The early human may go out looking for berries only to discover there are none because a massive heard of elk passed through and ate all the berries, or there was a bad frost the week before and killed everything. There is also an element of danger as the early human is forced to leave the safety of his home and go out into the wilderness, which may result in him being “gathered” by a larger predator.

Food production can be defined as the manipulating of an environment to have it produce desired crops. Again, let observe the early human. This time, there is a berry patch right outside his cave. This early human has a knack for observation and notices that wherever the berries tend to fall, new berry plants come up. He then decides he will take some of the berries and drop them in a different spot away from the plants. A couple of weeks later he observes that some new berry plants have grown in the new location. He shares his findings with his tribe who do the same thing, and within a couple of months they have a fully functioning berry patch. The early humans could then go on to apply this discovery to other wild edible plants they have found, and within a couple of years they have a complete garden.

The same system of production can be applied to animals as well. Said early human is out in the woods and finds a young abandoned deer. The knows that deer eat grass and plants, so he takes it home, ties it up, and stakes it to the ground. The early human feeds the deer grass from around the cave, and since they have a garden, is able to feed it scraps from the garden. If the early human finds another abandoned deer, perhaps one of the opposite sex, there is the potential for the beginnings of animal husbandry.

These two systems, gathering and producing, were not and are not mutually exclusive.[1] Perhaps the early human could not figure out how to get a certain plant to grow where he wanted it but he would still gather it where he could find it. Maybe he wanted to domesticate mastodons along with his deer, but mastodons proved to be too dangerous to keep, so he would still hunt them when possible. Even in today's production-oriented food system, people still gather food when it is convenient. For example, finding wild pecans in a lowlands area in a park by a river, or hunting deer with one's family over Christmas vacation, are both common methods of food gathering that are still practiced today.

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[1]Elaine McIntosh, *American Food Habits in Historical Perspective* (Westport, Connecticut: Praeger Publishers, 1995), 19.

Gathering

The very first humans ate a mostly plant-based diet obtained through foraging. More than likely, the early humans ate whatever plant foods they could find as they did not yet have the technological knowledge to make the basic tools required to kill large animal prey. Most animal protein would have been obtained from insects or from scavenging animal carcasses. From the Late Miocene to the early Pleistocene period, humans made a shift from the mostly plant-based diet to one that included more meat and more cooking. Small animals that could be caught, large slow animals, or the sick and injured could have been killed by hand and, with the discovery of fire, cooked and eaten. Both of these methods, however, relied on either foraging for plant matter or finding animals, either living or dead. Neither truly provided a stable intake of food. This led the early humans to adapt a “thrifty” gene.[2] This gene was important to these humans because they did not know where or when they would find their next meal. Therefore, it was important for them to eat as much food as they could when they had it to help them survive the next couple of days without food.

[2]Robyn McDermott. "Ethics, epidemiology and the thrifty gene: biological determinism as a health hazard." *Social Science and Medicine*, 1998: 1189-1195.

Most people assume that anyone could gather or collect wild plant matter for food, but in reality it was an incredibly specialized skill set. It required knowledge of the seasons to know when certain plants would be ready to eat. It also required knowledge of the individual plants to eat so as not to eat poisonous or harmful plants. Even some of these plants could be made safe to eat with the right preparation. For example, the cassava root is one of the most widely consumed plant edibles on the planet and is eaten just about everywhere it grows. Unless the root is processed or cooked, however, it is inedible as it contains linamarin, a toxin that produces cyanide when introduced into the stomach of animals.[3] Further, some parts of plants are edible while others are not (e.g. the potato). Potatoes are members of the nightshade family. While the roots of the potato plant are edible, almost every other part of the plant is poisonous. Learning what parts of what plants to eat would have been vital knowledge that would have been passed down from generation to generation.

On the other end, animal protein was a bit more difficult to obtain. Hunting greatly increased the

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[3]M.P. Cerada and M.C.Y. Mattos, "Linamarin – The Toxic Compound of Cassava," in Journal of Venomous Animals and Toxins vol 2, no 1(1996).

availability of meat that humans were able to come by, and it required just as much if not more skill and knowledge about their prey than the plant gatherers. For starters, hunting required knowledge of equipment. It takes time and practice to manufacture and use bows, spears, nets, and other gear used in hunting. Aside from this, there is great skill in hunting and using these primitive tools. Often times hunters would wear skins of the hunted to act as camouflage to allow them to get in closer. Also, they wore the skin of animals that hunt the hunted (e.g., Plains Indians wearing wolf skins while hunting buffalo).

With hunting came the first storage and preservation of meat which would prove to be a vital advance. The most common ways of preserving meat were drying and/or salting.[4] Food preservation was a critical step in the development of modern agriculture as it afforded people the ability to take advantage of the fat times and survive the lean times.

Production

Humans first domesticated plants and animals sometime around 8000 BCE and the first agriculturally based economy started around 5000 BCE.[5] With the implementation of

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[4]McIntosh, American Food Habits in Historical Perspective, 24.

[5]Ibid, 28.

agriculture came the first true cities and the advent of what we would consider civilization, trade, and people performing specialized non-food related tasks (potters, carpenters, soldiers, priests, etc.). Agriculture is what has allowed our modern civilization to become possible.

There are three means of food production. The first of these is horticulture. Horticulture can be defined as small scale cultivation of plants for edible consumption. Horticulture can be described as a backyard garden – growing food plants for personal use with basic hand tools with no intent to sell or trade on any large scale.

The second means of food production is animal husbandry, which can be defined as the science of raising and breeding animals for food. Animal domestication was a slower process than plant domestication because, unlike plants, animals can fight back. The first animal to be domesticated, the wolf-descended dog, was probably done so on accident more than on purpose. More than likely the wolf followed groups of humans feeding on animal remains after the humans left camp, eventually leading to humans finding and taking in pups. Other domesticated animals (sheep, goats, horses) were herd animals and were probably domesticated by nomads who followed the herds, eventually splitting off numbers of the herd and founding their own domesticated herds. While certain animals would have been used solely for meat (pigs, poultry), most animals were more valuable living than dead, either for transportation (horse, oxen, dogs), milk (goats, cows), or companionship (cats).

The third means of food production is agriculture, which is defined as the science of cultivating land for the purpose of growing food. The plow allowed humans to cultivate larger areas of crops, therefore allowing for greater food production. This greater production allowed for the first mass food surpluses, which would have allowed for the first instances of real trade between cities.

These surpluses had to be stored, however. Drying has already been discussed, yet many crops had to be stored through other means. One of the earliest forms of preserving crops was through fermentation. Beer was first discovered in ancient Egypt and Mesopotamia like many other breakthroughs – by accident. Grains, usually wheat and barley, were often crushed, mixed with water, then dried into cakes. These cakes would then be mixed with water again, allowing the sugar to be released which allowed for fermentation. As modern day “beer bellies” can attest to, beer is an excellent method of preserving calories and carbohydrates stored in grains. Further, when beer was brewed by boiling, it was a way of disinfecting water. Wine, first discovered around 5000 BCE also in Mesopotamia, also by accident, was one of the earliest methods of fruit preservation.

Other than pure animal fat, milk was one of the only ways early humans could access fats. Because of milk spoilage, however, there was a need for some method of preserving milk without refrigeration; this led to cheese. Cheese has been around in some form ever since humans started domesticating animals. Supposedly, it was discovered by someone traveling through a desert. The traveler put some milk into a pouch made from a sheep's stomach and, as he was traveling, the natural rennet lining of the pouch caused the curds and whey to separate, revealing cheese in the bottom of the pouch. Cheese can last much longer than milk and is essentially the concentrated fat content of the milk; therefore, it is an excellent method of preserving said fats.

As we have seen, many pivotal food discoveries throughout the centuries have been made by accident. Many of these discoveries, particularly the domestication of plants and animals, have been called the Agricultural Revolution. As technology advanced, however, people purposefully began to look for ways to improve food production and preservation. This technology truly improved by leaps and bounds during the Industrial Revolution.

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Further, I would like to thank my family and my wife, who pushed me to keep going even though I thought I couldn’t go on anymore. They know exactly what kind of carrot to dangle in front of me.

DEDICATION

To my wife. Without her, this would not have happened.

CHAPTER ONE

Introduction

Food today and the way we make it is dramatically different than it was thousands of years ago. Famine and malnutrition were much more common before the twentieth century, yet obesity, diabetes, and drug-resistant food-borne illnesses have been on the rise the past century. Much of this change can be attributed to modern agriculture and the industrial revolution.

The United States in the nineteenth century witnessed a great leap forward in agricultural technology that completely altered the way Americans obtained their food, especially beef. From the rise of the first cities and civilizations to the wars and revolutions of the 1700s and 1800s, people had been almost completely dependent on local agriculture production for their food. In the United States, European and Chinese immigrants flooded into the country seeking work and land, which they often found in abundance. While many of these immigrants were able farmers and capable of growing their own food, many people still thought that the added population put further strain on the food system because many immigrants settled in cities and were not contributing to food production.

These fears of immigrants partly fed the advancements of the Industrial Revolution, which might as well be called the second agricultural revolution. Advancements in both went hand in hand, such as advancements in metallurgy and the improvement of the plow and the invention of the internal combustion engine and the tractor. With the rise of the use of iron and steel came much advancement in agricultural technology. First came the iron plow, invented by Jethro Wood in 1819, followed by the steel plow in 1837, invented by John Deere. The mechanical reaper, used to cut wheat and other grains, was invented by Cyrus McCormick in 1832. All of these inventions were greatly improved upon by the discovery of the Bessemer process——a method for cheaply refining and creating steel. These inventions allowed greater tracts of land to be put under plow, therefore allowing for superior food production which allowed for improved food surplus.

The period before and during the Industrial Revolution and the Civil War was the last time in American history where there existed purely regional food systems. The rise of modern transportation methods – especially railroads and riverboats – allowed for food and livestock to be transported across the country quicker than any other method previously had allowed, thus removing the necessity of local systems. Improved transportation allowed people in Kansas to sell food to people in Florida, and vice versa. Before the modernization of transportation, diets depended on region, socioeconomic level, and ethnicity. These different diets deserve a quick look of their own.

Populations living in rural areas before the industrial revolution provided almost all of their own food with the exception of salt, some flour, and in some cases store-bought spices. Many families kept vegetable gardens big enough to feed their families. Since the produce of these gardens was restricted to what would grow in the region as well as the season, people ate whatever was available, resulting in seasonal as well as regional diets. Seasonal refers to diets that are affected by what is growing in season, and regional refers to diets that are restricted by what is able to grow in that region. For example, tomatoes do not grow in winter in Missouri, but winter wheat and certain greens will. In South Texas, however, tomatoes will grow all year round, but not winter wheat will not. Many of the vegetables grown in these gardens were grown to be preserved through canning. Fruits were often preserved through jams, preserves, drying, and through alcohol (cider and brandy). Vegetables could be preserved through pickling. If grains were not grown for baking,brewing, or distilling, they would have been bought locally from a mill.

Rural diets consisted of little meat. The most common meat eaten was salt pork, although eggs, along with meats that could have been hunted (deer, rabbit, squirrel) and caught (fish), were also common. Most families would raise a hog for yearly slaughter and then salt or smoke the meat to preserve it so they would have enough to last them through the winter. Almost every bit of the animal would have been used – skin for fried pork rinds, intestines for chitterlings, and the fat would have been used for grease, candle making, soap making, and food (lard).

Beef, incredibly common in modern times, would have been a rarity in pre-industrial diets. While a cow would have been kept on the farm for milk which could be processed into cheese, butter, and cream, cattle were rarely butchered because milk was as valuable a source of protein and fat as meat.

Due to their lack of food preservation and distance from food production areas, people who lived in cities had far worse diets than of those living in rural areas. Even though the first refrigerator was invented in 1803, it was nothing more than an insulated box with ice. Because of this lack of refrigeration there were few ways for people to get any fresh produce from the fields to the cities without spoilage. Milk and meat were also quick to spoil. Further, disease was far more common in the cities than in rural areas as populations concentrated and the conditions in cities were often unsanitary. One food that was often readily available to city dwellers was bread.[1] Bread did not need to be refrigerated, and its ingredients helped it keep well without refrigeration. If bread went stale, the consumers could mix it in with broth or beer and eat it like a soup to refresh it. If it got moldy, the consumers could simply cut the moldy part away and eat the rest.

Due to meat spoilage, the most common kind of meat that would have been available in cities was salted or smoked pork and fish, and perhaps some chicken as they could survive in cities. Canning of meat existed, but was still an imperfect science. Most canned meat was reserved for military use. Any fresh beef would not have been very fresh and probably would have been ridden with diseases and parasites. This lack of quality, available beef in urban areas inspired innovation in the raising and transportation of beef cattle.

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[1]Elaine McIntosh, *American Food Habits in Historical Perspective* (Westport, Connecticut: Praeger Publishers, 1995), 85.

