Animal Factory: Creatures, Capital, and the State in the Twentieth Century

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Acknowledgements

In some ways, this dissertation was born well over a decade ago when, struck by inspiration in the rural fields of northern India as a sixteen-year-old on a school field trip, I decided to forgo the consumption of all animal flesh. It was not because I saw a goat being slaughtered, or a chicken's head snapped off—although those sights were never too far, even around New Delhi where I grew up. I did not tremble at the suffocating conditions at an Indian feedlot, or the daily bloodletting at the local butcher shop. I was swayed not by the casual cruelty that I witnessed being directed at animals on a daily basis. Instead, I was moved by the plight of my fellow sapiens. When human beings, both the urban poor in my hometown and the rural poor only an hour's drive from Delhi, were fairing so poorly, with so little to live by, it was no surprise to me that the animals suffered an even worse fate. How could I feel so strongly about one injustice, yet remain so baldly indifferent to another? And thus, much to the consternation of my family and friends—mostly upper-middle class Hindus accustomed to enjoying what they considered the gustatory freedoms of a modern India, an increasingly meat-eating nation—I became a vegetarian, seeking to ameliorate my sense of helplessness in the face of all suffering: human and animal.

A decade later, as I debated the subject on which to write my PhD dissertation, I sought a topic that I could care about for years to come. The answer was staring at me from across the kitchen table. On the glass bottles, that contained the one animal product that I continued to consume in large quantities, was the face of a cow. I was not interested in animal by-products at the time—after all I was quite attached to *paneer* (Indian cheese) then. But I was interested in the bovines themselves. Through popular books like *Omnivore's Dilemma* and *Fast Food Nation* as well as documentaries such as *Cowspiracy* and *Forks over Knives* I became aware of the

enormous environmental and health costs of industrial animal agriculture. I began to ask: what were these "factory farms" where animals were mass produced? Why had I never seen one as I drove through the pastoral Virginia landscapes surrounding my college town? How did these industrial farms come into being and when? How were the animals there treated and who was responsible for them and their condition? But detailed well-researched answers that would satisfy a recent M.A. in History remained elusive. This was it: a gap in the literature that I could fill, a relevant subject that I knew I was not alone in caring about, and most importantly, a project through which I could do more to address some small part of this world's many injustices.

The dissertation that has since emerged could not have come into being without the initial encouragement of one of my primary advisors, W. Bernard Carlson, Chair of the Engineering and Society Department at the University of Virginia (UVa). I had studied STS under him as an undergraduate in the engineering school at UVa and I shall always be grateful to him for trusting me to be his graduate student in the History PhD program a few years later, knowing that I had not taken a single course in history as an engineer. Another early guide, whom I must offer deep thanks, is Professor Brian Balogh—an exemplary mentor to hundreds of students—he convinced me that political economy mattered. Professor Balogh also pointed me to my most important PhD advisor: Professor Sarah Milov.

Professor Milov was unyielding in her scholarly criticism, relentless in her desire to see me improve my work, and constant in providing detailed feedback to draft after draft of my chapters. When I turned in my first full draft to her in August 2020, a few months into a global pandemic, she told me that it wasn't ready to submit. I was disappointed, thoroughly disillusioned—as I am told many graduate students become—with the PhD process, and ready to quit. But she encouraged me, pointed to a path forward, and helped me bring my work to the

next level. I can say with certainty, that without her this dissertation would never have turned into a defensible piece of scholarship. From her I learned how to think and write as an historian. For that I will forever be in her debt.

Dozens of others guided me along the way. Besides my three above-mentioned advisors, Professors James Loeffler and William Hitchcock also wrote letters of recommendation on my behalf, helping me secure several university-wide grants and fellowships including the Environmental Resilience Fellowship, the Raven Fellowship, the Double Hoo Award, as well as the Jefferson Fellowship. Professors Andrew Kahrl, Christian McMillen, and Robert Stolz with whom I took memorable courses as a Masters student, played an important role in shaping my interest in environmental history. My fellow graduate students, especially those of my cohort: Adele Louisa, Allison Kelley, Brian Neumann, Chris Halsted, Hannah Tucker, Monica Blair, and Nicole Schroeder, all served as a constant source of inspiration as well as encouragement. My editorial team at the graduate student journal *Essays in History*, including Alexi Garrett, Joey Thompson, and Connor Kenaston, helped me appreciate the amount of administrative work that goes into academic publishing, and were an important part of my graduate experience. I would be amiss if I didn't mention Justin McBrien by name, who was the only other environmental history graduate student in the department and from whom I learned the most about surviving grad school. Christopher Fici, a friend and student of religion at Union Theological Seminary at the time, taught me some of the important ways in which religion interacted with history and the environment. Undergraduate research assistants, Emily Hastings, Becca DeVilliers, and Leah Silverman accompanied me on archival adventures around the United States, and I am grateful to them for their support and friendship.

This dissertation has changed my life. Researching and writing it has been a trial, an obsession, and an all-consuming labor of love that lasted well over four years. As it evolved so did I. I turned from vegetarian to vegan, as I soon knew too much to ignore the interdependency of all aspects of meat, milk, egg, and cheese production, and the heavy toll they together took on animals, humans, and the earth. Even as I carried this work to completion through major personal transformations and crises, I was also being carried by the love of those closest to me. I am filled with gratitude toward my mentors Professor Graham M. Schweig and his wife Catherine Schweig. Graham first encouraged me to apply to graduate school and helped me edit my statement of purpose. He stood by me at every step and showered me with appreciation and love when I was at my lowest. And finally, I want to thank my family for being so patient and unwavering in their love and support, despite their reservations. After all, how many boys from New Delhi quit their cushy engineering jobs to pursue a PhD in history? For trusting me to do what I love, I dedicate this work to Abhijoy Saha, my brother, Koushikes Saha, my father, and Vandana Saha, my mother. For without you, I never would have made it this far.

Introduction

"We gotta address factory farming," said U.S. Representative Alexandria Ocasio-Cortez, in early 2019, defending the Green New Deal—a plan by Democrats to bring America on track to meet net-zero emissions by 2030.[1] "Maybe we shouldn't be eating a hamburger for breakfast, lunch, and dinner," the congresswoman opined.[2] Republicans responded with outrage. At the Conservative Political Action Conference, one former White House official, punching his fist into the air, warned the audience, "they want to take away your hamburgers. This is what Stalin dreamt about, but never achieved."[3] Pundits, pastors, and the public, talk show hosts and twitter trolls, all weighed in on the threat to American beef. Thus, 2019 became the year that vast numbers of Americans came to connect cows with climate change and the future of their planet.

Feedlot animals, especially cows, have, in recent years, made the news the world-over in publications as far ranging as *The Washington Post* and *The Guardian*, as well as *Brietbart*.[4] The latter has gone as far as to name bovines alone the cause of global warming—undoubtedly an attempt at deflecting attention from anthropogenic sources. Yet, even as feedlot capitalists, land-grant scientists, and the federal government undeniably share responsibility for rising cattle populations and the consequent methane emissions over the second half of the twentieth century—it could not have been so without the animals themselves. Bovine creatures have acted in bovine ways, without knowing, to change the constitution of the global atmosphere. By doing so, they have forced humans to reckon with the very industry that has alienated them from their

[1] Quoted in: Antonia Noori Farzan, "The latest right-wing attack on Democrats: 'They want to take away your hamburgers'," *The Washington Post* (March 1, 2019).
[2] Ibid.
[3] Quoted in: Emily Atkin, "The Potency of Republicans' Hamburger Lie," *The New Republic* (March 4, 2019).
[4] Thomas D. Williams, "Cows Worse than Cars For Climate Change, Environmentalists Admit," *Breitbart* (18 July, 2016)

natural habitat and their grassy means of existence. The dissertation that follows is my own reckoning with the role that these gentle creatures and their keepers have played in creating our current climate catastrophe.

In order to truly understand the environmental impact of cows over the course of the twentieth century, it is crucial to first consider the history of the concentrated animal feeding operation or feedlot. That is the attempt of this dissertation. How did feedlots emerge? Why did they emerge when they did? And where? Who built the earliest feedlots? How did the industry grow? What were the political choices, design decisions, scientific investigations, and environmental mitigation efforts made along the way? How did it all affect the animals, and conversely, what role did bovine creatures play in shaping the industry? These are some of the questions that this work seeks to answer in the following pages.

A History of Feedlots

Wide open spaces and green pastures ring synonymous with the cattle ranch of popular imagination. Such an image, bucolic and serene, belonged to the animal farm of the pre-WWII era. Beginning in the wake of the Great Depression, cattlemen, such as Warren Monfort began to transform that idyllic image: corn silos began to tower in the background of most livestock operations, casting their shadows upon hundreds of thousands of cattle arranged in rectangular pens. Trucks drove past pouring precise amounts of feed into troughs that lined the perimeter of every enclosure; not a blade of green grass in sight. Enormous pools of toxic manure oozed at the periphery of such feedlots, pens teeming with animal life in concentrations never known before. These were farms, which, by the 1960s, had turned into animal factories.

The first step in the transformation of cattle ranches into factory farms over the course of the twentieth century, was the introduction of a “grain over grass” logic by the USDA. Its

Livestock Division worked with animal scientist Louis D. Hall and corn belt cattle breeders such as Alvin H. Sanders in the 1920s, to implement national beef grading standards that incentivized the production of grain fed beef. They were unequivocal in their prescription to cattlemen that grain fed cattle produced superior beef to grass fed animals. By defining the top grades, Prime and Choice, by the degree of their grain finish, the USDA urged cattlemen to shift production methods to meet the higher grades and therefore receive better prices per pound of bovine flesh.

Yet the feeding industry may not have shown such swift and phenomenal growth were it not for the emerging political economy of feed grains ushered in by the New Deal. Feed grains such as corn were the primary input and biggest variable cost in most animal feeding operations. High feed costs made cattle feeding especially unprofitable due to the large inefficiencies involved in turning grain into beef when compared with other meats.[5] Unprecedented government intervention in the 1930s agricultural economy, however, served to make grain feeding more economical for cattlemen, both in its policy of price supports and production controls. By stabilizing feed prices and incentivizing production, during the 1930s and 40s, and then by lowering prices and boosting production from then on, New Deal policies were crucial to the rise of industrial animal agriculture in the United States. Cattlemen were not only benefitted by the particular form of supply management that emerged, but also by the design of its retreat from the mid-1950s on.

The cattle feeding industry was also aided in its phenomenal growth during the 1950s and 60s, by the work of animal nutritionists such as John K. Matsushima at Colorado State University. Several major developments in the feeding industry, including the use of hormones, antibiotics, and flaked-corn in bovine diets, all were a result of the collaboration between animal

[5] Less than 10% of the total calories fed to bovines make their way to humans as beef because the grain to meat conversion ratio of beef is the lowest of all major animal proteins.

scientists and feedlot capitalists. These technologies allowed feeders to concentrate more animals in one place than ever before, gaining weight at an unprecedented pace. Together feeders and land-grant scientists went far beyond previous generations to control and dominate every aspect of the lives of bovine creatures.

From a small family farm in the wake of the Great Depression, Monfort of Colorado grew to become to the world's largest concentrated animal feeding operation by the late 1960s. Warren Monfort achieved this by feeding cattle all year-round, averaging out the risks of a seasonal market. In order to ride the highs and lows of the cattle cycle, Monfort eventually vertically integrated into meatpacking. The company went public in 1974, in search of more capital to feed its ever-growing operation, and a decade later merged with ConAgra one of the biggest meat processors in the world, becoming its single largest stockholder. Each of these important transformations in the business were spurred by needs and hazards of managing the life and death of hundreds of thousands of bovine creatures. The trajectory of Monfort was reflected in the story of feedlots around the nation. As the number of feedlots shrank, their sizes grew.[6] With Matsushima's help, Warren Monfort put increasingly greater numbers of cattle to work, creating surplus value in his industrial feedlots, around the clock.

The labor of bovine animals took the form of their bodies—their very flesh. In this business a bovine worker's death was just the next step in a production process eventually taken over by human labor. Bovine death bankrolled the further confinement and alienation of bovine workers from their grassy means of existence. New technologies assisted animals in gaining more weight in less time and with fewer resources, increasing their productivity—obsessively measured by feeders and scientists at the level of individual cows. In this system, feedlot animals

[6] Since the 1990s, feedlots with over 32,000 animals each—only about 150 of them—have accounted for over 40% of all fed cattle in the United States.

were captive workers, laboring to hasten capital accumulation. Yet, the endeavor to manipulate and achieve a total grasp on animal life made feeding enterprises totally dependent on the animals that they handled.