Post Civil War Urbanization and the Rise of Agribusiness

After the Civil War, people increasingly moved to cities to find work and escape a countryside devastated by war. Many of the people who had previously lived in the countryside were used to higher quality food, especially meat, and expected a higher quality product than what was available in most cities. What was needed was a concentrated method of meat production that would serve concentrated populations of people.

Thankfully, the new forces of the Industrial Revolution were up to the task. The most important developments were in the railroad industry. After the Civil War, railroads expanded extensively westward, linking the east and west coasts and also further opening up the regions of the Great Plains which had previously been ignored by Anglo settlers who originally favored coastal areas for settlement. More farmers equaled more crops of grains, which led to cheaper prices and surpluses.[2] Due to this surplus many farmers quit farming and turned to raising livestock that would eat the surplus grown by their farming neighbors, which also served to appease the growing

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[2]Harvey Levenstein, *Revolution at the Table* (Oxford: Oxford University Press, 1988), 30.

appetite for meat in the cities.[3] Railroads allowed for transportation of livestock from the Midwest and produce from the South to the eastern seaboard. While cities still depended on produce from surrounding farms, they were increasingly importing food from farther and farther away as transportation allowed it.

Railroad growth vastly expanded the popularity of beef cattle. Before the railroad, cattle grazed on the open Great Plains and were then herded to the slaughter houses and shipping centers of the Midwest – cities like Saint Louis, Fort Worth, Kansas City, and Chicago. These meat packing cities then either distributed the meat locally as the butchered meat could not withstand the trip, or the cattle were shipped to other markets. On the East Coast, consumers either relied on local beef, of which there was too little, or received live cattle from the Midwest. Many of these cattle were sick, underweight, or dead, as the trip was incredibly rigorous.

In the late eighteenth and early nineteenth centuries, technological changes, such as the improvement of farm implements and the growth of railroads, and economic changes, such as the growth of cities, changed the way Americans got their food, especially beef. The Industrial

[3]Ibid, 30.

Revolution had vastly improved farm production, thus resulting in crop surpluses. This crop surplus needed an outlet. The growth of railroads led to the development of "cattle cities" where railroads and cattle yards blended together, with businessmen in both industries constantly evolving their techniques to make the system more profitable and efficient. There were three developments in particular that resulted in a complete revolution in the American beef industry. These three things——the growth of commodity corn to be fed to beef cattle, the innovation of Gustavus Swift, and the invention and subsequent improvement of mechanical refrigerated railroad cars——completely revolutionized the American beef industry as they were instrumental in the creation of the modern feedlot system. That word, "feedlot," is very important, as the vast majority of American beef comes from feedlots. Without these three developments, it is likely that feedlots as we know them would not have developed. With that in mind, it is important that we break down these developments to explain how the American feedlot evolved, as well as the ramifications that this system has had on the people of the United States as well as the environment.

CHAPTER TWO

Corn and Cattle Drives

Corn is of vital importance to the American feedlot system. Without corn, feedlots would not have the cheap, readily available carbohydrates needed to fatten cattle quickly for slaughter. Corn is a New World crop and, along with the potato and the tomato, one of the new world's biggest contributions to agriculture. It belongs to the family Gramineae, and is the only member of the genus Zea.[1] Corn is a grass, and it looks like it – one simply needs to compare a corn tassel (see Appendix 1) to a Bermuda grass flower (see Appendix 2), to see the similarities.

Corn was originally domesticated in South and Central America, probably by the Mayans. They took a grass plant, zea mays, and bred it until they had the desired traits, such as bigger heads and bigger kernels. The corn the Mayans and eventually almost all Native American people came to eat looked somewhat like what we now call "Indian corn." It would not have been yellow in color, the heads would have been somewhat smaller and it would not have

[1]Arturo Warman*, Corn and Capitalism: How a Botanical Bastard Grew to Global Dominance* (Chapel Hill, North Carolina: The University of North Carolina Press, 2003), 12.

tasted as sweet as modern corn does. It would not have produced as much corn per head as modern corn either.[2]

Corn is one of the three sisters (the other sisters being squash and beans) of the New World diet. They were called the "three sisters" because they were grown in close proximity to each other. The corn would grow tall, providing something for the bean vines to grow up. The beans would provide nitrogen for the ground. The squash would provide a ground cover helping to prevent weed growth, retain moisture, and discourage pests via their many small spines or hairs on their stalks.[3]

The Native Americans ate corn a variety of ways. The Incas of Peru are known for making a weak beer called chicha from corn. There is the classic corn tortilla, which, along with beans, helps to form a complete protein. Corn could also be boiled and eaten on the cob or in soups/stews, along with many other ways.[4]

When European colonists first arrived in the Americas, they found that the crops they had brought with them were

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[2]Michael Pollan, *The Omnivore's Dilemma* (London: Penguin Books, 2006), 37.

[3]Jane Mt. Pleasant, "The Science Between the Three Sisters Mound System," in *Histories of Maize*, ed. Bruce Benz, John Staller, and Robert Tykot (Burlington, MA: Academic Press, 2006), 535.

[4]Michael Andrew Malpass, *Daily Life in the Inca Empire* (Westport, CT: Greenwood Press, 1996), 82.

ill-suited to the difficult climate of coastal New England. Many farmers thought that because they were along roughly the same latitude as Europe, they could produce the same crops. Wheat in particularly proved ineffective compared to corn as corn produces more, larger kernels per plant than wheat. Because of this, a farmer could take a plot of land and feed his family and some livestock with corn, while the same plot of land planted with wheat would produce far less.[5]

Farmers also improved upon Indian corn by breeding certain desirable qualities in corn; most notably taste. Indian corn was not as sweet, so farmers, through selective breeding, developed something called sweet corn. When people eat corn on the cob, sweet corn is generally what they are eating.

One person of note in improving American corn genetics was a Mexican banker named Zeferino Dominguez.[6] While Dominguez first earned his money through banking, his true passion was improving corn farming through genetics and farming methods. Dominquez's techniques would have been considered simplistic today, but for the time they were a

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[5]Pollan, 25.

[6]Jeri. L. Reed, "The Corn King of Mexico in the United States," *Agricultural History 78* (Spring 2004), 157. (155-165).

simple, easy to use method for the average farmer to improve his or her crops. Dominquez suggested that farmers simply take one hundred of their best ears of corn, and out of that hundred find the best two ears, meaning the ones with the most kernels, as well as the fattest, and breed those two together. This early method of genetic engineering vastly improved both output of a corn crop, as well as the quality.[7]

Farmers also improved upon the Incan chicha by developing methods of making whiskey and beer from corn instead of wheat, rye, and barley. This corn-based whiskey is a strictly American creation and is called Bourbon.[8] Corn was easy to store and pigs and chickens loved it, thus leading to its cultivation as livestock feed. Further, it handled droughts and hot American summers better than European crops. Additionally, the whole corn plant could be used as opposed to most other grains where the only useful by-product is straw. Corn husks could be used as matting, bedding, roofing, clothing, rugs, toys for children, paper, and numerous other uses. The stalks, when

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[7]Zeferino Dominquez, *The Modern Cultivation of Corn* (San Antonio: Dominquez Corn Book Publishing Co., 1914), 54.

[8]Electronic Code of Federal Regulations, “Title 27: Alcohol, Tobacco, and Firearms,” National Archives and Records Administration, http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=21224b7c634d83e0fa329bfd18bb85dc&rgn=div8&view=text&node=27:1.0.1.1.3.3.25.2&idno=27 (accessed May 25, 2010).

dried, are hard enough to be used in makeshift construction though they do not last as long as wood. Every part can be burned for fuel in fires, and cobs are very hard and can serve as tools or door handles and the ever popular corn-cob pipe. With such versatility in mind, it is no wonder that corn was a very popular crop.[9]

Many technological improvements of the Industrial Revolution led to improved crop production. The plow had been in use since pre-history, and probably originated as a simple heavy stick that was pushed or pulled through the ground to make a furrow for seeds. Eventually, the Romans added metal to add strength and durability. In Europe, farmers added a small metal spike in front of the plow to break the surface of the soil, which then allowed the blade (called a share, hence the term plow-share) to plow the earth more effectively. Eventually, in 1837 John Deere of tractor fame took the iron plow, which had been in use in America since colonial times, and made it out of steel. Steel (which is iron mixed with carbon) was lighter and stronger than iron, which only helped to improve the efficiency. In the mid 1800s farmers began adding wheels and a seat to their plow. This improved efficiency by allowing the plow to be suspended on a wheeled frame, which

[9]Pollan, 26.

made it easier for the oxen team to pull. It also allowed the operator to work more hours as he no longer had to walk alongside the plow and did not have to push down to keep the plow from bucking up – his body weight was enough to keep the plow down.[10]

Yet another innovation that allowed for greater production was the mechanical reaper, invented by Cyrus McCormick in 1831. Reaping is the process of cutting down stalks of a grain, thus allowing for harvest. The reaper was a machine that was pulled by a draft team that allowed large portions of fields to be harvested at a time. Prior to the mechanical reaper, whole fields had to be reaped by teams of field workers with sickles or scythes, a laborious, time-intensive process. The mechanical reaper drastically reduced the time needed to harvest a field. This improvement allowed for a quicker turnaround in crop planting, thus resulting in higher crop yields.[11]

All of these inventions were improved upon by the Bessemer process, a new method of refining steel developed by two people, independently of each other – Sir Henry

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[10]Society of Ploughmen, "History of the Plough," http://www.ploughmen.co.uk/ploughhistory.htm (accessed June 2, 2010).

[11]Illinois Periodicals Online, "McCormick's Revolutionary Reaper," Northern Illinois University, http://www.lib.niu.edu/1992/ihy921205.html (accessed June 2, 2010).

Bessemer of England and William Kelly of the United States. They discovered that by blasting air through the crucible while iron was being refined, the oxygen would combine with the impurities to form carbon, produce steel, and at the same time either force out the impurities in gas form or form a slag which could be removed later. This helped to make finer steel which was stronger and lighter than previous steel. It was a faster method than the previous one in which the impurities were removed and then specific elements were added to create carbon.[12]

Yet another invention that truly revolutionized farming was the tractor. The tractor served as a means to further automate farming. For example, the McCormick reaper previously had to be pulled by a team of draft animals that had to be fed, watered, and rested. The farmer also had to pay attention to where the animals were going as they had a propensity to amble off track. With the invention of the tractor all the farmer needed was a tractor and some gasoline. Unlike animals, tractors are not prone to wander off, they do not need rest, they do not get hurt, and they do not fight with the other tractors. Further, with the advent of the tractor came the advent of

[12]Henry M. Howe, "The Clapps-Griffiths Bessemer Plant," *Science Vol 6 No. 141* (October 16 1885): 342.

the power take-off attachment (PTO). This hookup is usually found on the back of a tractor and is used to power implements, such as mowers, reapers, seed sowers, and others. The invention of the tractor and PTO completely removed the need for animal labor in the cultivation of corn and removed the need for most human interaction with crops except for driving farm equipment.[13] The tractor and PTO made the planting process go even faster than previous advancements. Previously, a farmer could plow two or three rows at a time with a wheeled plow pulled by a draft team. A farmer with a tractor can plow multiple rows, pull off to the side, attach a power seeder, and then seed the field he just plowed, all in the same day.

These improvements in agricultural technology vastly increased production. There was such a surplus that corn could now be used as animal feed in greater quantities than it had previously. Due to some medical concerns to the animals, however, corn could not be fed to cattle for longer than a couple of weeks as cows are not adapted for corn consumption. With advances in veterinary medicine

[13]It should be noted that human labor is still widely used in fruit and vegetable harvest – many fruits are too delicate to be harvested by machine and require large scale hand-harvesting operations. However, tractors and implements are still used in plowing, seeding, watering, and pest control for these operations.

(discussed in chapter four), corn would eventually be the main ingredient in animal feed.

The advances of the Industrial Revolution and the fact that corn is a native plant, and therefore, perfectly suited to growing in the United States provided a perfect storm for massive corn surpluses. The early corn surpluses from the Industrial Revolution provided enough feed that it allowed feedlots to start feeding cattle mostly corn diets. Corn had been used as animal feed before, but rarely for cattle and never as their main food source; that all changed. The corn diet, while harmful to the animal's digestive system, fattened cattle about twice as fast as grass and hay.

The fact that cattle could now be fattened quicker was motivation for the cattle barons to start focusing their production into feedlots. With the introduction of commodity corn, men like Gustavus Swift were free to develop their own system of raising beef cattle. Before Swift could start his feedlots, however, the cattle had to make it halfway across the country.