Bovine creatures shaped and resisted their capitalist domination at the individual, local, and species level. They did this, not by acting out of character, but by being themselves. Their very "cow-ness" combined with their subjective urge to resist confinement and industrial discipline, thwarted, and in turn shaped, feedlot design and the norms of animal handling. By virtue of their unprecedented concentration—up to one hundred thousand steers and heifers in close quarters—the surrounding air for miles was made obnoxious and their fecal waste poisoned the water, killing riverine and marine life nearby and downstream. This forced feedlot-capitalists, animal scientists, and sanitation engineers to adopt various expensive, and sometimes unsuccessful, waste containment systems and even move locations altogether.

The impact of concentrated animal feeding operations did not go unnoticed. From the 1960s and 70s on, rural residents, public health officials, sanitation engineers, environmentalists, and animal rights and consumer safety activists, all were drawn into agricultural politics by the numerous ways in which feedlots intersected with their agendas. This took the form of citizen petitions, environmental lawsuits, as well as lobbying efforts to secure legislation to regulate feedlot waste. Because of such efforts the Clean Water Act of 1972 specifically outlined "concentrated animal feeding operations" as point sources of pollution to be regulated by the Environmental Protection Agency. Feedlots were thus sites of contestation that drew the attention of new stakeholders upon the cattle industry. Cattlemen were, understandably, resistant to their interference and chose to tackle what they perceived as negative publicity with alternative facts and technological fixes that were often supplied by their allies at land-grant

universities. Their fixes, however, paradoxically, led to an increase in animal density in already concentrated animal-feeding-operations across the United States.

By the end of the 1970s American beef production had changed unrecognizably from the pre-WWII era. Small-scale feedlots that practiced mixed grazing and feeding had given way to large-scale year-round concentrated animal feeding operations. This fundamental change made American bovines more susceptible to disease, subject to shorter lifespans, and increasingly concentrated in artificial habitats. Meanwhile, Americans were flooded with affordable beef, accompanied by a rise in diseases of affluence directly linked to the consumption of red meat.[7] As much of the rest of the world experienced famines and food shortages labeled as a World Hunger Crisis, American bovines ate more grain than ever before. This incongruency drew the ire of everyday citizens and turned their attention upon the cattle industry, which was increasingly seen as not only wasteful but cruel to animals. Land-grant scientists like Temple Grandin introduced new methods of feedlot production in response to vocal critiques by animal rights activists and became cattlemen's favorite animal welfare advocate.

With the transition to feedlot production, the mid-twentieth century cattle industry had become less constrained by the availability of pasture lands, and thus witnessed the cattle population double between 1940 and 1975. But the cost of this ecological transformation was becoming apparent to climate scientists such as Paul Crutzen and Sherry Rowland. They realized that the total bovine populace had released enough methane into the atmosphere to raise global temperatures. Thus, by the end of the century, the most potent threat yet to cattlemen and their

[7] Heart disease: https://www.nih.gov/news-events/nih-research-matters/eating-red-meat-daily-triples-heart-disease-related-chemical; https://www.nih.gov/news-events/nih-research-matters/risk-red-meat; Diabetes: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3942738/; Cancer: https://www.health.harvard.edu/staying-healthy/red-meat-and-colon-cancer; https://progressreport.cancer.gov/prevention/red_meat#:~:text=Red%20meat%20is%20associated%20with,beef%2C%20pork%2C%20and%20lamb.;

industry had been uncovered: cows were causing climate change. Even as some animal scientists at land-grant universities tried to undermine the role of cows in global greenhouse gas emissions, in 2014 the United Nations released reports confirming that the global warming emissions from animal agriculture—cattle being the largest contributor—were equal to the entire transportation sector.[8]

Thus, feedlots represent a fundamental reordering of global ecology. By concentrating and systematizing the large-scale feeding of grains such as corn, sorghum, and soy to livestock, feedlots have allowed the cattle population to escape the ecological limitations of a grass-based diet and hence allowed their impact on global warming, as well as ground water pollution and exhaustion, to go unchecked.[9] A grain-based diet has also made possible a radical reduction of the time that it takes for cattle to reach slaughter weight. While attenuating the average lifespan of a creature that may otherwise live for twenty years to less than two, this spatial and temporal contraction has led to expansive profits.[10] These returns, however, are not a by-product of the unfettered free market, but instead result from USDA beef grading incentives, federal price-supports for feed grains, and state-funded research at land-grant colleges. Yet, even as the role of government has been indispensable to the rise of large-scale feedlots, federal agencies like the

[8] Food and Agriculture Organization (FAO), "Tackling Climate Change Through Livestock," FAO (Oct., 2014) Retrieved from: http://www.fao.org/ag/againfo/resources/en/publications/tackling_climate_change/index.htm Accessed on: Feb. 7th, 2017. Methane emissions data: https://www.methanelevels.org/#sources

[9] Before the advent of grain-fed beef, cattle populations were largely limited by the amount of grassland available to livestock farmers. See Geoff Cunfer, *On the Great Plains: Agriculture and Environment* (College Station: Texas A&M University Press, 2005).

[10] On the shrinking lifespans of feedlot animals see: James Whitaker, *Feedlot Empire: Beef Cattle Feeding in Illinois and Iowa, 1840-1900* (Ames: Iowa State University Press, 1975).

EPA have been slow to regulate them. In fact, no federal agency collects consistent and reliable data on CAFOs.[11]

This dissertation illustrates how feedlots lie at the nexus of cowboy capitalism, state intervention, and bovine agency. There, animal bodies are produced through the systematic application of USDA regulations, feed subsidies, publicly funded science, capital intensive technologies, and bovine labor. At feedlots, steers (castrated bulls) and heifers (young female cows) are "finished" on grains laced with hormones and antibiotics for a four-to-six month period, crammed into pens overflowing with their own excrement, before being sent to slaughter. Feedlots are, thus, a kind of deathscape or death world. Achille Mbembe's defines "death worlds" as "new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of *living dead*."[12] Indeed, the status of 'living dead' could not be more apt for bovines in the American landscape, where cattlemen often refer to them as 'beeves' or 'beef-on-the-hoof'—a turn of phrase that intentionally obscures the sentient creature for its place in the capitalist system as meat.

Historiographical Interventions

Historians of animal agriculture have suggested that the emergence of the commercial feeding industry after World War II was the result of three main demand-side forces: a booming population, skyrocketing appetite for beef with the end of post-war rationing, and large national

[11] U.S. Government Accountability Office, "Concentrated Animal Feeding Operations: EPA Needs More Information and a Clearly Defined Strategy to Protect Air and Water Quality from Pollutants of Concern," GAO-08-944 (Sept. 2008)

[12] J. A. Mbembe, Libby Meintjes (trans.), "Necropolitics," *Public Culture* Vol. 15, No. 1 (Duke University Press, Winter 2003), 40.

retailers asking for a standardized grain-fed product.[13] But the road to meeting this increased and increasingly standardized demand was not so straightforward. Scholars have pointed to a few other crucial developments on the road to feedlot capitalism: the rise of a non-unionized trucking industry capable of transporting animals and feed independent of railroads, the development of hormones as a feed additive making possible huge leaps in feeding efficiency, and the use of antibiotics as well as Vitamin D in animal diets, enabling the concentration of animals in unprecedented numbers and proximity.[14]

These analyses participate in traditional narratives in business history and the history of technology, focusing on organizational practices and production techniques to explain change over time—perhaps best exemplified by the works of Alfred Chandler.[15] From this perspective, changes that swept the Corn Belt since the 1920s were a result of the ascending industrial logic in American agriculture during the twentieth century: Tractors replaced horse-power, mechanical picker-huskers displaced much manual labor, central pivot irrigation systems that tapped underground aquifers greatly enhanced soil productivity, and hybrid corn seeds fueled by fertilizers and pesticides revolutionized yields. [16]

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[13] Shane Hamilton's *Supermarket USA: Food and Power in the Cold War Farms Race* (New Haven: Yale University Press, 2018); Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (Boston: Houghton Mifflin Harcourt, 2013); Wilson Warren, *Tied to the Great Packing Machine: The Midwest and Meatpacking* (Iowa City: University of Iowa Press, 2006)

[14] Shane Hamilton, *Trucking Country: The Road to America's Wal-Mart Economy* (Princeton: Princeton University Press, 2008); Jimmy M. Skaggs, *Prime Cut: Livestock Raising and Meatpacking in the United States 1607-1983* (College Station: Texas A&M University Press, 1986); Alan Marcus, *Cancer From Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: Johns Hopkins University Press, 1994); William Boyd, "Making Meat: Science, Technology, and American Poultry Production." *Technology and Culture,* Vol. 42, 4 (Oct 2001): 631-644.

[15] Alfred Chandler, *The Visible Hand: The Managerial Revolution American Business* (Cambridge, MA: Harvard University Press (Belknap), 1977)

[16] For more on the industrial ideal in agriculture see Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003). For the Corn industry in particular see Allan Bogue, "Changes in Mechanical and Plant Technology: The Corn Belt 1910-1940," *The Journal of Economic History*, Vol. 43, No. 1 (Mar., 1983), pp. 1-25; Thomas B. Colbert, "Iowa Farmers and Mechanical Corn Pickers, 1900-1952," *Agricultural History,* Vol. 74, No. 2 (Spring, 2000), pp. 530-544.

Yet, this industrial logic in agriculture was not the work of private citizens and innovative businesses alone. Historians have documented the crucial role played by government policies and public servants in the emergence and flourishing of industrial agriculture in the United States.[17] Building on this scholarship, this dissertation emphasizes the astounding level of integration between USDA officials, publicly funded scientists, and twentieth century agri-business and its trade and lobbying organizations. Far from suggesting the corporate capture of government agencies, the rise of feedlots illustrates the autonomy and reach of government workers and policies to shape private industry and animal life.[18]

The following pages witness the ability of the federal institutions such as the USDA to embed itself within private organizations, shape discourse, and overcome dissent.[19] Specifically, we see how the USDA's livestock division succeeded in its own unlegislated agenda to transform the cattle industry with the support of only a small but powerful section of corn-belt

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[17] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003); Joshua Specht, *Red Meat Nation: A Hoof to Table History of How Beef Changed America* (Princeton: Princeton University Press, 2019); Shane Hamilton, *Trucking Country: The Road to America's Wal-Mart Economy* (Princeton: Princeton University Press, 2008); Bryant Simon, *The Hamlet Fire: A Tragic Story of Cheap Food, Cheap Government, and Cheap Lives* (The New Press, 2017); Sarah Milov, *The Cigarette: A Political History* (Cambridge, MA: Harvard University Press, 2019); Steven Stroll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California* (Berkeley: The University of California Press, 1998); Alan Olmstead and Paul Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008); Pete Daniel, *Breaking the Land: The Transformation of Cotton, Tobacco, and Rice Cultures Since 1880* (Urbana: University of Illinois Press, 1985); Alan Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870-1890* (Ames: Iowa State University Press, 1985); Kendra Smith-Howard, Pure and Modern Milk: An Environmental History Since 1900 (New York: Oxford University Press, 2013); Sarah Milov, "Promoting Agriculture: Farmers, the State, and Checkoff Marketing, 1935–2005," *Business History Review* 90, No. 3 (2016): 505–536; Timothy Johnson, "Nitrogen Nation: The Legacy of World War I and the Politics of Chemical Agriculture in the United States, 1916-1933," Agricultural History 90 (Spring 2016): 209-229; Paul K. Conkin, *A Revolution Down on the Farm: The Transformation of American Agriculture Since 1929* (Lexington: University of Kentucky Press, 2008).

[18] For the corporate capture thesis see: C. Wright Mills, *The Power Elite* (New York: Oxford, 1956); Gabriel Kolko, *The Triumph of Conservatism: A Re- interpretation of American History, 1900–1916* (New York: Free Press, 1963); Grant McConnell, *Private Power and American Democracy* (New York: Knopf, 1966).

[19] This argument furthers Daniel Carpenter's work on bureaucratic autonomy in the USDA. Carpenter highlighted the role of reputations and networks in allowing the USDA and its bureaus to achieve policy innovations despite political push back. See: Daniel Carpenter, *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928* (Princeton: Princeton University Press, 2001).

cattlemen. This approach aligns with the "associational synthesis," drawn from the scholarship on American Political Development and most recently put forward in Brian Balogh's *Associational State*.[20] The associational approach emphasizes the salience of intermediary institutions, such as universities and trade organizations, in mediating the connection between private citizens and the American state. By studying the ways in which the USDA and land-grant colleges as well as trade organizations such as the Better Beef Association and the National Cattlemen's Association shaped the relationship between creatures, capitalists, and the state, this dissertation illustrates the public-private nature of American governance and cowboy capitalism.

In exploring the role of the state in the development of twentieth century American agriculture, and in turn agriculture's impact on state development, political historians have spent much ink on commodities and interest groups directly regulated by the New Deal, such as cotton, tobacco, rice, wheat, hogs, milk, and corn.[21] This work differs, by highlighting ways in which Congress shaped other agricultural sectors in powerful yet oblique ways without directly

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[20] Brian Balogh, *The Associational State: American Governance in the Twentieth Century* (Philadelphia: University of Pennsylvania Press, 2015). See also: Louis Galambos, "The Emerging Organizational Synthesis in Modern American History," *Business History Review*, 44 (Autumn 1970): 279–290; Brian Balogh, "Reorganizing the Organizational Synthesis: Federal-Professional Relations in Modem America," *Studies in American Political Development*, 5 (Spring 1991): 119–172; Suzanne Mettler, *The Submerged State: How Invisible Government Policies Undermine American Democracy* (Chicago: Chicago University Press, 2011); Jacob Hacker, *The Divided Welfare State: The Battle over Public and Private Social Benefits in the United States* (New York: Cambridge University Press, 2002); Jennifer Klein, *For All These Rights: Business, Labor, and the Shaping of America's Public-Private Welfare State* (Princeton: Princeton University Press, 2003).

[21] Sarah Milov, *The Cigarette: A Political History* (Cambridge, MA: Harvard University Press, 2019); Pete Daniel, *Breaking the Land: The Transformation of Cotton, Tobacco, and Rice Cultures Since 1880* (Urbana: University of Illinois Press, 1985); Bill Winders, *The Politics of Food Supply: U.S. Agriculture Policy and the World Economy* (New Haven: Yale University Press, 2010); Anthony Badger, *Prosperity Road: The New Deal, Tobacco, and North Carolina* (Chapel Hill: University of North Carolina Press, 1980); Theodore Saloutos, *The American Farmer and the New Deal* (Ames: Iowa State University Press, 1982); David Hamilton, *From New Day to New Deal: American Farm Policy From Hoover to Roosevelt, 1928-1933* (Chapel Hill: University of North Carolina Press, 1991). Historians of agriculture and the environment have also focused heavily on basic commodities regulated by the AAA: Kendra Smith-Howard, Pure and Modern Milk: An Environmental History Since 1900 (New York: Oxford University Press, 2013); J. L. Anderson, Capitalist Pigs: Pigs, Pork, and Power in America (Morgantown: West Virginia University Press, 2018); Deborah Fitzgerald, The Business of Breeding: Hybrid Corn in Illinois, 1890-1940 (Ithaca, NY: Cornell University Press, 1990);Andrew Duffin, *Plowed Under: Agriculture and Environment on the Palouse* (Seattle: University of Washington Press, 2007).

regulating their production. By imposing regulations on basic agricultural commodities, legislators retained significant control over processors and producers that used the output of those regulated industries as their raw materials. This allowed producers like cattlemen to claim vehement independence from government interference, while remaining securely bound to ropes of federal regulation though their dependence on feed grains. In this way, twentieth century American government continued to function "out of sight" for certain agricultural groups.[22]

Another focus of this dissertation is the relationship between publicly funded science and capital-intensive agribusiness. Several generations of historians have studied the changing relationship between land grant scientists and farmers since the passage of the Morill Land Grant Act of 1862.[23] Early scholarship found that scientists emphasizing pure science over applied research attained a semblance of institutional autonomy from agribusiness through federal legislation starting from the Hatch Act in 1887 to the Smith-Lever Act in 1914. Charles Rosenberg argued that, "client-oriented policies which had brought success in the last decades of the nineteenth century became increasingly ambiguous as the twentieth century progressed."[24]

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[22] Brian Balogh, *Government Out of Sight: The Mystery of National Authority in Nineteenth-Century America* (New York: Cambridge University Press, 2009); William J. Novak, "The Myth of the 'Weak' American State," *American Historical Review* 113, No. 3 (June 2008): 752–772.

[23] Jim Hightower, *Hard Tomatoes, Hard Times: A Report of the Agribusiness Accountability Project on the Failure of America's Land Grant College Complex* (Cambridge, MA: Schenkman Pub. Co., 1973); Charles E. Rosenberg, *No Other Gods: On Science and American Social Thought* (Baltimore: Johns Hopkins University Press, 1976); Alan Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870-1890* (Ames: Iowa State University Press, 1985); Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890-1940* (Ithaca: Cornell University Press, 1990); William Boyd, "Making Meat: Science, Technology, and American Poultry Production." *Technology and Culture,* Vol. 42, 4 (Oct 2001): 631-644; Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003); Schrepfer and Scranton, *Industrializing Organisms: Introducing Evolutionary History* (New York: Routledge, 2004); Alan Olmstead and Paul Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008); Anderson, *Industrializing the Corn Belt: Agriculture, Technology, and Environment, 1945-1972* (DeKalb: Northern Illinois University Press, 2009); Kendra Smith-Howard, "Antibiotics and Agricultural Change: Purifying Milk and Protecting Health in the Postwar Era." *Agricultural History*, Vol. 84, Iss. 3 (Summer 2010); Ariel Ron, "Scientific Agriculture and the Agricultural State: Farmers, Capitalism, and the Government in the late nineteenth century," *The Journal of the Gilded Age and Progressive Era*, 15 (2016): 294-309.

[24] Rosenberg, *No Other Gods*, pg 159-160.

Agricultural colleges became far more interested in the long-term contributions to agriculture than immediate practical findings, what some have called a "business-science tension."[25] This suggests that the desire of land-grant scientists to be unfettered by farmers' demands was achieved by the early twentieth century.

Such a conclusion, in many ways, was a reaction to Jim Hightower's cutting critique of the land-grant college complex in 1973, which accused the public servants in this system of working "almost solely… to the advantage and profit of large corporations."[26] Hightower rightly identified the role of these agricultural scientists in imagining and then creating the scientific revolution in the American countryside. "There is no doubt," he wrote, "that agriculture's surge in productivity is largely the result of mechanical, chemical, genetical and managerial research conducted through the land grant college complex."[27] But Hightower's analysis resonated with other historians. Alan Marcus wrote that the Hatch Act's imprimatur for experiment stations "raise[d] scientists as fonts of agricultural wisdom to the apex of the agricultural pyramid."[28] Recent scholarship continues to describe twentieth century developments in scientific agriculture as a product of the land-grant research complex, in essence, "government led."[29]

This dissertation finds that even as farmers tried to solicit land-grant assistance, scientists reciprocated by showing an unprecedented degree of engagement with farmer-capitalists, and on the latter's terms: profit. In search of greater gains and efficiencies in animal agriculture, scientists applied hormones, antibiotics, and new feed processing technologies to the cattle

[25] Fitzgerald, *Business of Breeding*, pg 154.
[26] Jim Hightower, *Hard Tomatoes, Hard Times: A Report of the Agribusiness Accountability Project on the Failure of America's Land Grant College Complex* (Cambridge, MA: Schenkman Pub. Co., 1973)
[27] Ibid.
[28] Alan I. Marcus, *Agricultural Science and the Quest for Legitimacy*, pg 217.
[29] Shane Hamilton, *Supermarket USA: Food and Power in the Cold War Farms Race* (New Haven: Yale University Press, 2018).

feeding enterprise. This was the result of changes in the practice and methods of animal science instigated by feedlot capitalists. Over the course of the mid-twentieth century, animal scientists moved from conducting research in laboratories—removed from clients—to the very fields and feedlots of farmers and feeders. This happened on the insistence of agribusiness. Thus, the relationship between feedlot capitalists and animal scientists played an outsized role in determining the research questions, methods, and goals of animal science in the twentieth century.

Animal Factory interrogates one of the most invasive of human interactions with the natural world: the mass-production of animal bodies. This production takes place, not in slaughterhouses and stockyards—the subject of most histories of the meat industry—but in fields and feedlots. [30] By focusing its analytical lens upon the feedlot and on the lives the creatures therein, this work speaks to the intersection of the history of technology and environmental history. Livestock—biological creatures capable of independent action and subjective experience on the one hand, yet, ones so deeply embedded in technological systems—are situated at the boundary of nature and artifice. Environmental historians have questioned this dualism and problematized its implications for both industry and the environment.[31] By exploring the impact

[30] Historians have been much more concerned with the economics and production of "meat"—the process whereby animal bodies turn into food for humans. Hence, their focus has been on stockyards, slaughterhouses, butcher shops, and grocery stores. This project differs from such historical works, by taking the production of animal bodies as its subject. Animal bodies are sites of violence, control, and the creation of value in a capitalist system, as well as of psychological, physiological and biological resistance. That explains my focus on feedlots, where animal bodies are metabolized. For studies on meat production see: Wilson Warren, *Tied to the Great Packing Machine: The Midwest and Meatpacking* (Iowa City: University of Iowa Press, 2007); Steve Striffler, *Chicken: The Dangerous Transformation of America's Favorite Food* (New Haven: Yale University Press, 2005); Roger Horowitz, *Putting Meat on the American Table*: *Taste, Technology, Transformation* (Baltimore: Johns Hopkins University Press, 2005); Jimmy Skaggs, *Prime Cut*: *Livestock Raising and Meatpacking in the United States, 1607-1983* (College Station: Texas A&M University Press, 1986).

[31] These works interrogate the nature-culture binary: William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in *Uncommon Ground: Rethinking the Human Place in Nature* ed. William Cronon (New York: W. W. Norton and Company, 1996); Richard White, ""Are you an Environmentalist or Do You Work for a Living?": Work and Nature," in *Uncommon Ground: Rethinking the Human Place in Nature* ed. William Cronon

of animal biology upon surrounding land and waterscapes, specifically the production of highly toxic pools of manure in concentrated animal feeding operations, this dissertation explores how feedlots rearrange bovine life and metabolism in such a way as to create tremendous waste and great public health and environmental risk. This has not occurred despite animals and humans being part of the natural world, but because of it. Thus, in the age of hybrid nature, environmental mitigation remains a trade-off between different parts of the natural world: between groups of humans, between humans and animals, between animals and water, and between animals and the atmosphere—and industrial capitalism depends on this. The logic of feedlot capitalism, and perhaps capitalism broadly, necessitates the offloading of wastes and other hidden costs from one medium to another in order to dilute its own relation to it.

Historians have posited animals as machines, "industrial organisms", "convenient" animals, living-factories, "lively commodities", and "hybrid-nature".[32] Histories of capitalism that take agricultural commodities as their subjects of study, have, since Cronon's work on grain, lumber, and pigs, in *Nature's Metropolis*, asked how processes of production and marketing reduce, abstract, and standardize biological entities to suit the needs of the market. As a result, the agency of creatures has been sacrificed to the logic of capital in much of this literature.

(New York: W. W. Norton and Company, 1996); Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill & Wang, 1995).

[32] William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W. W. Norton, 1991); Steve Striffler, *Chicken: The Dangerous Transformation of America's Favorite Food*, (New Haven: Yale University Press, 2005); Bryant Simon, *The Hamlet Fire: A Tragic Story of Cheap Food, Cheap Government, and Cheap Lives* (The New Press, 2017); Wilson Warren, *Tied to the Great Packing Machine*: *The Midwest and Meatpacking* (Iowa City: University of Iowa Press, 2007); Roger Horowitz, *Putting Meat on the American Table* (Baltimore: Johns Hopkins University Press, 2006); Jason W. Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (London: Verso, 2015); Kenneth Fish, *Living Factories: Biotechnology and the Unique Nature of Capitalism* (McGill-Queen's University Press, 2013); Daniel Schneider, *Hybrid Nature: Sewage Treatment and the Contradictions of the Industrial Ecosystem* (Cambridge, MA: MIT Press, 2011); William Boyd, "Making Meat: Science, Technology, and American Poultry Production." *Technology and Culture,* Vol. 42, 4 (Oct 2001): 631-644; Tiago Saraiva, *Fascist Pigs: Technoscientific Organisms and the History of Fascism* (Cambridge, MA: MIT Press, 2018); Rosemary-Claire Collard and Jessica Dempsey, "Life for Sale? The Politics of Lively Commodities," *Environment and Planning A: Economy and Space* Vol. 45, Iss. 11 (Nov. 1, 2013), 2682-2699.