Cattle Drives

In 1860, Texas was the leading cattle producing state in the United States. This was due to the vast expanse of grass land for cattle to feed on, a temperate climate, and the fact that cattle had been roaming the state since Mexican colonial times. The only problem was that while there were some three million head of cattle in Texas, the major markets were in Kansas City and Chicago (Fort Worth had not yet been reached by the railroads). To get the cattle to the markets, they were usually taken on cattle drives wherein cowboys would guide the herd to market. This proved problematic, however. During and shortly after the Civil War, gangs of bandits often roamed Kansas and Missouri seeking to steal cattle and take them to market themselves or to kidnap and demand a ransom of the cowboys.[14]

Further, the cattle trails often went through Indian Territory. While in Indian Territory, the cowboys usually faced hostilities from the local tribes as the cowboys paid no attention to tribal boundaries, hunting lands, or crops. Additionally, the route that had to be taken to attempt to avoid bandits and hostile tribes was a less-than-direct

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[14]Charles Moreau Harger, *Cattle-Trails of the Prairies* (Dallas: Highlands Historical Press Inc, 1961), 1. (originally appeared in Scribner’s Magazine, 1892) 1-2.

route that often left the cattle worn out and little more than skin and bones.[15]

Thankfully, in 1867, construction began on the first railroad in Kansas. While it was heading west to the Rocky Mountains, it would provide an entrance for the railroads to be involved in the cattle industry. This doorway would be opened by Joseph G. McCoy of Illinois who built the first Western cattle-specific rail yard in Abilene, Kansas, located some one hundred and fifty miles from Kansas City. From Abilene the cattle could be shipped to Kansas City, where they could then be shipped to almost any major city to the east. While the yard did not make a profit its first year, by 1868, the yard saw about seventy thousand head of cattle and in 1869 about one hundred and sixty thousand cattle passed through the yard. By 1870, there were three hundred thousand cattle going through Abilene.[16]

As much as the cattle drives were succeeding, they still had two major hurdles to overcome. First, cattle from the Southwest, and particularly Texas, were infected with a disease called Spanish Fever. The disease, which was transmitted by ticks, was far more dangerous to the less hardy short-horned breeds of the North. Thus, when a

[15]Ibid, 2-3.

[16]Ibid, 2-4.

herd of Texas cattle was brought into an area, the local ranchers were very wary of the herd.[17] The second hurdle was that many northerners thought that Texas cattle were too “wild” to be edible. The fact that Texas beef was cheaper than local beef, however, was enough to get consumers to start buying.[18]

Along with being the terminus for the rail yards, several cattle trails were forged that ended in Abilene, most notably the Chisholm and Western Shawnee.[19] Abilene’s role as shipping center, however, would quickly be ruined due to two factors. First, the winter of 1871-72 was incredibly harsh, thus resulting in the death of many cattle waiting to be shipped east. This winter also worsened the symptoms of Spanish Fever, a disease that often caused trouble for cattle, weather notwithstanding. Secondly, as western settlement progressed, inhabitants, many of them farmers, started conflicting with ranchers and their cattle. These cattle deaths and conflicts between

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[17]Clara Love, “History of the Cattle Industry in the Southwest,” *The Southwest Historical Quarterly vol 19 no. 4* (April 1916), 396.

[18]U.S. Department of Agriculture, *Report of the Commissioner of Agriculture for the year 1870*, 41st Cong., 3d sess, (Washington, DC: Government Printing Office, 1871) 351-352.

[19]Harger, 4.

ranchers and farmers drove the rail yard further west to Ellsworth. Eventually, Dodge City, even further west than Ellsworth, became a major center for the cattle industry.[20]

Ultimately, the cattle drives were a victim of their own success. As settlement continued to expand further and further west, Texas ranchers eventually sent their cattle to the Rocky Mountains, in particular Montana and Wyoming, to graze during the summer. A hot and dry summer in 1886 that resulted in poor grazing, however, combined with a particularly harsh winter in 1886-7 to kill roughly 362,000 head of cattle in the Rockies.[21] At the time, this was about 60 percent of the total American cattle population.[22]

The final nail in the coffin, though, would be barbed wire. Ranchers could no longer depend on sending their cattle elsewhere to graze, either because there was no longer enough grass along the trails or because the cattle might die en route. To rectify this situation, the cattle barons began putting up barbed wire around their ranches. Many of these ranches were massive and could house several thousand head of cattle. Due to the expansion of the

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[20]Ibid, 5.

[21]Michael P. Malone and Richard B. Roeder, *Montana: A History of Two Centuries* (Seattle: University of Washington Press, 1976), 124.

[22]Ibid, 125.

railroads, ranchers no longer had to drive their cattle to Kansas to ship their cattle east, as more than likely there would be a train yard in their own state. Some cattle barons even blamed the railroads for the death of the cattle drive as they believed an unnamed railroad interest bought land along cattle drive routes and purposefully blocked the trail with fence.[23] The reason for this conspiracy is that railroads stood to make more money from shipping cattle longer distances. Considering how important the railroads were to the growth of the beef industry, it would be important to study how the railroad industry began and grew in the United States. Without railroads the feedlot system would never have developed.

[23]Frances T. McCallum and Henry D. McCallum, *The Wire that Fenced the West* (Norman: University of Oklahoma Press, 1965), 192.

CHAPTER THREE

Steam and Ice

As simple as agriculture may seem to many people, it is rather technology dependent. Some of the simplest tools used in farming had their origins in what would have been considered rather advanced technology when they were introduced. Even the plow and the irrigation ditch were marvels of their time. With that in mind, let us look at some of the fairly more advanced technology that allowed the American feedlot system to develop.

Railroad

The development of the railroad network in the United States was critical to the creation of the feedlot system introduced by Gustavus Swift, whose influence will be discussed in chapter three. That system, however, would not have been possible without James Watt. While Watt did not invent the steam engine, he improved it so as to make it practical and efficient.[1] This improvement came in the late 1700s via the addition of a separate condenser to the engine. The previous steam engine, called the Newcomen engine, was inefficient in that the cylinder had to be kept

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[1]Eric Robinson, “James Watt: Engineer and Man of Science,” *Notes and Records of the Royal Society of London* (April 1970): 229.

hot so as to prevent the steam from condensing and becoming liquid. The purpose of Watt’s condenser was that it was a smaller, easier-to-heat area than the full piston. Steam that was stored in the condenser was less likely to liquefy into water.[2]

Despite this improvement, steam engines remained unreliable and unpopular. The first steam engines in the United States, which were imported from Britain, were regarded as essentially useless.[3] Railroads still operated, however, but without steam locomotives. Carriages or cars would be on rails, but they were pulled by teams of draft animals or alongside a canal by a steamship. The first of these to be built, the Quincy Railroad, was built in the early 1800s. This railroad ran from Quincy, Massachusetts to the Neponset River southwest of Boston.[4] Although it carried only quarried stone, it was considered a marvel of technology for its time. Further, it is a good thing that it was successful, for it was constructed at a cost of $11,250 per mile.[5]

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[2]Ibid, 223.

[3]Charles Frederick Carter, *When Railroads Were New* (London: George Bell and Sons, 1909), 1.

[4]Ibid, 13.

[5]Ibid, 13.

While railroads such as these were successful, it would take some convincing to persuade the rest of the country that a similar system powered by steam could be successful as well. In fact, Henry Meigs, a New York congressman in 1817, lost his seat because of his beliefs that steam power could work.[6] Meigs's conviction would be vindicated, however, by Horatio Allen.

In 1828, Allen, an engineer and son of a university math professor, set sail from New York to England to try to learn as much as he could about the British system of locomotive transportation. While there, he observed numerous rail systems successfully utilizing steam locomotives in place of or in conjunction with livestock. Many of these railroads served industrial purposes like those in the United States, but Allen also noted that several of them were designed for carrying passengers.[7]

Allen was very impressed with the successful implementation of rail systems in England and returned to the United States with four British built locomotives. Of these four, three were never even started and one was used as an exhibition piece. The main reason they were never started is because American railroads were far different

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[6]Ibid, 8.

[7]Ibid, 16.

than British ones – mostly because British railroads used steel rails while American railroads used either wood rails or had rails sunk into the earth.[8]

After returning from Britain, Allen began working for the Charleston and Hamburg line, which ran from Charleston, South Carolina, to the Savannah River. This line would become the first steam-powered railroad in America. While Allen did not himself engineer the locomotive, he did engineer the gauge (distance between the rails) to be five feet. The locomotive, designed by E.L. Miller, was named the “Best Friend of Charleston”.[9] The Best Friend made its maiden voyage on November 2, 1830. Despite some initial failures, the locomotive proved able to haul about fourty-five passengers at a speed of 18 miles an hour. By January 15, 1831, the Best Friend of Charleston was making regular trips.[10]

Once other cities saw how successful Charleston’s system was, they began building their own regional railroads. From here, the expansion of railroads was mostly centered on improving locomotives and building railroads. For example, Horatio Allen had thought it

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[8]Ibid, 14.

[9]Ibid, 24.

[10]Ibid, 25.

important to add more wheels to locomotives to make them more stable and allow them to carry heavier steam engines.[11] Yet another important advancement came in 1869, when the first air brake was developed by Westinghouse.[12] For this story, however, the most important date is 1857, for that is when the first transportation of refrigerated meat took place.[13]

Refrigeration

Swift's feedlot system would never have made it out of Chicago had it not been for the invention and subsequent improvement of the refrigerated rail car. Refrigeration was nothing new. People had been storing food in root cellars and cold caves for centuries. What changed with the Industrial Revolution was that people were inventing artificial ways of manufacturing or preserving cold and making that process mobile. This method of mechanical refrigeration, along with cheap corn, is what made Swift's feedlot system possible, as it allowed the transportation of slaughtered meat without spoilage.

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[11]Ibid, 26.

[12]Stewart H. Holbrook, *The Story of American Railroads* (New York: Crown Publishers, 1947), 452.

[13]Ibid, 452.

As mentioned in the prologue, food preservation was nothing new. Be it cheese, alcohol, caves, or dehydration, there seemed to be no shortage of ways to preserve food. Why then the need for refrigeration? The answer is time and space. With the Industrial Revolution came a greater diversification of economies and trades. People moved to cities for factory jobs and no longer had time or land to farm vegetables or to raise animals. Even if someone working in a nineteenth century steel mill had the space to raise crops and animals, the extremely long shifts left little daylight and energy to work the land. People then had to turn to buying raw food, and except perhaps for pickling and canning, the kitchens of city tenements were ill equipped for preparing food for preservation and root cellars were out of the question.

Thus, the American working classes were left with only one real choice and that was to buy only what one was going to eat immediately. This caused several problems. First, going to the grocery store every other day was time consuming, and time is not something nineteenth century factory workers had in abundance. Second, seasonality was still a determining factor to what people could eat at the time, especially in northern industrial cities. One might find apples at the store one week and then might not see them for several months. Thirdly, seasonality without preservation caused rampant malnourishment in cities as many people were forced into eating restricted diets of meat, bread, and grains, often in the form of gruel, or eating vegetables such as potatoes and cabbage as these could be stored in warehouses. Most fresh fruits and vegetables could not be stored in such ways; they either required drying, canning, or cellaring.[14]

The Beginning

One of the earliest and most common forms of refrigeration was the icebox. It was a wooden box often packed with sawdust and blocks of ice. This could either have an electric fan that blew air into the storage compartment, or it could have a storage compartment beneath it as cold air moves downward. The ice would often be cut into blocks out of frozen lakes and rivers. These blocks would then be stored either in warehouses or ice caves where they would be distributed throughout the year; however, this system was expensive. The maintenance of refrigerated rail cars was time consuming, and thus, not financially feasible. The ice had to be loaded and reloaded as the train traveled, which required making

[14]Elaine McIntosh, *American Food Habits in Historical Perspective* (Westport, Connecticut: Praeger Publishers, 1995), 105.

frequent stops at ice houses where the ice was stored. These constant stops resulted in longer train trips. Further, the ice in the storehouses was slowly melting, which added prices to the producer or warehouse. Additionally, the cars needed constant cleaning. The melting ice and condensation resulted in a cold, murky environment that was not the most hygienic.[15]

This system worked——despite the expense——until the populations of cities grew to be too much for ice harvesting to supply their needs. Ice companies knew that if they wanted to stay in business they would either have to invent a way of making the ice more efficiently or invent a new cooling method entirely; they settled on the latter.[16]

There were two major methods of refrigeration that were initially developed and used in the nineteenth century, and they were classified by the refrigerant. The two methods were either air-compression or compression of another substance, usually ether or sulfur oxide.[17] Ammonia

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[15]Jimmy M. Skaggs, *Prime cut: Livestock Raising and Meatpacking in the United States 1607-1983* (College Station, TX: Texas A&M University Press, 1986), 91.

[16] Oscar Edward Anderson Jr., *Refrigeration in America* (Princeton, NJ: Princeton University Press, 1953), 83.

[17]Ibid, 83.

was also commonly used.[18] Ammonia and sulfur, however, were far more common as they were not as combustible as ether and were far cheaper.[19]

These two chemicals worked via a machine called a condenser. First, the ammonia or sulfur would be forced, or condensed, into water in a pipe. The gas remained chemically free from the water; that is, the gas was not diluted into the liquid. Once the gas and water were in the pipe, it was externally cooled by water. After the gas was cooled, it was forced into pipes that the water did not wholly fill, thus allowing the gas to leave the water yet cool down the pipes and everything around them.[20]

When Swift convinced the Grand Trunk, a small regional railroad in southern Canada and the Northern United States that will be discussed further in chapter three, to haul his refrigerator cars, there were two problems. The first problem was that he was not quite sure what kind of refrigerator cars he would use. Mobile refrigeration was still a young industry, and there was still much experimentation to be done. One of the earliest

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[18]Frederik A. Fernald, "Ice-Making and Machine Refrigeration," *The Popular Science Monthly XXXIX*, 20.

[19]Ibid, 20.

[20]Ibid, 20.

experiments Swift undertook was simply to utilize the northern winter. To do this, Swift took the doors, as well as the front and rear panels, off of a normal freight car.[21] While this worked, there were several flaws, most notably that the temperature could become so cold and freeze the meat, which resulted in freezer burn.[22] Second, when this meat froze, it became much heavier, resulting in a dangerous tendency to tip over the car. Yet another problem was that the weather was unpredictable. As cold as it may have been in the northern United States in winter, one never knew when a warm spell might occur.[23] Further, this system did not allow for shipment during spring or summer.

Swift eventually came to utilize a more modern method of refrigeration. In 1881, engineer Andrew J. Chase invented the cold blast refrigerator car by putting an ice container on the roof of a railroad car.[24] This method worked much the same way that the home ice box worked; air came into contact with the cold box, became heavy and moved down to the floor of the car, where it became warm and

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[21]Anderson Jr., *Refrigeration in America*, 50.

[22]Ibid, 50.

[23]Ibid, 50.

[24]Ibid, 44.

picked up moisture, causing it to move back up, thus creating circulation. As efficient as this system was, it had its drawbacks. First, it did not solve the problem of tipping over as the cars became top heavy. Secondly, condensation from the box would drip onto the meat and freeze, often leading to spoil spots on the meat.[25]

Gustavus Swift worked with Chase to correct this problem. To do so, they moved the ice compartment from the roof of the car to the front and rear. The compartments still would be loaded from the top. This system provided air circulation by the movement of the car.[26]

The second problem was that the Grand Trunk was not willing to build the refrigerator cars themselves because early refrigerator cars were still experimental, and the owners of the Grand Trunk were unsure if they would receive a return on their investment. Swift offered to build his own cars and to contract the Grand Trunk to ship them. To this the railroad's managers agreed, and Swift had ten cars

[25]Rudolf Alexander Clemen, *The American Livestock and Meat Industry* (New York: The Ronald Press Company, 1923), 215.

[26]Anderson Jr., *Refrigeration in America*, 50.

built. Eventually at the height of his empire Swift would have hundreds, if not thousands of such cars.[27]

Following this innovation in the shipment of slaughtered beef, Swift’s system experienced an explosion in popularity and use, which resulted in a surge of profits. This growth caused his competitors to switch to this system, as well. Soon, every meat packer (as well as most fruit and vegetable growers) was using similar refrigeration systems.

Modern Refrigerated Transportation

As technology progressed, refrigerator cars were no longer reliant on ice containers for their refrigeration. While mechanical refrigerators or condensers were initially too bulky and power dependent to be used on trains, they eventually became smaller and more efficient, thus allowing them to be used on refrigerator cars.[28]

Aside from meat transportation, the refrigerated rail car was incredibly useful for the transportation of fruits and vegetables. Refrigerated transportation’s impact was so great that a breed of lettuce, iceberg, was created

[27]Charles Winans, “The Evolution of a Vast Industry”, Being a reprinting of an article which appeared in *Harper's Weekly* in ten consecutive issues, beginning with November 11, 1905. 1906, 36.

[28]Anderson Jr., *Refrigeration in America*, 230.

solely to last long distance trips in refrigerated rail cars. Normal lettuce was simply too delicate to last the trip in these rail cars; it was either too cold and caused the lettuce to wilt or it simply smashed during the trip.[29]

This transportation allowed for produce, as well as seafood, to be transported to areas of the country where these items were traditionally reserved for the wealthy. After the introduction of refrigerated railroad cars, people in Wichita could now have salmon for dinner, and people in Fargo could have oranges in their lunch box. Further, it allowed places that had traditionally not had large populations of cattle access to more beef than their local producers had been able to produce. For example, the mountain states did not have as many wide open ranges for cattle ranching as the Midwest. While they border these areas, it was difficult to get beef into the heart of these areas. Most towns and cities relied on locally hunted meat as well as smaller animals, such as goats and sheep, that could live with smaller grazing areas. With the introduction of refrigerated transportation, Swift's system could get beef into these hard to reach areas.[30]

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[29]McIntosh, *American Food Habits*, 99.

[30]Anderson Jr., *Refrigeration in America*, 230.

Refrigerated transportation was the last piece in the puzzle. The movement of slaughtered beef could now be done safely and in a cost-effective manner thanks to cheap corn, railroads, and refrigerated transportation. Now that all the pieces were in place, Gustavus Swift could implement his revolutionary feedlot system.

CHAPTER FOUR

The Mind of Gustavus Swift

The feedlot system, as we know it today, was the brainchild of a small-town meat packer, Gustavus Swift. Meat packers like Armour and Company had used feedlots to hold cattle until they were loaded onto trains to be shipped off to market.   Swift, on the other hand, thought that if he could find a way to fatten and slaughter beef at the feedlot and then ship the slaughtered beef to market instead of whole, live cattle, he could make more money. Swift spent his career implementing and perfecting this system.

One of the great changes in the American food system was the growth in popularity of beef cattle in the late nineteenth century. Before the railroad, cattle grazed on the open Great Plains and were then herded to the slaughter houses and shipping centers of the Midwest – cities like Saint Louis, Fort Worth, Kansas City, and Chicago. From here cattle were either slaughtered and shipped for local consumption or shipped alive to markets in cities on the East Coast where they would be processed by local butchers. The innovative business mind of Gustavus Swift, however, along with the availability of cheap corn, changed all this.

Before Swift could implement his ideas, a change needed to occur in the railroad industry; it needed to expand. When Swift first started his business, the railroads had not yet expanded to the cattle centers of the country. Aside from the cattle drives, produce had a role to play in the expansion of the railroads. One of the first things that spurred the cooperation between agriculture and railroads was vegetables. Cattle could survive the four seasons anywhere in the country if they were cared for properly. Produce, however, could not. In the northern reaches of the country people had to rely either on preserved food, mostly through canning, drying, or cellaring.[1] Railroad networks helped to expand the vegetable market. Fresh vegetables that could be grown almost year round in the southern part of the country could now be shipped north and then sold. Produce like melons, tomatoes, and other fruits were now available in the cities when they were locally out of season. The Georgia peach

[1]Elaine McIntosh, *American Food Habits in Historical Perspective* (Westport, Connecticut: Praeger Publishers, 1995), 73.

farms, decimated by the Civil War, were saved by the railroads – railroads that would later serve feedlots.[2]

While produce did help to expand the railroad between the North and the South, it did little to expand service between the feedlots in the Midwest and the big city markets in the Northeast. There were already rail lines connecting most of these cities, but they were mostly for passenger and general freight. This is where Augustus Swift decided to make his name known by changing the relationship between railroads and the beef industry.

Augustus Swift grew up on Cape Cod, Massachusetts, the son of a local, well-known farmer. From an early age, Swift showed a proclivity towards agribusiness, starting at an early age by selling chickens to locals.[3] At the age of fourteen, Swift began an apprenticeship with a butcher, which gave him practical experience to go along with his business prowess.[4] Swift had such a mind for money that he managed to save enough from his apprenticeship to buy himself out early. Soon after, he had his own business

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[2]Harvey Levenstein, *Revolution at the Table – The Transformation of the American Diet* (Oxford: Oxford University Press, 1988), 31.

[3]Louise Albright Neyhart, *Giant of the Yards* (Boston: Houghton Mifflin Company, 1952), 3.

[4]Rudolf Alexander Clemen, *The American Livestock and Meat Industry* (New York: The Ronald Press Company, 1923), 159.

butchering and selling meat. Known for the cleanliness of his shop, he experienced great success. This success inspired Swift, and he realized that by moving farther up the production scale to buying and selling cattle, he could make even greater profits.[5]

Swift’s business continued to grow, allowing him to relocate closer to Boston and giving him a market share all over New England. In 1872, Swift went into a business partnership with Henry Hathaway in Buffalo, New York.[6] In this partnership, Swift purchased the cattle and Hathaway butchered and distributed the beef. Their success allowed them to expand west to take advantage of locations that had access to western beef. During this time period Swift realized that if he ever wanted to experience real success, he would have to move his business to the meatpacking center of the United States - Chicago. In 1875, Swift left Hathaway and moved his business to Chicago where Swift continued to be a buyer.[7]

After arriving in Chicago, Swift quickly realized that for his business to take off, he had to encompass every

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[5]Charles Winans, “The Evolution of a Vast Industry”, Being a reprinting of an article which appeared in Harper's Weekly in ten consecutive issues, beginning with November 11, 1905. 1906, 36. 14.

[6]Ibid, 14.

[7]Ibid, 14.

aspect of meat packing, from cattle buying and selling to butchering. To get into the large-scale butchering business, Swift bought “Billy” Moore’s slaughter house in Chicago.[8] The purchase of this facility provided Swift the opportunity and eventually the profits to expand his business.

Innovation

It was during this time frame that Swift began to change the way the United States raised and ate its beef. Swift, with the help of Herbert Barnes in 1875, developed the idea to ship slaughtered and dressed cattle.[9] While this idea had been tried by other companies such as Armour, Swift and Barnes were the first ones to implement it profitably by utilizing a little known regional railroad.

There were numerous reasons that Swift would want to implement a system of shipping slaughtered beef. If successful, he could slaughter and ship beef across the country cheaper than most other producers were shipping live cattle, which had been the traditional method. Shipping live cattle was expensive, for one had to ship the entire animal with its bones, internal organs, skin, and

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[8]Clemen, *The American Livestock and Meat Industry*, 161.

[9]Winans, ”The Evolution of a Vast Industry,” 30.

animal waste. Only 55-66 percent of the animal was usable (although later much of this waste found an industrial purpose), so most of the animal was not going to be used when it arrived to market. This added a considerable amount of weight to be shipped, which added significantly to shipping costs.[10] Also, Swift figured that the cattle that survived the journey lost about one hundred pounds of body weight on their trip from the stockyards to market.[11] In addition to the weight loss, most of the cattle were injured or sick, and some even arrived dead.[12]

Swift faced an uphill battle to implement his new system. This battle was primarily against the railroad companies, which, along with the eastern slaughterhouses that were killing the shipped animals, did not want to see any change in the current system. Cities like Pittsburgh, Buffalo, Cleveland, and Albany all had large slaughterhouse operations, along with railroad shipping centers.[13] Here cattle would either be detrained and slaughtered, or they would be detrained, rested, fed, and watered, then reloaded

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[10]Louis F. Swift, *The Yankee of the Yards* (Chicago and New York: A.W. Shaw Company, 1927), 128.

[11]Louise Albright Neyhart, *Giant of the Yards* (Boston: Houghton Mifflin Company, 1952), 49.

[12]Ibid, 47-49.

[13]Winans, *The Evolution of a Vast Industry*, 31.

onto the trains and shipped further on the line, which produced a good profit for the stockyards.[14] Cattle in particular were incredibly profitable for the railroad companies, as their holding fees were higher than fees for other animals.[15]

The railroad companies earned a good profit shipping cattle on the hoof due to the added weight of shipping a whole animal. Further, the railroad companies had not invested in refrigerated railcars to ship slaughtered animals. Converting their cars would require a significant amount of capital; capital that would bite into their profits. The reluctance by the railroads to convert to Swift's new system proved to be a challenge. How was he to get his product from Chicago to the eastern markets?[16]

Swift found a willing partner with a railroad that was not engaged in the established system; the Grand Trunk. The Grand Trunk ran from Chicago to the East Coast, but it did not go there directly; it ran north through Canada.[17] This was a longer trip than the other railroads were

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[14]Mary Yeager Kujovich, "The Refrigerator Car and the Growth of the American Dressed Beef Industry," *The Business History Review* 44 (Winter 1970): 461.

[15]Federal Trade Commission, *Report of the Federal Trade Commission on the Meat-Packing Industry, Part 3*, June 28, 1919, 17.

[16]Kujovich, 461.

[17]Winans, *The Evolution of a Vast Industry*, 36.

taking, and it was a trip that live cattle could not make, especially during the harsh winter. The Grand Trunk, therefore, was shipping other cargo and passengers and had no involvement with the slaughterhouses.