Animals are considered through the lens of the very industries that control them—as constant capital, subject to depreciation in a capitalist calculus. Most recently, in Jason Moore's *Capitalism and the Web of Life,* animal bodies are described as a form of "cheap nature" subject to capitalist appropriation. These efforts at theorizing capitalism's interaction with the environment and natural world are useful, but too often the labor and struggle of creatures is lost in the subsuming tendency of these overarching theorizations.

This dissertation challenges scholarship that seeks only to ask how the logic of capital has standardized, reduced, expropriated, and abstracted the living organisms destined for the slaughterhouse, without asking how those organisms have toiled and in turn transformed the system of production that drives them ever closer to their deaths. This study, seeks to give space to animal experiences, even as it seeks to understand the forces that shape them. A focus on animal lives pervades every chapter of this work.[33] By shedding light on the origins and development of concentrated animal feeding operations, this dissertation hopes to capture and distill the relationship between creatures, capital, and the state. In it, are highlighted, not just the struggles and machinations of bovine life, but both structural forces, such as USDA policies and farm legislation, as well as individual agents, like prominent cattle feeders and animal scientists, that have given shape to animal agriculture in the twentieth century.

The story of feedlots is the story of animal lives, animal labor, animal resistance, and animal death. Confined, stuffed, drugged, and killed prematurely, the life of American bovines is the stuff of nightmares. In the efforts of farmers to alienate, manipulate, and expropriate animal bodies—indeed to systematically reproduce them for confinement and slaughter—we can see

[33] By placing animal lives at the center of this narrative, I do not seek to take away from the experiences—positive and negative—of feedlot workers. But the fact is, that the highly automated nature of these animal factories makes it so that a very small number of people manage extremely large populations of animals.

some clarity return to what Paul Sutter calls the "haze of moral relativism" [34] that has followed the hybridization turn in environmental history wherein "the concept of responsibility for the environment seems to lose its force and vitality."[35] The application of animal science, state regulations, and the logic of capital upon animal bodies participates in the declension that so compels Sutter and environmentalists at large.

By focusing on the twentieth century cattle industry specifically, this dissertation not only fills in a gaping void in the historical study of agriculture, environment, and technology, but also addresses questions of grave concern to policymakers and environmentalists.[36] Bovines worldwide are the largest agricultural contributors to global warming. Still, historians have yet to consider how that came to be. The emissions from animal agriculture equal, if not exceed, those of the transportation sector. In order to mitigate this climate catastrophe, first we must understand the history of the *Animal Factory.*

The following pages bear out the origins and development of bovine feedlots in the United States. The chapters of this dissertation align with the very metabolic processes involved in the production of animal bodies: ingestion of feed grains, digestion and growth, and finally the production of wastes. *Chapter One* of this work discusses the institution of USDA beef grades and their grain over grass logic—the first blow to the free-range grazing of American bovines and a prerequisite for the transition to a grain-based diet. *Chapter Two* highlights the political economy of feed ushered by the New Deal, which made intensive grain feeding possible and led

[34] Paul Sutter, "The World With Us: The State of American Environmental History," *Journal of American History*, Volume 100, 1 (1) (June 2013): 119.
[35] Christof Mauch, "Which World is With Us? A Toquevillian View on American Environmental History," *Journal of American History,* Volume 100, 1 (1) (June 2013): 124-127.
[36] The only full length academic monograph on cattle feedlots is now almost 50 years old and ends its investigation at the end of the nineteenth century: James Whitaker, *Feedlot Empire: Beef Cattle Feeding in Illinois and Iowa, 1840-1900* (Ames: Iowa State University Press, 1975).

to the growth of the cattle feeding industry. *Chapter Three* details the development of technological innovations that increased weight gains and improved feeding efficiencies, spurring a boom in the number of concentrated animal feeding operations. It explores how these new techniques were born out of the relationship between feedlot capitalists and land-grant scientists. *Chapter Four* examines the struggle to contain the thousands of tons of manure piling up at feedlots around the nation and how farmers and public health officials in states with a large number of feedlots sought legislation to curb pollution from concentrated animal feeding operations. *Chapter Five*, focuses on the impact of the animal rights movement and several consumer health and safety crises on beef production in the United States, including the cattle industry's response to these threats. It ends with the emergence of the biggest threat to the cattle industry yet: climate change and the role of cows in it. Finally, the conclusion ties together the different strands of the story of feedlots discussed in this dissertation and offers a glimpse into how they spread around the world.

USDA Beef Grading & The Grain Over Grass Logic

The United States Department of Agriculture (USDA), in its efforts to shape beef production and standardize the livestock market across the nation, began a concerted campaign to introduce national beef grading standards in the 1920s. Within their beef grading conception was embedded what I call a "grain-over-grass" logic that, despite challenges from Western cattlemen, unequivocally promoted the assumption that grain-fed beef was better, and more desirable, than grass-fed beef. The adoption of federal beef grading therefore incentivized American cattlemen to feed their bovines an increasingly grain-based diet. The USDA was successful in these efforts because it was able to secure the support of a small but powerful section of the cattle industry: breeders and feeders—who came together to organize the Better Beef Association to lobby for USDA grades. This was not an instance of corporate capture of a government agency, but a display of USDA autonomy and its power to shape discourse—indeed embed itself within civilian institutions—and overcome dissent.[37] The USDA launched education campaigns to win consumer support, secured funding in order to offer the grading service to packers for free, and engaged the machinery of its extension service to reach resistant ranchers and cattlemen. The triumph of the USDA's grain-over-grass logic had major consequences for animals, consumers, and the planet. Cattlemen began to drastically alter the diet of their animals, from grass to grain, in an attempt to meet the highest grade, and therefore, receive the highest price per pound of animal flesh. This was the first step in the emergence of large-scale industrial feedlots around the United States.

[37] This argument furthers Daniel Carpenter's work on bureaucratic autonomy in the USDA. Carpenter highlighted the role of reputations and networks in allowing the USDA and its bureaus to achieve policy innovations despite political push back. This chapter highlights how the USDA's livestock division succeeded in its own unlegislated agenda to transform the cattle industry without the support of most cattlemen, packers, and consumers. See: Daniel Carpenter, *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928* (Princeton: Princeton University Press, 2001).

This chapter addresses several key questions in relation to the larger dissertation. How did the adoption of beef-grades spur the transition from grass to grain-heavy diets for bovine animals? Who were the key actors in nationwide adoption of federal beef grades? Who, on the other hand, were resistant to USDA beef grading and why? How did the USDA overcome this opposition? In addressing these questions, this chapter details the origins, adoption, and impact of beef grading in the United States. The USDA Livestock Division's papers from the National Archives in College Park, Maryland, form the bulk of the primary sources for this chapter. USDA and land-grant college bulletins and publications found at the National Agricultural Library in Beltsville, Maryland, are used as key evidence to support the claims put forward herein. Historical newspapers and magazines from the 1920s, available through various online databases, are also used to provide background and context.

The Cattle Industry at the Turn of the Twentieth Century

By the mid-nineteenth century, the cattle industry had established four distinct stages of beef production that have characterized the industry ever since: cattle raising, transport, feeding, and slaughter. This process of production began with ranchers, largely west of the Mississippi River, who grazed large herds of bovines on enormous tracts of land—ever driving the frontier westward in a violent process that dispossessed Native Americans off their land and exterminated bison to the brink of extinction.[38] On ranches, animals were left mostly unattended and able to graze and reproduce freely, until they were three to five years old and ready to market in the Fall. At such time, bovines were driven by bands of cowboys along well-trod trails either directly to eastern markets, or increasingly, as the century progressed, to cattle towns that

[38] Specht, *Red Meat Republic*

formed at the western most nodes of the railroad. From these cattle towns, such as Abilene, Kansas, the bovines were shipped to large stockyards in Midwestern packing-towns like Chicago and St. Louis that formed central nodes in the system of railroads than spanned the continent. Railroad transportation was expensive and drew much criticism from cattlemen who felt powerless in the face of the nineteenth century's largest corporations. At the central stockyards—also controlled by the railroads—if the cattle weren't headed further east, they were either bought by feeders in Iowa and Illinois to be fed corn over the winter, or by local meatpackers to be slaughtered, and then either dried or pickled, before being shipped east to large urban markets such as New York and Philadelphia. Grain-fed animals from the Mid-West were shipped back to the stockyards in the winter and spring months, from where they made their journey to the eastern seaboard to be slaughtered and then served at restaurants and in the homes of the wealthy who could afford prime cuts of fresh grain-fed beef.

Prior to refrigerated transport, most of the animals that made it to urban butchers and slaughterhouses arrived thirsty, half-starved (often injured) after the long journey from their place of birth hundreds of miles to the west. When leading Chicago packers successfully adopted refrigerated railcars, in the early 1880s, however, urban beef supply was no longer limited to the thin and rangy stock that had previously arrived either on foot or by rail. Midwestern packers could now slaughter fatter animals, that had traveled shorter distances, some of whom had been fed corn to regain weight lost en route. These beefier, or "prime" carcasses, were then shipped in refrigerated cars to packer-operated distribution centers in major Eastern cities from where butchers and retailers could purchase the meat for their stores at much lower prices than had ever been possible before.[39]

[39] This was a contentious process driven as much by social and political conflict between packers, railroads, labor, and butchers, as by technological change. See Specht, *Red Meat Republic*.

The packers cut prices of refrigerated beef to never-before-seen lows, in order to win over skeptical consumers and browbeat recalcitrant butchers who refused to carry refrigerated meat. The largest packers, with agents in all the major stockyards, also colluded to set low cattle prices, further alienating cattlemen who could not easily or cheaply find alternative markets for their animals. These tactics gave the largest meatpackers the unsavory distinction of being labeled the "Beef Trust". In the early twentieth century, trust-busting President, Theodore Roosevelt, asked his attorney general to file a case against the Beef Trust in violation of the Sherman Anti-Trust Act of 1890. Even though the Supreme Court ruled against the meatpackers in *Swift & Co. v. United States* (1905), the damage had already been done: the butchers were bankrupt and the cattlemen subordinated by the oligopoly of meat packers. The packers' strength remained in their ability to increase the supply of prime beef at low prices, generating further demand for such beef in urban centers. This increased demand spurred the initial growth of the cattle feeding industry.

Nineteenth century cattle feeding consisted mainly of small seasonal operations, of fewer than a thousand cattle, run by corn farmers seeking a profitable market for their corn (through cattle) and an easy way to fertilize their fields. Most feeders, however, did not specialize; alongside land for planting crops, they often maintained hundreds of acres of pasture to graze their livestock during the corn growing season in the summer. During harvest season, especially when the price of corn was low, such farmers let their cattle into the corn fields, followed by pigs who would salvage what the cattle left behind. Other feeders "stall fed" their animals on rations of shocked corn—dried cob, stalk, leaves, and all. Either way, grain fed bovines would gain several hundred pounds before they were shipped to slaughter in the winter and spring seasons. These fed animals were usually four to six years old and weighed somewhere between 1000 and

2000 pounds before slaughter. As cattlemen began "improving" their stock through the purchase of purebreds, producing animals that gained weight faster on a grain diet, cattle feeders began sending younger animals to market at lighter weights. This was a rather slow process, however, that received a boost from the institution of federal beef grading in the twentieth century, the subject of this chapter.

Despite the growing demand for corn-fed beef, large year-round feedlots did not appear in the nineteenth century. Packers became some of the largest cattle feeders of this earlier era because they perceived the demand for prime beef most keenly. For instance, Nelson Morris, one of the four largest meatpackers in the nation, fed over fifteen thousand bovines a year in the 1880s on corn mash from whiskey distilleries in Peoria, Illinois. Large operations such as Morris', however, were the exception, not the norm, and their methods were not adopted by the rest of the industry. In years when the price of corn was high, mixed feeders chose to sell grain instead of feeding it to animals, and so not as many corn-fed cattle made it to market. After all corn feeding was a more expensive practice than simply letting cows graze freely on pasture as long as land prices weren't too high. Packer-feeders alone thus struggled to boost the supply of grain fed animals that the urban centers seemed to be demanding.