In the autumn of 1876, Swift was able to implement his plan. Now that he had his railroad system in place, he could begin preparing the animals for slaughter. To do this, Swift would improve upon a system already used. The practice of feeding corn to cattle before being shipped was nothing new; it had been used by other meat packers as a quick way for cattle to pack on quick pounds before the long rail journey during which they were sure to lose weight. With Swift's new system, the cattle would no longer have to lose all that weight in shipping. Why not simply fatten the cattle to make them fat instead of fattening them to make the trip? It would increase sales as cattle are sold by the pound, and consumers like having the peace of mind knowing that their meat came from a nice plump animal.[18]

Swift decided to tie the refrigerated railcars and the feedlots together. Swift's system went something like this.

[18]Swift, The Yankee of the Yards, 178.

First, after nine months of gestation, calves were born, preferably in the spring, on a small family farm. When most people think of cattle farms, this is what they think of, for these were mostly small, family-operated businesses where the cattle were generally free to graze on open pastures. Calves generally spent the first few months of their lives with their mothers feeding on milk. Between six and ten months of age the calves were generally separated from their mothers and put to pasture, where they learned to eat nothing but grass (a process called weaning). Most of these cattle that were turned into beef are neutered bulls, called steers. Many females were returned to the breeding cycle at these cow-calf operations.[19]

Second, after the cattle were weaned and they reached about a year in age, they were sold at market to feedlots ran by a packing firm (Swift, and Armour, for example).[20]

Third, when the cattle arrived at feedlots they were put into feeding pens for a final fattening on corn.[21]

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[19]Beef from Pasture to Plate, "Stages in Beef Production," http://www.beeffrompasturetoplate.org/stagesinbeefproductionprocess.aspx (accessed June 23, 2009).

[20]Ibid.

[21]Ibid.

Fourth, when the cattle reached the target weight, usually between one thousand and fifteen hundrend pounds, cattle were herded to slaughterhouses. In Swift's time, the feedlots and the packing houses would more than likely have been in the same complex, but now they are often many miles apart. Upon arrival at the slaughterhouse, the cattle were butchered at once, usually into sides or individual cuts. Shortly afterwards the butchering process evolved into a "disassembly line" where dead cattle are suspended on moving chains from the ceiling, and as they move they pass a man who has a specific job to do on each carcass. These sides and cuts would then be loaded onto the refrigerated rail cars and then shipped to the destination city to be sold to a butcher who would then cut the beef to order.[22]

This system that Swift invented is the model upon which the American beef industry (and other meat industries) have built themselves. Although Swift did not have access to the same quantity of corn surplus as modern feedlots or to the same technology in transportation and medicine, the concept is the same: fatten cattle, slaughter them, and then ship the meat instead of the

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[22]Neyhart, Giant of the Yards, 33-38, 71, 80.

animal. The credit for this idea belongs wholly to Gustavus Swift. Without his innovation the modern feedlot system would not exist.

Success and Legal Problems

One of the greatest testaments to the success of the Swift system is to look at the profits that the Swift Company earned by implementing this system. These profits were so great that in 1919 the Federal Trade Commission brought an anti-trust suit against Swift and several other large meat packing firms, collectively known as The Big Five (Swift, Armour, Morris, Wilson, and Cudahy). This case took an in-depth look at profits, number of animals slaughtered, and pounds shipped.[23]

The basis of the anti-trust suit was the claim that "the 5 firms have attained such a dominant position that they control at will the market in which they buy their supplies, the market in which they sell their products, and hold the fortunes of their competitors in their hands."[24] For example, in 1917, Swift Co. brought in $47,230,000 in profits. Compare that to his next largest competitor,

[23]The Federal Trade Commission, *Report of the Federal Trade Commission on the Meat-Packing Industry*, Summary and Part I, June 24, Government Printing Office, 1919, 106.

[24]Ibid, 24.

Armour, who brought in $27,137,000 in profits.[25] The three smaller competitors, Morris, Wilson, and Cudahy, only brought in a combined $21,000,000. It must be noted that out of those competitors, Armour was in operation before Swift, yet Swift had been able to surpass Armour in large part due to his early adoption of refrigerated transportation.[26]

One of the biggest areas of concern was the feedlots influence over the railroads. These five meatpacking companies combined to own over 93 percent of all railcars used in meatpacking interstate commerce and 91 percent of meat-specific refrigerator cars.[27] This ownership allowed the meatpackers to hold considerable sway with the railroads. For example, if the Grand Trunk wanted to do any business with Swift, Swift would make a contract with the Grand Trunk stating that the Trunk would only haul refrigerator cars owned by Swift Company. Further, the Trunk could only haul Swift meat in those cars. This came to a considerable cost to the railroads as well as smaller packers. For example, if the Trunk was running a line between Chicago and Boston, the Trunk may carry fully

[25] Ibid, 173.

[26] Ibid, 173.

[27] Ibid, 40.

loaded cars from Chicago to New York. If Swift did not have anything to bring from New York to Chicago, the Trunk had to bring back empty cars even if there was a local packer who would pay the Trunk to ship from Boston to New York.[28]

The result of this case was that the government required the packers to allow the government to lease or buy the facilities for transportation, marketing or storage. This prompted the cry of government ownership from the meatpackers, to which the FTC responded by saying that “the pending legislation carries no appropriation whatever and therefore no step further than the licensing of the conduct of packers and the use of the facilities.”[29] This FTC ruling is evidence of the success of Swift’s feedlot system.

Now that the system was in place, it continued to spread. As time went on, certain aspects of the feedlot system evolved, leading it to look somewhat different today than it did when Swift developed it. Those transformations deserve their own discussion.

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[28]Ibid, 41.

[29]William B. Colver, “The Federal Trade Commission and the Meat-Packing Industry,” *Annals of the American Academy of Political and Social Science,* Vol. 82, (Washington, DC: Government Printing Office March, 1919): 170-174.

CHAPTER FIVE

The Modern Feedlot

Since Gustavus Swift implemented his system in the nineteenth century, there have been numerous economic and scientific advances that have either contributed to or changed his system. While the system is still essentially the same by relying on the moving of slaughtered beef via refrigerated transportation, certain advancements have been made, thus changing the way the system works. These improvements deserve a greater analysis as to how they have evolved from the original system.

New Corn

The corn that was grown for feedlot usage when Swift instituted his feedlots would have been whatever was grown for human consumption, the aforementioned sweet corn. In the twentieth century, however, a type of corn is utilized that is ultra starchy, which is perfect for fattening cattle. This corn is called Number two yellow dent corn. Number two yellow dent has been used as industrial commodity and for agricultural use. It is where corn meal and corn syrup come from, and off the cob, is not fit for human consumption because of the incredibly hard outer shells found on the kernels. The Native Americans, however, were able to eat it as hominy after it had been processed with lye. While it is too tough for humans to chew, it is easy for cattle, with their large molars, to chew, and the policies of Earl Butz (1909-2008) ensured that there was a steady stream of #2 yellow dent coming in from American farms to supply cattle in American feedlots.

Earl Butz

While Swift may have developed the feedlot system, the feedlots that Swift developed looked very different than the feedlots of today. This is mostly due to Richard Nixon's agricultural secretary, Earl Butz. Butz grew up on a 160 acre farm in Indiana run by his father to feed his family and to provide a little bit of income. In his essay "The Family Farm: Shall We Freeze It in Place or Free It to Adjust?," Butz described his family's farm as mostly self-sufficient. His family did not use a tractor but a team of horses; they did not purchase fertilizer but instead used the manure from their livestock; they did not buy feed for their livestock but rather grew their own animal feed; the labor of the farm was supplied by his family.[1]

Even with this efficiency, Butz did not see the farm as efficient enough because it did not produce enough crops and, therefore, money. Butz sought to change this. He saw economies of scale, and while these farms were self-sufficient, they did not produce enough profits for the operators to afford many luxuries of the time such as multiple cars, air conditioning, color television, and other modern conveniences.[2]

After Butz left his family farm to go to graduate school at Purdue, the property was bought by a neighbor who himself came to own and farm eight hundred acres. This, according to Butz, was enough land to turn a profit. These types of large-scale farms, farms that planted from fence to fence, that ran tractors, that bought seed, pesticide, and fertilizer, were the best kinds of farms. These large-scale farms supported the economy in more ways than subsistence farms because they not only produced but

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[1]Earl L. Butz, "The Family Farm: Shall We Freeze It in Place or Free It to Adjust?" in *Food, Policy, and Politics: A Perspective on Agriculture and Development*, ed. by George Horwich and Gerald J. Lynch (Boulder, San Franciso, & London: Westview Press, 1989), 280.

[2]Ibid, 281.

consumed. Modern farms could produce excess crops that guaranteed surplus, surplus that could be used to feed millions of people and livestock across the country.[3]

After being appointed Secretary of Agriculture by Richard Nixon, Butz wrote the 1973 Agricultural and Consumer Protection Act (1973 Farm Bill) in reaction to a grain shortage in the Soviet Union in 1972.[4] The Soviet Union had purchased about 440 tons of corn from the West (mostly the United States) to help offset the shortage from land degradation and drought.[5] Normally this would be seen as nothing of note – the only thing that could cause any upset was that the United States was trading foodstuffs with its sworn communist enemy. In 1973, however, grain prices in the United States skyrocketed. The price of a bushel of corn was worth two barrels of oil. This was what Butz, who had set up this sale, wanted. After all, high corn prices provide high corn profits for farmers, which would guarantee the farmer votes. Butz did not expect, however, the public backlash it produced. Meat animals which were fed on corn became more expensive as their feed

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[3]Ibid, 281.

[4]Full text of 1973 Agricultural and Consumer Protection Act can be found here: http://www.nationalaglawcenter.org/assets/farmbills/1973.pdf (accessed September 20, 2009).

[5]"Another Soviet Grain Sting," Time, November 28, 1977.

became more expensive, thus driving up consumer prices. Butz’s idea to combat this price inflation was the 1973 Farm Bill.[6]

Butz wanted to ensure that American farmers produced ample amounts of grain. While he enjoyed seeing farmers reap the profits that high prices produced, he did not like coming under pressure for shortages. His policy then revolved around high production and guaranteed prices. Before this bill, farmers would only plant what they thought they could sell. If some of their crop went unsold, that was wasted money. Butz implemented a program in which the government set prices and would buy anything that was not purchased on the market.[7] The programs described in this bill were designed to produce massive surpluses, thus guaranteeing there would be no shortages in the future. Further, this bill essentially removed most of the capitalist element from the agricultural commodities market by removing the law of supply and demand. With this

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[6]Arturo Warman, *Corn and Capitalism: How a Botanical Bastard Grew to Global Dominance* (Chapel Hill, NC: University of North Carolina Press, 2003), 197.

[7]http://www.nationalaglawcenter.org/assets/farmbills/1973.pdf (page 11 of PDF file, page 230 of bill).

bill, there would technically always be a demand due to the government's promise to buy surplus.

The 1973 Farm Bill must be compared to the 1949 Farm Bill, which also promised farmers that the government would purchase any unsold crops. There are some major differences between the programs, however. First, the 1949 Farm Bill did not let the government set prices. Instead, the government promised farmers they would purchase the excess crops for 90 percent of what they would have gone for at market.[8] The main idea behind this bill was to prevent shortages, not to create surpluses. The 1973 farm bill and its surplus would lead to one final modification to Swift's feedlot system.

The Revolutionized Feedlot

Modern cattle now spend much more time in feedlots than when the system was first introduced. When Swift first implemented his system, cattle were mostly finished on corn for a week or two and then slaughtered and transported. Advancements in veterinary medicine and the

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[8]Full text of 1949 Farm Bill can be found here: http://www.nationalaglawcenter.org/assets/farmbills/1949.pdf (accessed June 6, 2010).

massive corn surpluses allowed cattle to spend far more time in feedlots.[9]

The reason veterinary medicine is so important is because the corn diet that is prevalent in modern feedlots is incredibly harmful to cattle because cattle are not meant to eat corn. Further, feedlots have cattle placed in extreme proximity to each other; therefore it is easy to spread disease among themselves. One of the easiest diseases to spread is bovine respiratory disease (respiratory infection). This disease is usually caused by viruses such as rhinovirus, enterovirus, reovirus, and bacteria such as hemophilus and pasteurella. The most common treatments for these diseases have been dead and live culture vaccines, the development of which followed the implementation of similar vaccines in humans in the early to mid twentieth century.[10]

Yet another disease that has to be combated is footrot.(see Appendix 5) Footrot is caused by having cattle stand in soft or muddy ground for too long. The mud

[9] Beef from Pasture to Plate, "Stages in Beef Production," http://www.beeffrompasturetoplate.org/stagesinbeefproductionprocess.aspx (accessed June 23, 2009).

[10] Clell V. Bagley, "Bovine Respiratory Disease", Utah State University Cooperative Extension (July 1997), http://extension.usu.edu/files/publications/factsheet/ah_beef_04.pdf, (accessed January 8, 2010).

and muck collects in the hooves of the cattle, causing seepage and infection. The ground in feedlots is often muddy either from rain or from cattle urine, so it is a common problem. One of the most common treatments is penicillin which was developed for human use in the 1930s and 40s. Shortly thereafter, penicillin was developed for animal usage. To treat footrot, penicillin injections are used to combat the bacterial infection in the sores located on the foot.[11]

Yet another disease that has to be defeated in feedlots is acidosis. Acidosis is caused by an increased population of bacteria in the stomach of cattle due to the high grain diet cattle are fed in feedlots. The *Journal of Animal Science* says that acidosis causes stomach acidity to increase markedly as acids and glucose accumulate. These can damage the stomach and intestinal wall, decrease blood pH, and cause dehydration that proves fatal. Laminitis [weakening of the hoof], polioencephalomalacia [polio], and liver abscesses often accompany acidosis.[12] The most common

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[11]S.D. Lincoln, "Infections Footrot of Cattle," Beef Cattle Handbook: 1-2, http://www.iowabeefcenter.org/pdfs/bch/03225.pdf (accessed January 8, 2010).

[12]D. Gill, W. Hill, F. Owens, and D. Secrist, "Acidosis in Cattle: A Review," *Journal of Animal Science 76*, (1998): 275.

method of treatment is prevention through feed control. Cattle feed can be mixed with antibiotics that will limit the growth of the bacteria as well as with what are essentially cattle antacid. If acidosis does occur in cattle despite preventive measures, the cattle are typically placed on a different diet.[13]

Bloat is another disease that has its origins in feedlots. Bloat is when gas accumulates in the rumen (one of the four stomachs that cows have and where fermentation takes place), and it cannot leave. Grain diets provide for more fermentation than grass, therefore providing for a faster, more vigorous fermentation than a grass-fed diet. The digestive system of cows is not designed to alleviate the amount of gas made by eating corn. Treatment of the disease is to coat the animal's food in oil, usually peanut oil, that will slow down fermentation.[14]

Many of these diseases stem from over reactive stomach bacteria that is normally essential to the animal's well-being. Due to this reaction, many feedlots give their

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[13]Ibid, 275.

[14]New South Wales Primary Industries, "Opportunity lot feeding of beef cattle, Chapter 11: Cattle health in feedlots," New South Wales Government, http://www.dpi.nsw.gov.au/agriculture/livestock/beef/feed/publications/lotfeeding/cattle-health-in-feedlots (accessed August 8, 2009).

animals antibiotics in their feed with the specific aim of reducing stomach bacteria (Other antibiotics will be discussed later). One such antibiotic is inophore, a compound mixed with grain. An excess of inophore can lead to a rapid heart rate, loss of appetite, and death. The treatment is to reduce inophore doses.[15]

Like humans, cattle are susceptible to bladder stones. Unlike humans, however, cattle are unable to let people know of the discomfort they are going through and, therefore, the stones are usually not detected until it is too late. Bladder stones in cattle are caused by high phosphorous levels in grain. The first sign stems from the blocking of the urethra. These signs are bloody urine, irritated penis, and straining (trying to urinate). In the unlikely event these signs are caught (urine is likely to get trampled into dirt and other urine), the bladder will often rupture, in which case the animal is likely to die. If the symptoms are caught, the animal is usually slaughtered prematurely.[16]

Vitamin deficiencies are quite common, as well, particularly vitamins A and E. Grain diets do not contain

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[15]Ibid.

[16]Ibid.

the requisite amounts of these vitamins and usually have to be mixed with supplements. [17] When these supplements are not enough, animals can experience fatigue, panting, drooling, night blindness, swelling, and death. Treatment is usually enhanced supplements.

Perhaps one of the most disturbing feed-related illnesses is urea poisoning. Chicken urea is used as a bonding agent in feed mixes in feedlots, along with various other chicken parts. Symptoms include bloat, abdominal pain, and death. Treatment is to reduce the amount of urea mixed in the feed, although once the symptoms are discovered it is often too late.[18]

Many of these diseases relate to the intestinal track of cattle. Agribusiness firms as well as cattle ranchers therefore have a vested interest in trying to find out as much as they can about how cattle feed interacts with a cow's digestive system. To study this, Iowa State University has gone so far as to fistulate ten cows.[19] This allows researchers to actually see inside the cow's stomach

[17]Ibid.

[18]Ibid.

[19]Fistulate means to surgically cut a hole in the side of the cow where the rumen is and then placing a removable plug over it.

and to take direct samples of certain foods being digested.[20]

Yet another disturbing disease is Bovine Spongiform Encephalopathy, or Mad Cow Disease. Mad Cow Disease comes from cows being fed ground up cow parts (particularly bone and organs) mixed in with their grain.[21] This prompted the FDA to ban the use of cattle protein in cattle feed, but this has not stopped the spread of BSE transmission.[22] Cow blood and offal are fed to chickens, and chicken litter is an additive in cow feed.[23] Therefore, through a very roundabout way, it is still possible for cows to transmit BSE. The symptoms generally include extreme changes in behavior, loss of the ability to stand, and decreased milk production. There is no treatment.[24]

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[20]Michele Kann. "Earl the steer helps teach students about the bovine digestive system," *Iowa State Daily*, May 1, 2002.

[21]Center for Disease Control, "BSE (Bovine Spongiform Bacteria Encephalopathy, or Mad Cow Disease)," Department of Health and Human Services, (Accessed August 12, 2009).

[22]USDA Food and Inspection Service, "Bovine Spongiform Bacteria Encephalopathy – "'Mad Cow Disease,'" United States Department of Agriculture, http://www.fsis.usda.gov/FactSheets/Bovine_Spongiform_Encephalopathy_Mad_Cow_Disease/index.asp (Accessed August 12, 2009).

[23]Paul Roberts, The End of Food (Boston, New York: Houghton Mifflin Company, 2008), 185.

[24]USDA Food and Inspection Service, "Bovine Spongiform Bacteria Encephalopathy – "'Mad Cow Disease,'" United States Department of Agriculture.

Transportation

When Gustavus Swift first implemented his system in the 1870s, automobiles did not exist. When the assembly line made automobiles more practical in the first part of the twentieth century, people began using refrigerated transportation technology from railroads and applying it to trucks. This vastly expanded the feedlot system. Before, if you lived in a small town without a rail station or far away from a station, you were more dependent on local producers. With the rise in popularity of the automobile, however, meat producers could now send out refrigerator trucks from rail hubs to small towns to make deliveries as it is far easier to make local deliveries with a truck than a train.

Refrigerated transportation also allowed for another, unexpected development – international trade in perishable commodities. While trading for spices and grain is nothing new, countries have rarely if ever traded meat, fruits and vegetables because of their tendency to spoil. Refrigerated transportation has allowed that to change completely. Countries that excel at beef production (the United States, Argentina, and Australia, in particular) are now trading beef with countries that have large populations but do not have the space to grow cattle (England) or the transportation network to operate the feedlot system (China). Conversely, countries that excel at produce production (Chile) are able to ship their goods to countries where that produce is out of season. For example, apples from Chile can be found in a grocery store in the United States in December. This trading has caused further expansion of the feedlot system as feedlots are now not only feeding the country where they are located but feeding other countries as well.

A Model of Efficiency

As one can see, the feedlot system of today has changed and grown by leaps and bounds since Swift first had the idea to combine cheap corn, feedlots, and refrigerated transportation. Modern feedlots excel at producing massive quantities of beef. The single largest feedlot in the United States is the Simplot operation in Grand View, Idaho.(see Appendix 6) This operation has a total capacity of 150,000 cattle on 750 acres, with a maximum of 1,000 animals per pen, an extraordinary number of livestock in one place. When Swift first envisioned his feedlots, he must have had no idea to the degree they would be successful.

CHAPTER SIX

Conclusion

One would think that with the invention of agriculture and animal husbandry humans would be far better off than when we were roaming the plains picking berries and foraging for a lion’s leftover table scraps. After all, we were no longer completely at the whim of luck and fate and could now harvest whatever we were able to produce. Further, we now have the most stable supply of food ever known to man.

Not everyone agrees, however, that this agricultural system is beneficial. The first person to seriously question seriously modern agriculture was anthropologist Marshall Sahlins. In his piece “The Original Affluent Society,” Sahlins argues that hunters and gatherers were, in some ways, better off than humans were once they settled.[1]

Sahlins states that hunter-gatherer societies were what we would consider poor, meaning they had few if any personal possessions or luxuries – perhaps a tent and some

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[1]Marshall Sahlins, “The Orignial Affluent Society," *Anthropology for the Eighties*, 1982: 219 - 238.

hunting and foraging equipment and some animal skins. Sahlins's argument is that the hunter and gatherer societies were indeed far from poor and could be considered affluent. Sahlins mainly looks at economist John Kenneth Galbraith's definition of affluence. Galbraith argues that man's wants are great, but his resources are finite, and the more he is able to fulfill his wants, the more affluent he is. Sahlins argues that hunters and gatherers had far fewer wants than we do today and were generally able to fill almost all of them. Modern humanity's wants——big screen HDTVs, large expensive houses, luxury automobiles—— require large amounts of effort and materials to manufacture and also require large sums of money to acquire. Compare these wants with hunter and gatherers' wants - food, shelter, maybe some bone or wood tools and we can see that their wants were much easier to fulfill. Therefore, using Galbraith's definition of affluence, Sahlins argues that hunters and gatherers were more affluent than modern humans.[2]

The Impact of Efficiency

The modern beef production system is a model of efficiency. It does a fantastic job of taking cheap corn

[2]Ibid, 219-238.

and turning it into meat. This system, along with advances in agriculture, is one of the reasons the United States has not experienced anything approaching a famine since the Dust Bowl. It has not been without its consequences, however. Most notably, feedlots have harmful affects on the health of animals and consumers, as well as the environment.

Health

Beef raised in feedlots poses a number of health problems to both the consumer as well as the animal. Most of this stems from the fact that cows are not allowed to eat what they are meant to eat when they are in feedlots, which is grass. While the ill effects of feedlots on cattle have already been discussed, the ill effects of feedlot beef on people have not. Also, the alternative to feedlots, grass-fed free range beef, needs to be discussed as well.

Human Health

As unhealthy as the feedlot lifestyle is to cattle, beef from feedlots can be rather unhealthy for people. One of the most prevalent health issues of late that originates from industrial beef is the 0157:H7 strain of the bacteria Escherichia Coli, or E. Coli. The E. Coli bacteria already exists in the intestinal tracks of both cattle and humans.

This bacteria never posed a problem until about twenty years ago after the bacteria mutated into the 0157:H7 strain. This new strain evolved after E. Coli and another bacteria, shigella, mingled. This mingling and interchanging of genetic code gave E. Coli the ability to manufacture something called shiga toxins. These toxins are harmful because they shut down the absorption of protein in the intestinal wall. This causes the intestinal wall eventually to puncture, allowing the toxins to enter the bloodstream where the toxins destroy red blood cells. This mutation is a direct result of the industrial, grain-feed-based diet fed to cattle in feedlots.[3]

As already mentioned, E. Coli already exists in our intestines, but that is where they stay – they do not make it into our stomach. Cattle, on the other hand, have E. Coli in their rumen. The rumens of cattle have traditionally been less acidic than our stomachs. In the past, when E. Coli made it into our stomach the higher acidity of our stomach would kill the E. Coli. When producers started feeding cattle corn, this raised the acidity in their rumen, as well as causing many of the previously mentioned maladies; therefore, E. Coli mutated

[3]Paul Roberts, *The End of Food* (New York: Houghton Mifflin Company), 180-88.

to survive in a higher acid environment. This new strain can now survive in our stomachs, and, therefore, make us sick.[4]

The question is, how do bacteria from a cow's stomach make it into our food? Offal has not been a part of the American diet for some time. The answer goes back to the small pens found in feedlots. Cows live and sleep in their own feces – feces that contain E. Coli. Feces then get on the hide of the cattle. When the cow is slaughtered it is done in a processing plant. If one sends enough feces-caked cattle through a processing plant, no matter how well one thinks they clean the animals off, some of that bacteria laced-fecal matter is bound to make it into the final product. Further, the E. Coli is in the stomach of the cow and during the butchering process it is very likely that some stomach contents will get on the meat.

The meat industry has thought of several methods of reducing the amount of E. Coli found in meat. One such method, invented by Jim Russell, a USDA microbiologist and faculty member at Cornell University, discovered that if one feeds grass to a cow a couple of days before slaughter, that little bit of grass is enough to lessen the amount of

[4]Michael Pollan, *The Omnivore's Dilemma* (New York: Penguin Books, 2006), 82.

carbohydrates in the stomach and thus the rate of fermentation in the stomach and therefore reduce the amount of E. Coli in the stomach by eighty percent.[5] Feedlots, however, find this impractical for several reasons – grass is not subsidized like corn is, and there is not any grass to be found in most feedlot. Therefore, the only real methods of controlling E. Coli in beef are antibiotics and cooking methods.