Louis D. Hall and the Emergence of Beef Grading

Louis D. Hall, Assistant Chief in Animal Husbandry at the University of Illinois' Agricultural Experiment Station, sought to address this disjunction between supply and demand by creating a common language for producers and processors and thereby educating the former

in the needs of the latter.[40] From his investigations at the Union Stock Yards in Chicago, he had found that the meat processors valued animals with large carcass yields and high degrees of finish—intermuscular fat. With the centralization of the market in big cities, however, Hall believed that livestock producers were increasingly out of touch with market conditions. So, in 1910 he published Bulletin No. 147 entitled "Market Classes and Grades of Meat."[41] His bulletin introduced standardized meat grading terminology, along with descriptions, that would help distinguish superior meat from inferior products.

Halls' new grading system was meant to replace the use of loose and undefined terms such as "Good Western", "Medium Native", and "Select Texas" which had different connotations in different regions, making standard reporting impossible and interstate trade confusing at best. The older grading terminology was often used at the whim of the cattle buyer and did not corelate in any systematic way with the practice of intensive grain feeding of bovine animals. But Hall's new grading system placed that correlation front and center. In adopting the new terminology, not only were livestock men and women better able to communicate with each other about the quality of their animals but were also being educated in the kind of meat animals they should aim to produce: grain-fed.

Louis D. Hall was born on a livestock farm in 1878 and grew up around the cattle feeding business in Hawarden, Iowa. He received a bachelor's and master's degree in Animal Husbandry at the University of Illinois. At the turn of the twentieth century, Hall was a manager at Hall Cattle Company, running cattle feeding operations in Iowa, South Dakota, and Nebraska, feeding

[40] This was in line with Herbert Mumford's early work on beef grades at the University of Illinois: Herbert W. Mumford, "Market classes and grades of cattle with suggestions for interpreting market quotations" *University of Illinois Agricultural Experiment Station* Bulletin No. 78 (Urbana, Illinois: July 1902). Mumford had written, "Without a thorough understanding of market and feed lot requirements the feeder is groping in the dark." Pp. 370.
[41] Louis D. Hall, "Market Classes and Grades of Meat," *University of Illinois Agricultural Experiment Station* Bulletin No. 147 (Urbana, Illinois: July 1910).

up to 1500 cattle a year. Soon he was hired by the University of Illinois' Animal Husbandry Department where he was in charge of investigation, instruction, and extension work in beef cattle production and meats. He published his findings in university circulars and research bulletins, as well as farm papers and magazines, writing on the selection, feeding, and marketing of cattle, as well as the economics of beef production.[42]

In his 1910 bulletin, Hall, expanding on the work of his department head, Herbert Mumford, named six grades for beef: Prime, Choice, Good, Medium, Common, and Canners.[43] Some of these labels were already in use in stockyards around the country, but in no consistent fashion. Hall wrote that a carcass' grade should be judged based on its "form", "thickness", "finish", "quality", "soundness", and "weight". "Form" referred to the shape or build of the carcass, "thickness" to the amount of lean flesh, "finish" to the amount and distribution of fat, while "quality" was indicative of a host of factors such as size, color, smoothness, grain, softness of bones, etc. "Soundness" indicated an absence of bruises and injuries, and "weight" was self-explanatory.

The better a carcass ranked in each criterion, the higher its grade, with Prime being the most desirable and Canner the least. Hall admitted, however, that absent of anomalies, "quality" was "closely associated to form, thickness, and finish."[44] And that "thickness depends somewhat upon the finish of the carcass."[45] That weight was also usually a result of finish suggests that, among healthy and uninjured animals, form and finish were the two most important determining factors of grade, essentially because the remaining factors were dependent on them. Hall boiled it

[42] "Personal Record of Louis D. Hall," in USDA Livestock Division Papers, RG 136 A1-29, 170-76-7-00 box 2, NARA.
[43] Louis D. Hall, "Market Classes and Grades of Meat," *University of Illinois Agricultural Experiment Station* Bulletin No. 147 (Urbana, Illinois: July 1910).
[44] Louis D. Hall, "Market Classes and Grades of Meat," *University of Illinois Agricultural Experiment Station* Bulletin No. 147 (Urbana, Illinois: July 1910), 157.
[45] Ibid.

down further: "As to the relative importance of the above factors in grading carcass beef, it may be said that in the higher grades finish is particularly essential."[46] Good finish, indicated by the marbling of the flesh or the presence of intermuscular fat, was generally associated with juicy and tender meat. And so, Hall's top two meat grades, Prime and Choice, were inextricable from a carcass' high degree of finish.

Hall clearly espoused a particular view about the relation between cattle feeding and the quality of meat: "the lowest grade…[has] a green or grassy appearance of the flesh [indicating] a marked lack of finish…characteristic of grass-fed cattle."[47] In other words, Hall was making the unambiguous statement that grass-fed cattle produced poor beef. Hall's emphasis on finish betrayed his desire for the cattle industry to move away from grass feeding toward intensive grain feeding, in the hopes of producing prime and choice beef. This was an early and influential endorsement of a grain-over-grass logic which was soon adopted by the USDA and eventually by cattlemen around the country.

Rationalizing American Agriculture at the USDA

With an agricultural recession depressing prices during the 1920s, many farmers desired government intervention in the economy to raise agricultural prices. Corn prices had fallen by more than half from their war time high. Farmers who had invested in land and machinery during the boom years had their debts come due at a time of rock bottom commodity prices. By 1924, many farm organizations, including the farm bureau, had agreed upon a plan to increase prices and restore farm purchasing power: the McNary-Haughen plan. It entailed a federal program of

[46] Ibid., 161.
[47] Ibid., 157.

price supports—an unprecedented intervention into the agricultural economy. A bill of the same name was twice passed by Congress but vetoed by President Calvin Coolidge.

Coolidge and his successor Herbert Hoover, believed that rather than using the power of the federal government to fix prices, farmers should help themselves through voluntary agreements and cooperative commodity associations. They, and their Secretaries of Agriculture, saw the function of the government as a coordinator of marketing programs. In their view, the more streamlined the market was, the more information available, the better farmers would perform. Historian of agriculture, Deborah Fitzgerald writes about the 1920s: "this was the historical moment when agriculture in America was made rational and legible to the state, when it became national policy to ensure that farmers operated in as standardized and routine a manner as possible."[48]

Economists were at the forefront of this standardization effort and soon came to prominence at the USDA with the formation of the Bureau of Agricultural Economics (BAE) in 1922. The BAE was an outgrowth of the Office of Markets created by Congress in 1913 in response to the increasing complexity of agricultural marketing.[49] Since the late nineteenth century, farmers en masse—grangers, populists, and farmers' alliances—had identified middlemen (processors, railroads, bankers, etc.), in other words, marketing, at the root of most challenges faced by the American farmer. Farmers and middlemen had unequal access to

[48] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003),36.

[49] The Rural Organization Service, established in 1913, and Office of Markets, established May 16, 1913, by the Agricultural Appropriation Act (37 Stat. 854), March 4, 1913, were consolidated July 1, 1915, by the Agricultural Appropriation Act (38 Stat. 1111), March 4, 1915, to form the Office of Markets and Rural Organization, redesignated the Bureau of Markets, July 1, 1917, by the Agricultural Appropriation Act (39 Stat. 1162), March 4, 1917. Bureau of Markets and Bureau of Crop Estimates were consolidated, July 1, 1921, by the Agricultural Appropriation Act (41 Stat. 1341), March 3, 1921, to form the Bureau of Markets and Crop Estimates, which was combined with the Office of Farm Management and Farm Economics, 1922, to form the Bureau of Agricultural Economics. Retrieved from: https://www.archives.gov/research/guide-fed-records/groups/083.html

information and capital, fundamentally disadvantaging the former in any transaction with the latter. Many farmers thus created cooperatives in order to pool together their resources and achieve greater bargaining power.[50] The Office of Markets, wary of price fixing and increasingly concerned with creating an "industrial ideal" in American agriculture, saw themselves as a rationalizing force, well placed to provide market information and promote scientific knowledge, but not as an intervening power, seeking to interfere in the market on behalf of farmers.[51] The BAE inherited this outlook from the Office of Markets. Their answer to marketing problems in American agriculture was market information made legible and accessible to every farmer.

Many BAE employees, as well as its first Chief, Henry C. Taylor, identified as agricultural economists. Agricultural economics began taking shape as a field in the early twentieth century with the formation of professional associations such as the American Economic Association and the American Farm Management Association. These organizations consolidated in 1919 to form the American Farm Economics Association (AFEA). BAE Chief, Taylor, had served as president of the AFEA and was a founder of one of its parent organizations. Many employees of the BAE were also regular members of these professional organizations. Reflecting the newness of the field, much of the membership of the AFEA as well as most of the staff at the BAE only had bachelor's degrees.[52] Their lack of degrees, however, was compensated by their experience on farms and in agricultural industries.

Employees of the Livestock Division at the BAE, Charles V. Whalin and Walter C. Davis, were both veterans of the meat industry before they were hired by USDA. Whalin used to

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[50] Victoria Saker Woeste, *The Farmer's Benevolent Trust: Law and Agricultural Cooperation in Industrial America 1865-1945* (Chapel Hill: University of North Carolina Press, 1998).
[51] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003).
[52] Ibid., 45.

be active in meatpacking in Kansas City and Davis was engaged in the wholesale and retail meat business in Washington D.C. and Virginia.[53] During the 1920s, the livestock division, headed by Whalin, identified its "long-time program" as consisting of "research, service, and educational work."[54] These took the form of published bulletins and much sought-after market news and educational demonstrations.

The Dawn of USDA Beef Grading

The first reports on prices and conditions in the livestock market were issued in Chicago in 1918. But the division soon realized that in order for the news reports to make sense to a national audience there need to be a common national vocabulary. Essentially, the Office of Markets needed a set of uniform classifications and grade nomenclature that everyone could agree upon. Therefore, the task of establishing national beef grades fell squarely within the priorities of the bureau and the emerging profession of agricultural economics.

Federal grading standards, had in the previous decade, already been established for several commodities. In 1914, the Office of Markets, mandated by the Cotton Futures Act, established official standards for grades of American upland cotton. The national grades would be crucial to regulating the enormous trade in contracts for the future delivery of cotton, in order to prevent fraud and protect speculators' interests. Official corn grades soon followed from the Grain Standards Act of 1916. Grading standards and market news reports for a variety of fruits

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[53] Staff, "W. C. Davis Dies: Market Expert," *The Evening Star* (Washington D.C.: March 27, 1934), A-5; American Institute of Agriculture, *Profitable Marketing: Home Study Courses in the Marketing of Grain, Livestock, Fruits and Vegetables, Poultry and Eggs, and Dairy Products* (Chicago, 1923), 19.

[54] Lloyd S. Tenny, *Report of Chief of Bureau of Agricultural Economics*, USDA Bureau of Agricultural Economics (Washington D.C.: 1927), 22. Retrieved online: https://books.google.com/books?id=Yo5VJnWFQoUC&dq=charles+V.+whalin+livestock&source=gbs_navlinks_s Accessed on: Oct. 30, 2020.

and vegetables came next. Tentative beef grading standards were established in 1916. They were the first federal grades to be established for any meat product. Because meat was a perishable product, however, the establishment of grades did not immediately lead to the emergence of a futures market.[55]

To establish national livestock grades the USDA relied heavily upon Louis Hall, who was, in fact, hired as a specialist. With Hall's guidance, Whalin and Davis of the Marketing Livestock and Meats Division eventually published the official federal beef grades in USDA bulletin No. 1246, "Market Classes and Grades of Dressed Beef," by 1924. This was the first set of official grades for any meat product published by the USDA. The USDA bulletin 1246 borrowed much from Hall's work, but simplified things further. The factors determining grade were reduced to three: "conformation" (the same as Hall's "form"), "finish", and "quality". The first two together usually determined the third. Thus, the USDA's prescription for cattlemen was unequivocal: "Prime beef represents the best results of beef-cattle breeding, care and feeding. Only beef from the highest types of beef cattle, that have been fed intensively on grain… are found in this grade."[56] Thus, the largest and most trusted agricultural organization in America began to encourage grain-feeding as the most important determinant of a high-grade beef, relegating grass-fed animals to the lower grades.