These methods, however, do not work all the time. Bacteria have the ability to adapt to different antibiotic treatments. Many veterinarians in the agriculture industry spend much of their time adapting their antibiotics to constantly changing bacteria, and most of these realize that the bacteria are becoming more and more resistant to these antibiotics. This applies to another food related bacteria, salmonella, a bacteria associated commonly with poultry. Cooking meat thoroughly will kill bacteria, but it is still hazardous as you can get infected by touching meat and then touching your face. Another common method of transference is cutting raw meat on a cutting board and

[5]Ibid, 82.

then cutting vegetables to be eaten raw on the same cutting board and with the same knife without cleaning it well.

Animal antibiotics can cause health problems in humans as well. Aside from causing bacteria to mutate in animals, humans ingest these antibiotics which can cause bacteria to develop immunity to antibiotics in humans. This allows diseases to jump between animals and humans. Historically, animal diseases that mutate to attack humans have been the the most deadly, such as avian flu, and recently, H1N1 swine flu.

Aside from diseases, industrial beef poses another health problem to humans – diet. There are two main kinds of fatty acids found in beef – omega 6 fatty acids and omega 3 fatty acids, which are essential fatty acids (EFAs).[6] These two fats often work in tandem with each other to help with brain function and development, as well as body functions and growth. Omega 6 and omega 3 fats are part of a larger group of fats called polyunsaturated fats (PUFAs). They are used in growing skin, hair, bones, and in reproduction.[7] A lack of EFAs can lead to stunted growth, but in most western diets this does not happen.

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[6]University of Maryland Medical Center, “Omega-6 fatty acids,” University of Maryland, http://www.umm.edu/altmed/articles/omega-6-000317.htm (accessed August 15, 2009).

[7]Ibid

What does often happen in these western diets, however, is an imbalance between omega 6 and omega 3 fats. A healthy diet should consist of 2-4 times as many omega 6 fatty acids to omega 3 – but in reality, most American diets consist of 14-25 times the omega 6 fatty acids to omega 3 fatty acids. This imbalance stems from the fact that industrial cattle are fed corn, and corn has a great amount of omega 6 fats in them. An excess of omega 6 fatty acids can lead to obesity, cancer, asthma, and arthritis.[8]

Another cause of this imbalance is that Americans simply eat more red meat than is necessary, dietarily speaking. People look at what is called the "French paradox."[9] This is where people are perplexed at how the French, who smoke heavily, drink more than Americans, and spend more time eating than Americans do, tend to outlive Americans. Western nutrition looks solely at the chemistry and science of food while ignoring the social aspect – the relationship between people while eating as well as the relationship of people and their food. Someone eating at a drive through has no relationship with that food – it is just food. If they are driving or eating on a train or

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[8]Ibid

[9]Roberts, *The End of Food*, 182-83.

commuting, they are very unlikely to savor that food and will eat it quickly. When one eats food quickly they eat more as they do not feel their hunger being satisfied, but if they eat slowly they eat less.[10]

Compare this to the French (or many other cultures outside of America) where eating is an event. There are usually smaller servings of food, but there is more variety. Also, people rarely eat by themselves. Further, in many cultures people have a much greater connection to their food; either they bought it from their local market where they are friends with the seller, perhaps they gathered it themselves, or grew it themselves, or slaughtered it themselves. Combine these factors (eating together, eating smaller portions of greatly varied foods, and having a relationship with food), and people eat better – maybe not in purely nutritional terms, but in other ways. There is much about food that nutrition cannot explain.

Grass-fed/Local

Cattle Health

Grass is what cattle are meant to eat – they are perfectly suited to it, from their teeth to their four stomachs (without which grass cannot be digested). None of

[10]"Slow Down and Savor the Flavor," *Harvard Heart Letter* Vol. 19 Issue 3 (Nov 2008), 6.

the grain-fed related illnesses happen to cattle fed on grass. The only dietary problem that can stem from grass-fed beef is more related to weather – a drought can wreak havoc on range land. Cattle will go through and eat all the grass and if there is not enough rain the grass will not grow back. In limited pasturage the cattle will not have enough land to graze which will result in the cattle’s diet having to be supplemented by commercial feed (usually grain based) and hay.

Aside from being healthier for the cattle, grass fed cattle are far cheaper to raise than grain fed. There is no feed to buy and no “rent” to pay to a feedlot. While there are veterinary fees, they tend to be much lower than veterinary fees paid in feedlots as there are fewer health issues.

These factors beg the question: if it is cheaper to raise cattle on grass, why raise them on corn? The answer is time. It takes a grass-fed steer about three to five years to reach slaughter weight and maturity when fed on grass, and it only takes a grain-fed cow less than five years to reach slaughter weight. While each year spent on grass is cheaper, it takes longer. The speed of which grain fed cattle are matured is enough to make grain feeding cattle worthwhile.

Human Health

Healthy cattle makes for healthy beef, which can help lead to healthier humans. Beef from grass fed cattle have a much better omega 6 to omega 3 ratio, and produce a much leaner meat. The idea of marbling, making for flavorful beef, is a recent idea that was put out by grain-fed producers who wanted to convince consumers that fattier beef was better tasting. While fat does contribute to flavor in beef, fat-content in grain fed beef is far more than has been attained throughout history through grass feeding cattle.

There are far fewer diseases that are transferred to humans from grass-fed beef than grain-fed beef. E. Coli, for example, was almost never transferred to humans until cattle were fed grain (although recently it has been a more common occurrence). Also, BSE was not a problem in humans until the rise of industrial beef. Neither of these diseases occurs in grass-fed beef. Grass fed beef is not 100 percent safe, however. They can still have meat-related parasites, particularly various types of worms which can be transferred to humans.[11] Also, there are many external parasites that can spread diseases between

[11]Floron C. Faries, Jr., Agrilife Exension, “Common Cattle Parasites,” Texas A&M University, http://animalscience.tamu.edu/images/pdf/beef/beef-common-parasites.pdf (Accessed August 17, 2009).

animals. These parasites are somewhat due to their living in range as opposed to in a feedlot. There is simply a greater variety of life in grassland and that includes parasites. Many of these parasites can be killed by pharmaceuticals often given to them in feedlots, as well as through thorough cooking.

Many of these worms and other internal parasites are transferred among cattle through contaminated manure. Cattle defecate and the parasites get into the soil and onto grass, which is then ingested by cattle. One way to defend against this is through birds, either wild (cattle egrets) or domesticated (chicken). These birds pick through cattle manure looking for parasite eggs and worms. Cattle egrets, as well as chickens, also eat ticks.[12]

Many of these natural feeding methods, aside from being healthier for cattle and for humans, are better for the environment as well.

Environment

Along with being bad for people's health, feedlots are notoriously harmful to the health and quality of the environment. To have such large concentrations of one

[12]Pollan, *The Omnivore's Dillema*, 212.

species of animal in such a small area is too much for almost any ecosystem to handle. One of the biggest sources of pollution from feedlots is animal waste.

Traditionally, animal waste has not been a part of pollution; instead, it was part of the ecosystem. Animal waste, especially from herbivores, contains a significant amount of plant matter and is easily absorbed back into the ground. It also contains good amounts of compounds beneficial to plants, such as nitrogen. Manure has also long been used by plants and certain parasites as a means of reproduction. Many plant seeds and parasite eggs are designed to pass through the intestinal track of an animal and be deposited with the animal's manure, allowing the plants and parasites to spread seeds and eggs. Further, animal manure has been used as fuel in fires and for building materials for centuries. Knowing this, it would seem as though feedlots would be vibrant with plant life since there is a lot of manure produced. However, this is far from the case.

Feedlots are virtual dead zones, environmentally speaking, with few species living there except for the one intended. Plants will not grow on the ground for numerous reasons. There are many reasons for this, the first stemming purely from the animals being so physically concentrated in their pens. Plants cannot grow in the pens because of the animals constantly walking and standing in the same area. The same thing happens in pastures around ponds, troughs, and water tanks – the animals hooves trample any young plant that might get started in the pens. Also, the animals' manure constantly covers the ground which keeps light away from young plants.(Appendix 5) This lack of plant life contributes greatly to erosion. Feedlots often have to spray water down over the pens to prevent the topsoil from blowing away. Further, this manure often makes its way through the soil into groundwater sources, causing cancer and "blue baby" syndrome where infants are born with too much nitrogen and not enough oxygen in the blood.[13]

Manure poses many environmental problems to feedlots and surrounding areas. There is such an abundance of manure that the feedlots struggle to find things to do with it. For example, California's dairy industry alone produces some twenty-seven million tons of manure per year. Pigs produce even more waste——about three gallons of waste every twenty-four hours, with large hog pens producing

[13] Holly B. Brough and Alan B. Durning , *Worldwatch Paper 103* (Washington, DC: Wolrdwatch Institute, 1991), 19.

about the same amount of waste as a midsize city.[14] Feedlots would try to sell beef manure to farmers to spread on their fields as fertilizer, but for numerous reasons farmers do not want it Manure from feed lots is far more nitrogenous than grass-fed manure. Even though plants need nitrogen, too much will kill plants off. Even if farmers had access to less acidic manure, farmers are so used to using chemical fertilizers they probably have no interest in manure fertilizer.[15]

To handle the manure most feedlots have developed waste lagoons – giant ponds where the waste is shoveled. One reason they do this is because it visibly hides it. Also, a major pollutant from manure is actually from dust after it has dried. This dust can aggravate the eyes and the lungs of both cattle and people working in feedlots. Further, nitrogen from manure can escape into the air in the form of ammonia gas, which is a contributor to acid rain. In some countries, livestock contributes more to acid rain than industry or cars.[16] Putting the manure into a pond helps to contain the dust. Also, bacteria and algae

[14]Paul Roberts, *The End of Food*, 77.

[15]Paul Roberts, *The End of Food*, 77.

[16]Brough and Durning, 20.

will break down the manure, but the water is still highly pollutant.[17]

While these ponds may seem a good place to put manure waste, they often help create more problems. For starters, if the feed lot ever leaves, the pond is essentially a toxic time bomb, seeping into and contaminating local groundwater sources (which can cause cancer and “blue baby” syndrome in humans), as well as poisoning the soil around it.[18] Manure from feedlots often gets washed away by rain and can end up in local watersheds. This raises the nitrogen level in the water which then causes algae blooms. Nitrogen, a plant fertilizer, will cause algae levels to explode, which can then cause the oxygen level in the water to fall dramatically, which can then cause massive drops in the level of aquatic life. These algae blooms can cause conflicts between people downstream from feedlots and the feedlot companies themselves. For example, over the past twenty years there have been numerous lawsuits and attempts at lawsuits between the states of Oklahoma and Arkansas concerning the watershed of the Illinois River. The state of Oklahoma blames Arkansas and its many feedlots (most of

[17]Don D. Jones and Alan L. Sutton, “Design and Operation of Livestock Lagoons,” Purdue University Cooperative Extension Office, http://www.ces.purdue.edu/extmedia/ID/ID-120.html (accessed May 14, 2010).

[18]Brough and Durning, *Worldwatch Paper 103*, 19.

which are for poultry) for a drop in the oxygen levels of the Illinois River and several lakes whose watersheds come from Arkansas.[19]

Further and most dramatic, the dams that hold manure lagoons back sometimes burst. In 1995 an eight-acre lagoon at a pig feedlot burst, unleashing a tide of excrement lasting two hours that killed a neighbor’s crops and eventually made it to the New River, where it killed all aquatic life for seventeen miles downstream.[20]

Another environmental hazard that stems from feedlots has to do with the very involved process of feeding of the animals. First, a tremendous amount of energy and resources are needed to feed the animals in feedlots. It is estimated that it takes the energy contained in one gallon of gasoline to produce two pounds of pork.[21] According a 1997 study from Cornell University, 800 million people could be fed with the grain that is fed to livestock in the United States. [22] The United States has devoted 120

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[19]U.S. Water News, “Oklahoma readies for another court fight, blaming river's decline on poultry,” *U.S. Water News Online*, http://www.uswaternews.com/archives/arcrights/5oklaread7.html, (accessed July 30, 2009).

[20]Roberts, *The End of Food*, 77.

[21]Brough and Dunning, *Worldwatch Paper 103*, 16.

[22]Cornell University, “U.S. could feed 800 million people with grain that livestock eat, Cornell ecologist advises animal scientists,”

million acres of land to growing food just for livestock. More than half of all grain grown in the United States and 40 percent worldwide is going to feed livestock.[23]

There is meaning behind these facts and numbers. All the land that is under plow to feed the animals in feedlots is exceptionally susceptible to erosion. Corn is the main crop used to feed livestock, and while the corn is not in season the fields often sit empty. Farmers rarely plant cover crops anymore as they are not financially feasible. Corn receives subsidies – cover crops do not. When these fields are empty it leaves millions of acres susceptible to both wind and water erosion. This soil can be just as harmful to water as manure due to the heavy use of fertilizers (mostly nitrogen based). Further, the fields are often the causes of large dust storms that can blanket the sky with thick dust. Aside from growing corn, the massive tracts of land where the cow-calf operations are located can be overgrazed, which allows for erosion from water and wind.[24]

Cornell University, http://www.news.cornell.edu/releases/aug97/livestock.hrs.html (Accessed July 30, 2009).

[23]Ibid.

[24]Brough and Dunning, *Worldwatch Paper 103*, 21.

The feed lot system is a massive drain on water sources. Half of the hay and grain that is used to feed beef cattle grows on irrigated land, with much of this water coming from underground water sources such as the Ogallala Aquifer and, to a lesser extent, rivers and lakes. The Ogallala Aquifer water level is estimated to be declining at a rate of about 1.74 feet per year.[25] If the Ogallala Aquifer were to dry up, not only would agricultural production come to a standstill but a large population of the Great Plains would lose drinking water access.

A far more environmentally friendly method of animal raising is free range or grass-fed, depending on the animal. Free range is where the animals are released into pastures to eat whatever is available. This is much easier for the ecosystem to handle for several reasons. For starters, the animals are not concentrated in a small space – they are able to walk around. This leads to the distribution of manure, which benefits plants as they are then able to absorb the nutrients better. Second, the animals are not standing in the same place, so they are not

[25]North Plains Groundwater Conservation District, “Ogallala Aquifer,” North Plains Groundwater Conservation District, http://www.npwd.org/Ogallala.htm (accessed July 31, 2009).

trampling plants down as often, which helps prevent erosion. Further, the animals spread out to eat plants so they do not eat all the plants in an area which also helps to prevent erosion.

As idyllic as this system sounds, it is not perfect. The marketing that is associated with free range meat, mostly poultry and eggs, is misleading. These animals are often kept in the traditional chicken houses used in modern industrial agriculture. To make them free range, they are provided a small door that opens up into an outside area. The animals are not allowed access to this door, however, until they have reached a certain age (supposedly to prevent exposure to disease and predators). By this age the animals have no desire to go outside and probably would not know what “outside” is and would suffer stress.[26]

Cattle, if not allowed enough space, will utterly destroy an ecosystem. One can witness this by driving through the countryside and witnessing a single cow in a small pen with no plant life present. Multiply the number of cattle and land and one can see how this could be a problem. If mismanaged, cattle will overgraze and trample any plant life. Further, trampling can compact the soil to

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[26]Pollan, *The Omnivore’s Dilemma*, 172.

the extent that the ground will not absorb water. Rain then turns into runoff which further contributes to erosion.

To graze animals one needs cleared land as grasses and smaller edible plants generally do not grow under tree canopies, although animals such as goats and pigs can thrive in forest environments. Deforestation with the goal of grazing animals has been a major contributor to deforestation throughout the world. Forests provide habitat for a vast array of life around the world and animal grazing has caused habitat loss for a great number of animals. Further, deforestation is yet another cause of erosion. In Latin America deforestation has been particularly destructive as much of the forest destroyed has been tropical rain forest, which is very difficult to grow back. Aside from erosion many of these forests are along rivers. When forests that are around rivers are removed the character of the river changes. Often times a clear river will become muddy and inundated with silt which disrupts aquatic life as well as water quality.[27]

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[27]Brough and Durning, *Worldwatch Paper 103*, 25.

Disconnect from Food

One side effect that Swift’s system has had on food is that it has resulted in a societal disconnect from people and their food. When one goes to a grocery store and buys beef, all one sees is meat wrapped in cellophane. They have little to no idea where that beef came from or how it got there. In case the consumer may have an inkling of what a feedlot is, the grocery store will sometimes try to dispel that by displaying images of cattle in green pastures grazing on grass.

Further, many people may know that beef comes from cattle, but they do not want to think about it. They are comfortable not knowing that they are eating an animal which was once alive. Before feedlots, many people either killed their own animals or they went to a butcher shop. At the butcher, they would often see whole sides of beef, along with chicken and hog carcasses, hanging in the shop. This at least gave the impression that their meat was coming from something that was recently alive. In today’s system, most consumers have little to no idea where their meat came from and that it was ever alive. The fact that an incredibly complex, international system of agriculture, agronomy, animal husbandry, politics, and trade is behind someone’s ninety-nine cent cheeseburger is the last thing on their mind.

APPENDIX

1.  [1]

[1] http://www.veggieharvest.com/images/vegetable-images/corn-tassel.jpg (9-12-2009).

2.  [2]

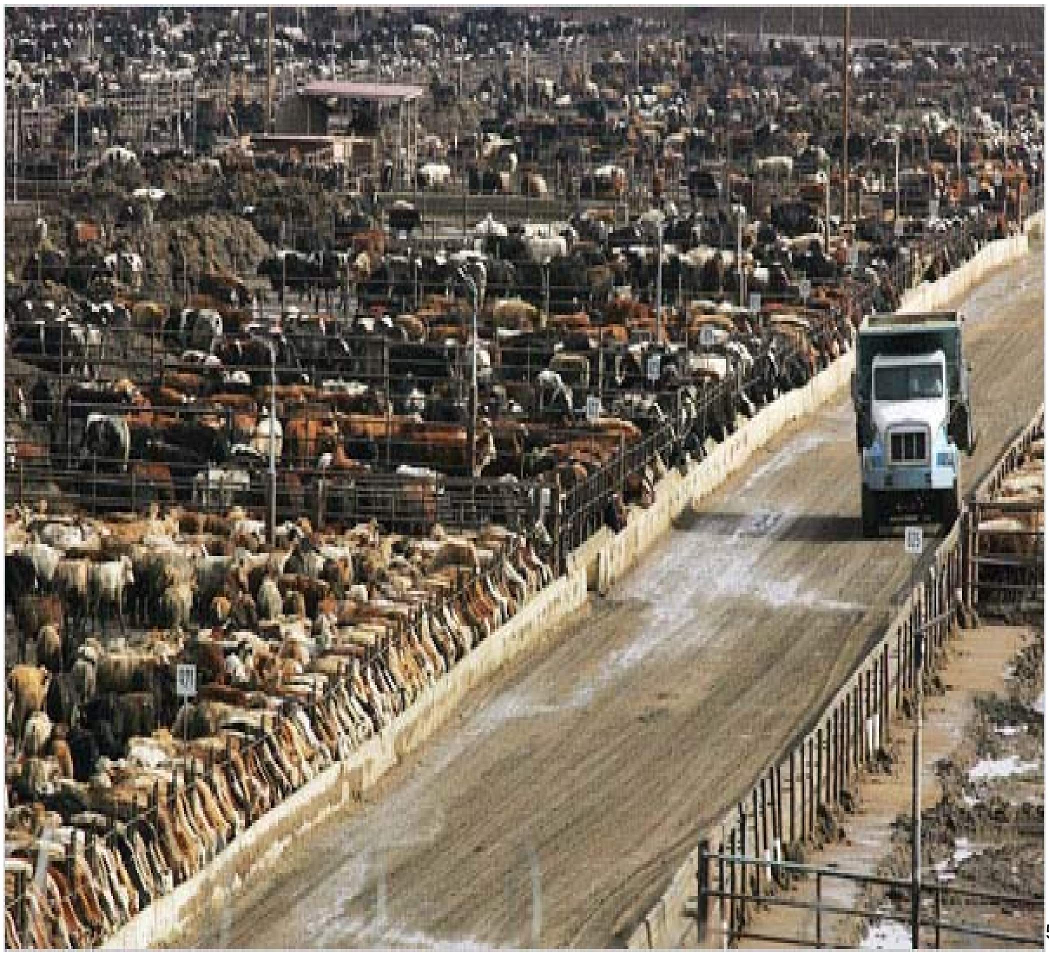
[2] http://alfalfa.okstate.edu/images/RRAlfalfa/RRalf-bixby9-29-06/crab-grass-bix247.jpg (9-12-2009).

3.  [3]

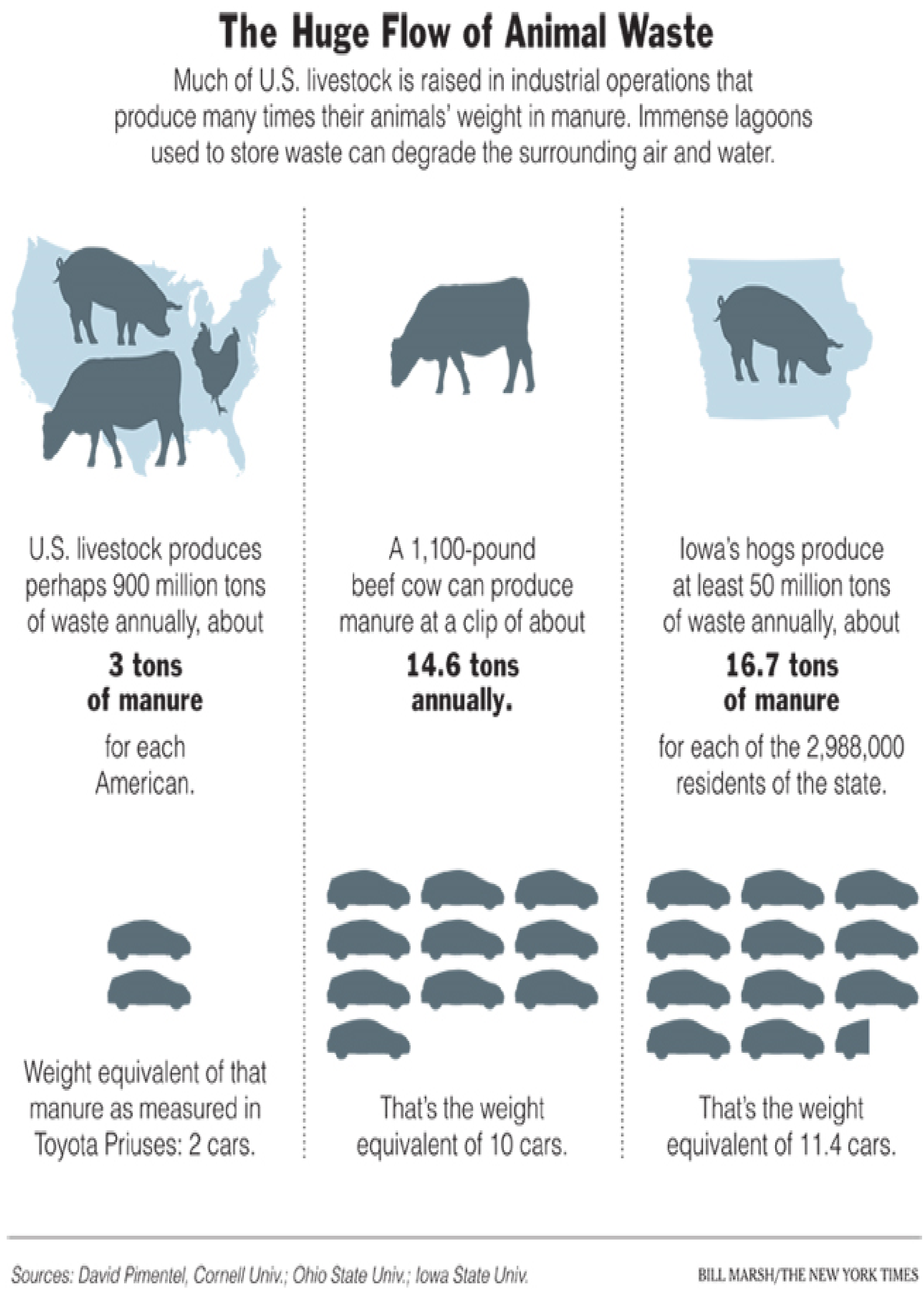
[3] http://pubs.ext.vt.edu/400/400-310/L_IMG_400-310-2.jpg

4.  [4]

[4]http://www.simplot.com/land/cattle_feeding/images/grandview_feedlot_1_1.jpg (accessed March 20, 2010)

5.  [5]

[5]Mark Bittman, Here's the Beef, 2008, from Mark Bittman, "Rethinking the Meat Guzzler", New York Times, http://www.nytimes.com/2008/01/27/weekinreview/27bittman.html (accessed July 30, 2009).



6. [6]

[6] Mark Bittman, "Rethinking the Meat Guzzler", New York Times, http://www.nytimes.com/imagepages/2008/01/27/weekinreview/20080127_BITTMAN2_GRAPHIC.html (accessed July 30, 2009).

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