In addition to grain feeding, Bulletin 1246 specified age as a factor that contributed to higher grade beef. Carcasses in prime and choice, it was stated, "are from young animals, under three years of age."[57] That exact age prescription would go down further with time, incentivizing

[55] The Chicago Board of Trade only began futures trading in non-grain commodities such as livestock during the 1960s.
[56] W.C. Davis and C.V. Whalin, "Market Classes and Grades of Dressed Beef," *United States Department of Agriculture,* Department Bulletin No. 1246 (Washington D.C.: August 13, 1924), 18.
[57] W.C. Davis and C.V. Whalin, "Market Classes and Grades of Dressed Beef," *United States Department of Agriculture,* Department Bulletin No. 1246 (Washington D.C.: August 13, 1924), 19.

producers to send their animals to feedlots, and ultimately, the slaughterhouse, at younger and younger ages. One reason was that animals who had been on grain feed over long periods of time tended to accumulate thick layers of fat over muscle, which retailers considered wasteful and consumers did not want. To address this, the bulletin prescribed prime carcasses have "creamy white fat that is not excessively thick or wasty at any point, the greatest depth being over the loins and ribs, which generally does not exceed three-fourths of an inch."[58] To meet this requirement producers would have to start grain feeding early in the life of a bovine. This logic was thus skewed to favor younger, and therefore, smaller and lighter animals. C. E. Gibbons of the USDA brought this to the attention of his superior, Whalin:

> We say that the maximum depth over the loins is ¾ inch for a 500 pound carcass and we set the same limit for a carcass weighing 900 pounds. I cannot feel that such a course is logical. Is it not possible that an animal producing a 900 pound carcass might carry a greater depth of fat over its loin than one which produced a 500 pound carcass and still retained its grade standing. In the first carcass virtually every bone and muscle is larger than in the second. Then why should there not be a certain tolerance in the depth of fat? To my mind a 500 pound carcass might conceivably and logically be considered over fat if it carried the same depth of fat covering as a carcass nearly twice as large.[59]

Whalin, however, maintained that beyond that ¾ inch mark, the amount of fat on a carcass became too excessive, irrespective of size and weight. Nonetheless, as Gibbons had pointed out, the USDA's grading requirement worked against larger, and therefore older, bovines. Simply put, only young animals could meet the top grades. By incentivizing producers to meet those higher grades, the USDA was also instituting a necropolitics that began to shorten the lifespan of America's bovine creatures.[60]

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[58] Ibid., 21.

[59] C. E. Gibbons to C. V. Whalin (March 14, 1923) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00, Box 2, NARA

[60] Achille Mbembe defines necropolitics as "the subjugation of life to the power of death." In obscuring animal life in favor of visualizing animal death, the beef-on-the-hoof paradigm enabled the institutionalization of bovine

The U.S. Shipping Board, created during WWI, was the first to use the USDA's tentative beef grading standards in its contract specifications as early as January 1923 (before the official standards were published).[61] The Shipping Board had had trouble securing consistent quality beef for its steam liners—something that the armed forces had struggled with routinely and had turned into a public scandal during the Spanish-American War.[62] Thus, to ensure quality, the Bureau of Agricultural Economics was enlisted to grade the beef purchased under the Shipping Board's contracts. Their trial was a success, and beef grading was no longer just an idea. With the formal publication of Bulletin 1246, other organizations began to request the same service from the USDA on a fee basis. As greater interest was generated in beef grading, in 1925, hearings were held in Portland, Chicago, and New York, with members of the livestock and meat trade, to debate the introduction of a nation-wide voluntary grading service conducted by the USDA.

At these hearings, USDA officials did not hesitate to spell out their objectives. They wanted to create a "language" to facilitate trading, "translate values", and, in particular "to translate the quality of [livestock] animals into the quality of their meat."[63] More specifically, a uniform grading language would enable the producer "to know what the market wants, to

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necropolitics, which took the shape of feedlots or concentrated animal feeding operations dotting the mid-century American landscape. These feedlots met Mbembe's definition of "*death worlds*, new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of *living dead.*" After all, what do a few years of animal life matter when the only goal of animal existence is the finish and form of its carcass? This was an instance of market reductionism turned necropower, having a very tangible and literally life-altering impact. See: J. A. Mbembe, Libby Meintjes (trans.), "Necropolitics," *Public Culture* Vol. 15, No. 1 (Duke University Press, Winter 2003), 11-40.

[61] L.B. Burk, *History of Meat Grading* (Washington D.C.: Agricultural Marketing Administration USDA, November 1944), 1.

[62] For more on the scandal about low quality canned beef being blamed for weakening US forces, see: Joshua Specht, *Red Meat Republic: A Hoof to Table History of How Beef Changed America* (Princeton, NJ: Princeton University Press, 2019), Chapter 5.

[63] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 9.

produce what the market wants, and to send to the market what it wants when it wants it."[64] In this way, agricultural experts believed they could help farmers without the kind of direct federal intervention proposed by the McNary-Haughen plan.

The USDA's ultimate purpose in establishing a nation-wide system of beef grades and classes was to create a market that functioned in the way they imagined markets should: seamlessly adjusting supply to demand over time—something the beef market had apparently failed to do for corn-fed beef. In other words, Whalin and Davis wanted to shape a function that, until then, was being managed by individuals coming together in the marketplace unmediated by a third party. The ill-defined and geographically diverse terms for different kinds of cattle and beef that were used by cattlemen, however, made it impossible to determine a given carcass' "true value… [and] price," something—that the USDA specialists believed—markets depended on for proper functioning.[65] Without a nationwide grading system, the same animal that was judged "good" in one market could be graded "choice" in another and "common" in the next. With standard nationwide terminology, however, cattlemen would be more clearly able to see the needs of the meat market.

Concurrent with efforts to rationalize the cattle market, the USDA's livestock division also sought to grow the cattle feeding industry as a way to head off the depression. USDA field agents, from large cattle states such as California, wrote Whalin about, "the need of enlarging the cattle feeding business."[66] Cattle feeding would, they argued, take grass fed cattle out of the market during periods of excess supply, relieving the downward pressure on prices. Additionally,

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[64] Ibid., 10.
[65] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 2.
[66] Correspondence James K. Wallace to C. V. Whalin (June 21, 1924) in USDA Bureau of Agricultural Economics Marketing Division, RG 16 E17, 170-5-28-6 box 1067, NARA.

range cattle could be fed over a period of 4-5 months for increased weight and quality. Better quality would elicit greater consumption, even as the lesser quality stock could simultaneously be culled. Therefore, with the growth of cattle feeding more meat would be supplied from fewer, heavier animals, increasing cattle prices while keeping beef prices low. In other words, USDA specialists identified grain-feeding as the key to rescuing the cattle market from depression. Because USDA beef grading implicitly and explicitly advocated the grain feeding of bovine animals, it also participated in all the perceived economic benefits of a larger cattle feeding industry.

The Better Beef Association

Davis, co-author of Bulletin 1246 and a market specialist in the USDA's Livestock and Meat division, did not shy away from saying that the industry had "a very prominent part" in establishing the USDA's federal beef grades. In his opinion, the USDA and the meat industry were "practically identical" in their ideas about grading.[67] The meat industry, however, consisted of a diverse array of actors: breeders, ranchers, feeders, shippers, packers, jobbers, and retailers. It was the first of these—breeders—that organized a campaign to secure federal beef grading. Their campaign, the Better Beef Association, in the words of Whalin, was "a new organization of livestock producers… having for its sole object the advancement of one of the important aspects of the divisions standardization program."[68]

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[67] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 17.

[68] Charles V. Whalin, "Division of Livestock, Meats, and Wool," in Lloyd S. Tenny's *Report of Chief of Bureau of Agricultural Economics*, USDA Bureau of Agricultural Economics (Washington D.C.: 1927), 22. Retrieved online: https://books.google.com/books?id=Yo5VJnWFQoUC&dq=charles+V.+whalin+livestock&source=gbs_navlinks_s Accessed on: Oct. 30, 2020.

Beef grading's most ardent supporter, one who played a prominent role in lobbying for the USDA's grading program, was Alvin H. Sanders. Sanders, Editor of the *Breeder's Gazette,* was an avid promoter of purebred, cornfed cattle. At a time when the agricultural depression of the 1920s had been particularly ruinous for cattle feeders, Sanders' publication responded to the depressed market with a fervent campaign denouncing grass fed beef, using monikers such as "tiger meat" and "cat meat" to illustrate its inferior quality.[69] One reader of Sanders' gazette even wrote a poem summarizing the breeders' view:

Cat meat, rat meat,
From canner cows and steers,
So very short in quality,
But rounded out in years.

Tough meat, enough meat,
Of fibre cord and string,
With juicy steaks and marbled roasts
As rare as snow in spring.

Lean meat, mean meat,
From scrubby kinds of stock;
It takes away our appetite,
To see it on the block.

Purebred, corn-fed,
The juicy steaks to chew;
So tell the bloody butcher
That nothing else will do.[70]

Like this reader, Sanders lamented that, if only consumers knew how to get high quality beef they would buy it. "The public needs to learn: the lesson that *lean* beef is necessarily poor

[69] V. James Rhodes, "How the Marking of Beef Grades Was Obtained," *Journal of Farm Economics* Vol. 42, No. 1 (Feb. 1960), pp. 133-149.
[70] W. E. Tharp, "Sing a Song of Beefsteak," *The Breeder's Gazette* Vol. LXXXIX, No. 8 (Chicago: Feb 25, 1926), pp 238.

beef."[71] (italics in original) Both the producer and the consumer needed educating. This was the exact contention of the Better Beef Association (BBA).

At Chicago's Saddle and Sirloin Club, in April 1926, gathered over rib roast cuts from a 1600 pound prime-finished bullock, Sanders and the top brass from three leading beef breeding associations and the International Livestock Exposition, considered the formation of the Better Beef Association. Sanders described the purpose of the meeting: "Generally speaking, there is at all times, a very narrow outlet for the best fat cattle on the hoof; and killers insist that this is due to the limited call from buyers and consumers… What, if anything, can be done to exploit the virtues of good beef and expand its consumption?" [72] USDA stamping of prime and choice cattle and the need for a public education campaign were the most heavily discussed solutions to Sanders' opening question. And along the way, it became clear that, "cattle feeding must be made one of the corner-stones of a permanently successful agriculture in this country."[73] These were ambitions that the Better Beef Association shared with the USDA.

Most historical accounts emphasize the role of Sanders and the BBA in the adoption of federal beef grades, while downplaying the role of the USDA.[74] However, the USDA had been working on beef grading several years in advance of the creation of the BBA, as this chapter has borne out. When Sanders' and his collaborator—cattle breeder and financier—Oakleigh Thorne met with Agricultural Secretary William Jardine to

[71] Quoted from Elmer R. Kiehl and V. James Rhodes, "Historical Development of Beef Quality and Grading Standards," *University of Missouri Agricultural Experiment Station,* Research Bulletin 728 (Columbia, MO: February, 1960), 27.
[72] Notes on USDA Bureau of Markets letterhead (n.d), taken from *Breeder's Gazette* (May 6, 1926) pp 560-63, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[73] Notes on USDA Bureau of Markets letterhead (n.d), pp 7, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[74] Elmer R. Kiehl and V. James Rhodes, "Historical Development of Beef Quality and Grading Standards," *University of Missouri Agricultural Experiment Station,* Research Bulletin 728 (Columbia, MO: February, 1960).

request a USDA beef grading program, it was hardly the first time he was hearing about it. The Bureau of Agricultural Economics had been reporting to the Secretary about its grading initiatives for several years already. When Jardine promised to stamp beef grades free of charge to all packers, upon request, starting July 1, 1926, it was not merely the result of the BBA's advocacy. The Better Beef Association was only officially born later that month at a convention in Missouri (see Image 1) with over 200 representatives from the cattle industry present. To carry out the work of promoting beef grading, the BBA elected a nine-member board, with none other than Louis D. Hall as the executive secretary and Oakleigh Thorne as Chair.

Conference called by the Better Beef Association in Kansas City, Mo., July 22-23, 1926, to consider Beef Grading and Stamping

Image 1: Inaugural BBA Conference in Kansas City, MO, July 22-23, 1926 Source: Better Beef Association, "Report on Development: Grading and Stamping Beef," *National Livestock and Meat Board* (Chicago: 1928), pp. 13, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00, Box 2, NARA.

Overcoming Opposition from Western Cattlemen

Even though the USDA sought to "provide a guide to the producer," many cattlemen were largely left out of the discussion of grading standards.[75] The USDA wanted to sway producers not ask them for advice, especially because, most Western cattlemen did not see eye to eye with the USDA's grain-feeding agenda. Sanders knew as much. In a letter to the Secretary of Agriculture, Sanders argued:

> No premium to speak of is being paid for the prime stuff as against the common kind. Railways, hotels, and other large purveyors of beef desiring to serve really good product will be only too glad to make contracts for the Blue Ribbon grade as soon as established. The argument that a wider public demand for fine beef might unsettle somewhat the trade in cheaper cuts should not be permitted to have weight. Good cattle well fed have suffered long enough.[76]

But to "the producer of cattle west of the 100th meridian, whose product had a hard enough time competing against the choice corn-fed cattle of Iowa and Illinois," beef grading was a "handicap."[77] One Coloradan elaborated:

> Perhaps ninety per cent of the Western cattle, in which we, out here, are interested, never come within sight of either "Prime" or "Choice" grades. They cannot, because of natural conditions such as the short grass of Arizona, the sometimes dry summers of Montana, and the long winters of Western Colorado. Grading meats for us simply arms the Packers with another gun to shoot at our product and gives the woman who knows nothing about meats a chance to ask her butcher for a "government inspected roast", thus lowering the price for our delicious grass fat beef, with which she would have been well pleased if someone had not told her about this new "rubber stamped" article…If these government

[75] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 13.
[76] Alvin H. Sanders to W. M. Jardine (May, 1926) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[77] A. E. deRicqles, "Labeling Beef," The De RIcqles Agency (Denver: August 13, 1926) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

> agents start to grade meats, it would be 'good-night' for the range cattle from Montana, Wyoming and other Western States.[78]

Essentially, cattlemen who ran grass fed operations would be at a severe disadvantage if the beef grading standards remained so unequivocally in favor of grain fed beef. Western cattlemen thus accused Sanders of "see[ing] this movement merely as an opportunity to advertise the very best beef that the comparatively limited number of those engaged in producing it may receive a somewhat higher price."[79]

Indeed, the BBA warned the Secretary of Agriculture, William Jardine, "Of course there is going to be a big cry from the cattlemen that [beef grading] is simply a pure bred or rich man's claim." [80] But the BBA also offered several solutions to Jardine, including soliciting endorsements for the experiment from the head of the Bureau of Animal Industry who was held in esteem by cattlemen of every stripe. Such assurances would "set it all at rest… eliminating a lot of unpleasant and adverse criticism."[81]

Whalin and the livestock division of the USDA believed that most cattlemen just weren't knowledgeable enough about the federal grading program: "The packers and wholesale and retail meat dealers, especially in the large consuming centers where we have been issuing reports have become quite familiar with our market classes and grades, and follow our reports with extreme care. It is regretted, however, that the farmer is not so familiar with them."[82] But they had a plan

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[78] Ibid.
[79] Editor, "How Many Grades of Meat Should be Marked?" *Western Breeders Journal* Vol. 58, No. 28 (Portland, OR: July 15, 1926)
[80] Oakleigh Thorne to William M. Jardine (Chicago: December 18, 1926) in General Correspondence, RG 16, E 17, 170-5-31-5, Box 1208, NARA.
[81] Ibid.
[82] Marketing Live Stock, Meats and Wool, "Memorandum for Dr. Taylor," USDA (May 9, 1922) in USDA Livestock Division Papers, RG 136 E29, 170-76-7-00 box 2 part 2, National Archives and Records Administration, College Park, MD, NARA from here on.

for the American farmer and the consuming public: "To the producer and consumer these conditions will remain more or less mysterious until placed before them in an intelligible manner… there seems to be an occasion for a campaign of education."[83] Thus, USDA officials, including Whalin and Davis, personally traveled the country to publicize the beef grading project and pacify their critics. They published promotional articles in outlets such as *The Cattleman* and the *Farm and Ranch Market Journal*.[84]

Whalin planned to leverage the USDA's extension service in his effort to educate cattlemen. "We do get out literature right now but nobody cares to read much," he complained. Therefore, Whalin promised to engage "the machinery of the State and the State extension service" in the grading effort.[85] County agents attached to land grant universities were told to advertise local grading demonstrations as widely as possible. USDA men would travel from one such demonstration to the next, on farms and ranches across the country, working with local live animals to explain the official grading standards. The requests for such demos far exceeded the availability of trained graders. And so USDA officials also made many radio appearances, all in the effort to transform American farmers' cattle feeding and marketing practices, and simultaneously build networks, enhance their reputations, and further their autonomy.[86] These public appearances were not simply part of USDA educational efforts but were a salesman's pitch for the nationwide adoption of grading on a permanent basis.

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[83] Assistant in Marketing Live Stock and Meats, "Memorandum for Mr. Hall," USDA (September 16, 1916) in USDA Livestock Division Papers, RG 136 A1-29, 170-76-7-00 box 2, NARA.
[84] W. C. Davis, "Government Beef Grading and Marking Desirable—W. C. Davis," *Farm and Ranch Market Journal* (Nov. 25, 1926); W. C. Davis, "Beef Grading Good for Industry," *The Cattleman* (Nov. 1926), 17.
[85] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 90.
[86] Daniel Carpenter, The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928 (Princeton: Princeton University Press: 2001).

When presenting the benefits of the beef grading program to the consumers and cattlemen, whose practices the program aimed to transform, USDA officials focused less on how grading was to be "a guide to the producer" and more on the anticipated benefit of reining in retailer malpractice. They touted research on how a national beef grading program would "materially simplify consumers' meat problems, tend to increase meat consumption, promote production of better grades of meat animals, and restrict operations of unscrupulous dealers."[87] The first and last of these reasons, were something many cattlemen were already primed to accept. A loose-knit "Truth in Meats" campaign was popular among Western cattlemen blaming retailers for marketing mature dairy cow meat and other inferior products under the guise of quality steer and heifer beef. Thus, to gain producer support the Better Beef Association coopted the "Truth in Meat" campaign, meant to prevent the dishonest labeling of beef, into a crusade for grain-fed beef. By appealing to these pre-existing concerns, the USDA and BBA were able to secure a broad mandate for their grading project.

Convincing Packers Through Precision and Obfuscation

The packers too had their reservations seeing that the actual grading would take place in their plants. The chair of the Better Beef Association, Oakleigh Thorne, conceded as much in a letter to Jardine in late 1926: "The Packers were and to a certain extent are still opposed to meat being graded by or under the supervision of the government, but we were able to bring sufficient pressure to bear upon them to the effect that the consumers and the public were entitled to this

[87] Bureau of Agricultural Economics, "Influences of Methods and Costs of Retailing and Consumers' Habits Upon the Market for Meat: A Preliminary Report," *United States Department of Agriculture* (Washington D.C.: December 1924) retrieved from RG 16, E 17, 170-5-28-6, Box 1068, Bureau of Agricultural Economics General Correspondence, NARA.

service irrespective of their opinion… they have made up their minds to give this a fair trial."[88] In this regard, the USDA and BBA promised to finance the grading service and provide the manpower for the project, making it easier for the packers to acquiesce.

Packers were also skeptical of the consistency, speed, and precision with which grading could be conducted across the nation. The uniformity of USDA grading would determine the workability and legitimacy of the system. The work of beef grading was therefore tremendously important to the success of the grading experiment and was to be conducted by men experienced in cattle buying and meatpacking, hired by the USDA. Davis thus assured those concerned with the reliability of USDA graders:

> The men employed in beef grading are practical beef men. They have had years of experience in packing plants and wholesale houses. No one is permitted by the Department to undertake beef grading work who has not had at least eight years' practical beef grading or beef selling and buying experience… These men have been carefully trained in the use of the official grade standards and their work in the various plants is being constantly supervised. Every precaution has been taken to insure uniformity.[89]

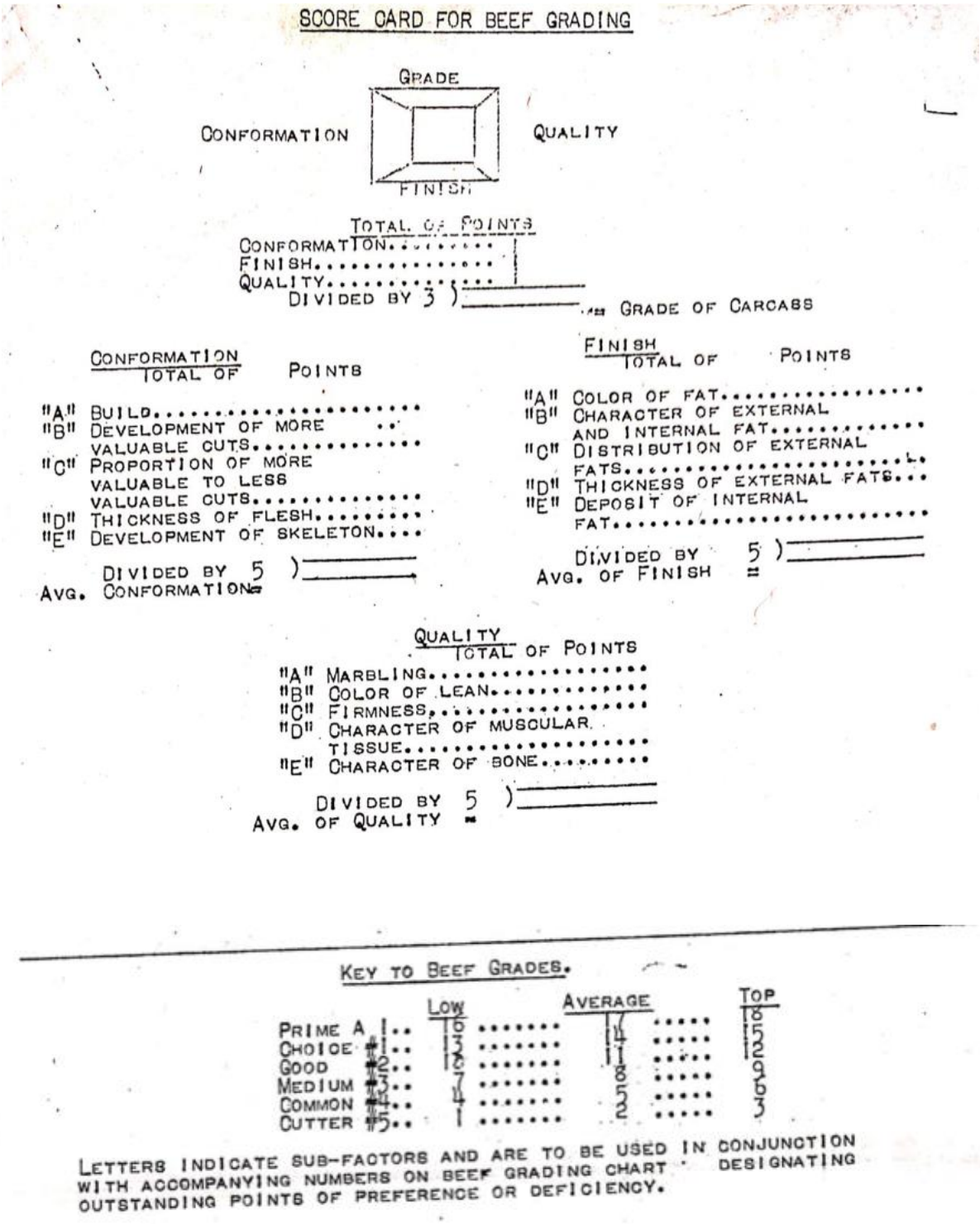
The beef grader's task was to assess the grade of a bovine carcass based upon tape measurements and eye-ball assessments. Numerical formulae were devised to average out the conformation, quality, and degree of finish of each carcass. Each grade had a corresponding numerical range associated with it. So the final grade of every carcass would depend on where in the range the average carcass calculation fell. Figure 1 shows an example of an early beef grading score card designed along these lines.

[88] Ibid.

[89] W. C. Davis, "A Million Pounds of Beef is Graded," *Grading and Stamping Prime and Choice Beef Carcasses*, BBA Bulletin No. 2, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

Because consistency across carcasses and across graders was key to creating a national beef market, the USDA resorted to impersonal mathematical formulae as the purest arbiters of grade, and a check against each grader's subjective disposition. To packers who thought accurate and consistent grading was impossible, Whalin described a USDA experiment in which three graders independently graded the same five hundred bovines. "The three graders were a full grade apart on only two animals," he insisted. This "shows quite conclusively, first—that our grade standards are well founded, and second, that they can be accurately and satisfactorily applied by anyone who has a working knowledge of livestock and meats."[90] However, this statement was quite misleading, as precision did not signal in any way that the standards were necessarily well-founded.

[90] C. V. Whalin, "Grade Standards for Livestock, Meats and Wool," Address to the Kansas Livestock Association (Wichita: Feb 25, 1927), pp 20, in USDA Livestock Division, RG 136, A1-29, 179-76-7-00, box 1, NARA.



SCORE CARD FOR BEEF GRADING

GRADE

CONFORMATION

QUALITY

FINISH

TOTAL OF POINTS

CONFORMATION.....
FINISH.....
QUALITY.....
DIVIDED BY 3)_____ = GRADE OF CARCASS

CONFORMATION
TOTAL OF POINTS

"A" BUILD.....
"B" DEVELOPMENT OF MORE VALUABLE CUTS.....
"C" PROPORTION OF MORE VALUABLE TO LESS VALUABLE CUTS.....
"D" THICKNESS OF FLESH.....
"E" DEVELOPMENT OF SKELETON....

DIVIDED BY 5)_____
AVG. CONFORMATION=

FINISH
TOTAL OF POINTS

"A" COLOR OF FAT.....
"B" CHARACTER OF EXTERNAL AND INTERNAL FAT.....
"C" DISTRIBUTION OF EXTERNAL FATS.....
"D" THICKNESS OF EXTERNAL FATS...
"E" DEPOSIT OF INTERNAL FAT.....

DIVIDED BY 5)_____
AVG. OF FINISH =

QUALITY
TOTAL OF POINTS

"A" MARBLING.....
"B" COLOR OF LEAN.....
"C" FIRMNESS.....
"D" CHARACTER OF MUSCULAR TISSUE.....
"E" CHARACTER OF BONE.....

DIVIDED BY 5)_____
AVG. OF QUALITY =

KEY TO BEEF GRADES.

	LOW	AVERAGE	TOP
PRIME A	16	17	18
CHOICE #1	13	14	15
GOOD #2	10	11	12
MEDIUM #3	7	8	9
COMMON #4	4	5	6
CUTTER #5	1	2	3

LETTERS INDICATE SUB-FACTORS AND ARE TO BE USED IN CONJUNCTION WITH ACCOMPANYING NUMBERS ON BEEF GRADING CHART DESIGNATING OUTSTANDING POINTS OF PREFERENCE OR DEFICIENCY.

Figure 1: USDA "Scorecard for Beef Grading" from USDA Livestock Division Papers, RG 136 E29, 170-76-7-00 box 2 part 2, NARA.

According to one historian of science: "precision measurements require agreement about what is valued and how it is to be valued."[91] But in this instance, the promise of precision was instead used to create agreement around the USDA's values and assumptions. Claims of precision and numerical exactitude were used to justify the suppositions and value judgements that undergirded the USDA's grading system entire. The air of objectivity lent by numbers helped Whalin persuade unwilling participants of the fairness and appropriateness of the USDA's particular priorities and designs. This aligns with Theodore Porter's work explaining the rise of statistical sciences and a trust in numbers due to their ability to appear to be "fair and impersonal."[92]

The USDA had come to value "finish" over and above all other characteristics of a bovine body. At a meeting with packers, USDA officials stated, "grass finish, and the quality that goes with it, does not compare favorably at all…with the finish and quality that you will have in your corn fed and concentrate fed animals."[93] But some remained skeptical of this emphasis on diet, stating the importance of geography, climate, and breeding on the grade of an animal. When pushed on this, USDA official C. E. Gibbons responded, saying:

> Other things being equal grass cattle will not sell as high as grain fed cattle. Why?... It is not just a whim of the buyer or of the seller or of the retailer or of the consumer… Ultimately, the two animals, one grain fed and the other grass fed, will show some differences… Different feed has produced different results in the two animals… The results of the feed administered, will show up in one or another of these [three grade

[91] M. Norton Wise, "Introduction," in *The Values of Precision* ed. M. Norton Wise (Princeton: Princeton University Press, 1995), 7.
[92] Theodore M. Porter, *Trust In Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995), 8.
[93] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 78.

> factors: conformation, finish, quality], possibly in all of them… The differences are apparent.[94]

The differences between the two diets, and the bodies they produced were indeed apparent. But Gibbons was unable to explain why one was more desirable than the other without resorting to subjective indicators such as taste. That there was a substantive difference between two animals on different diets, said nothing about which one was judged better, more expensive, and why and who got to make that decision? According to one agricultural economist: "There was some injection of the gratuitous assumption that whatever costs more to produce must be better."[95]

The USDA appealed to consumer preference in order to obfuscate the grading system's reliance on subjective or arbitrary parameters. Whalin and Davis maintained that "market preference," and not their own arbitrary ordering, determined the arrangement of the grades from most desirable to least, i.e., prime to canner. In other words, the USDA insisted that it was the consumer that decided what was most desirable (prime) and not them. But the consumers were not consulted in any systematic way. The bulletin even stated:

> It is conceivable that, in a state of free distribution where price is eliminated as a factor, a majority of consumers might select Good grade beef in preference to Prime grade beef. Trade preferences shift from time to time. As an example of this, the present strong trend toward lighter weight carcasses may be noted. Today a majority of consumers willingly pay a higher price for relatively inferior grades of meat… which are better suited to present day modes of living.[96]

This incongruency, between the USDA ordering of beef grades and consumer preference, flew in the face of the USDA's claim that grades reflected market preference not USDA designs. But the

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[94] Ibid., 82.

[95] V. James Rhodes, "How the Marking of Beef Grades Was Obtained," *Journal of Farm Economics* Vol. 42, No. 1 (Feb. 1960), pp. 138.

[96] W.C. Davis and C.V. Whalin, "Market Classes and Grades of Dressed Beef," *United States Department of Agriculture,* Department Bulletin No. 1246 (Washington D.C.: August 13, 1924), 6.

counter-evidence was quickly brushed aside by the assertion that the USDA system was determined "by the preference, over a long period of time, of the more discriminating consumers."[97] This was a problematic statement, because who such "discriminating" consumers were and what the "long period" was exactly, was left unstated. In internal communications, though, it was clear that "slaughterers, wholesalers, jobbers, large buying interests and retailers" constituted the "consensus of opinion" with whom the USDA conferred in arriving at the beef grading standards, not consumers.[98] Indeed the USDA launched a concerted campaign to educate consumers about beef grades.

Campaign of Consumer Education

To reach the larger consuming public, the USDA published posters, as in Figure 2, illustrating the key difference between "common" beef and "choice" beef. The distinguishing factor that the posters highlighted, was the presence of marbling or intermuscular fat. Other posters, like that in Figure 3, were distributed to hundreds of retailers advertising the U.S. government's stamp—an "assurance of quality". Retailers were encouraged to put up these posters in visible locations, attracting customers' attention to the USDA's new beef grading service. USDA efforts to shape consumer opinion and influence beef purchasing patterns casts serious doubt on the claim that consumer preference was the key determinant of higher and lower beef grades.

[97] Ibid.

[98] Marketing Live Stock, Meats and Wool, "Proposed United States Grades for Dressed Beef," USDA (April 21, 1924) in USDA Livestock Division Papers, RG 136 E29, 170-76-7-00 box 2 part 2, NARA.

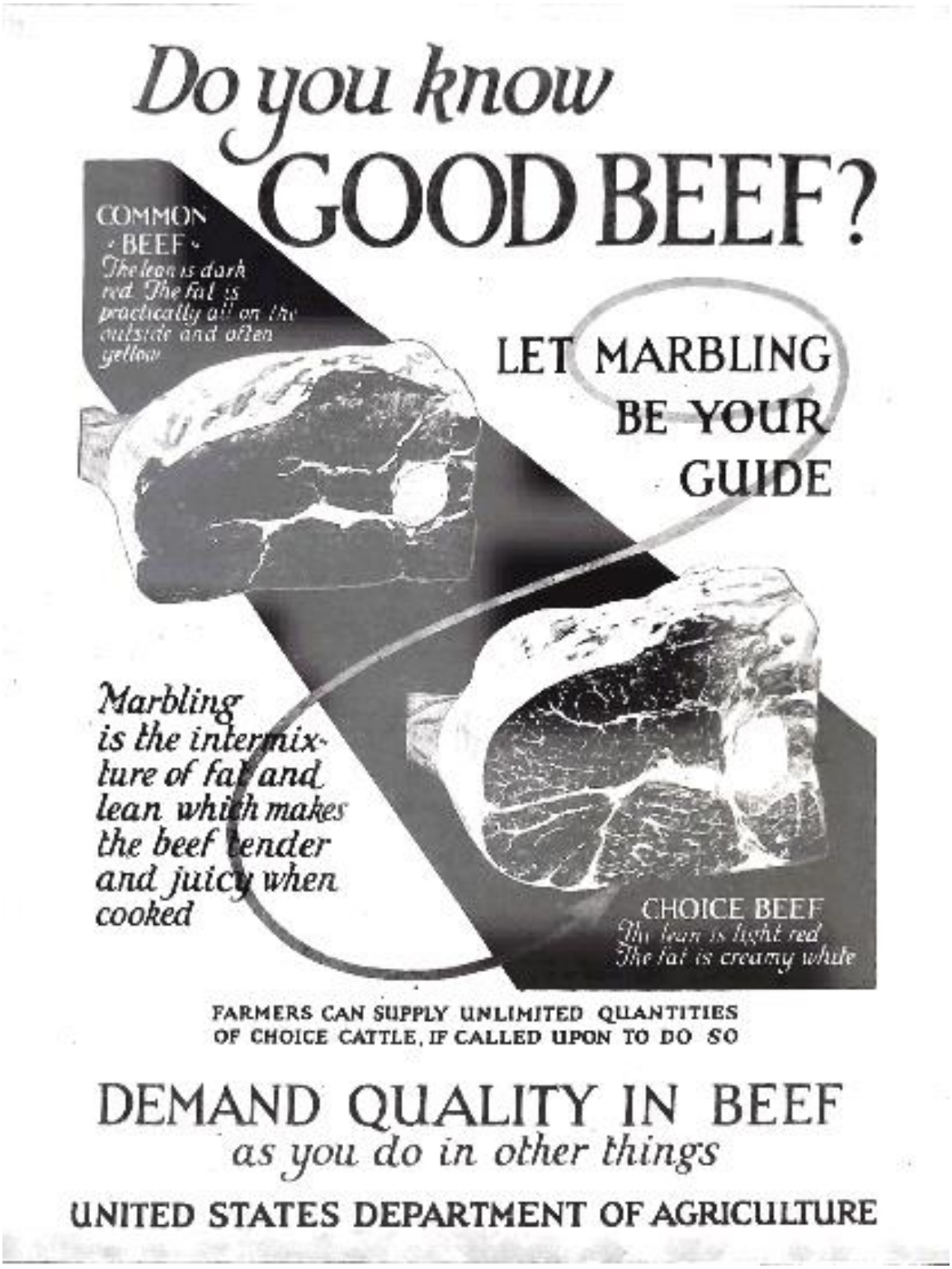

Figure 2: USDA "Do you know Good Beef?" Poster from *The Breeder's Gazette* Vol. LXXXIX, No. 6 (Chicago: Feb 11, 1926) pp 171.

Bureau of Agricultural Economics
U. S. Department of Agriculture

POSTERS ARE FREE—SENT ON REQUEST

Above is a small black and white reproduction of the attractive poster to be furnished those handling graded and stamped beef. The poster itself is 18x24 inches in size and is printed in four colors. The carcass is reproduced in natural colors.

Figure 3: National Live Stock and Meat Board, "We Handle Government Graded and Stamped Prime and Choice Beef," *BBA Bulletin* No. 2 (Chicago: June 14, 1927) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

The American housewife was the better beef campaign's main audience. "Many housewives refuse to buy fat beef, thinking that it is poor meat… a general plan of education is the only remedy."[99] But housewives did not really care for fat, they cared about palatability. And even though the link between fat and palatability was tenuous at best, the BBA and the USDA considered it a given. At a meat retailers conference in Kansas, W. C. Davis declared, "Seventy per cent of the women who now buy meat are being fooled."[100] Elsewhere Davis stated, housewives were woefully ignorant of quality beef and low prices beguiled them into purchasing "beef that practically cannot be consumed."[101] To these USDA officials American housewives were naïve, irrational, and picky consumers who needed clear guidelines, in the form of grades, to make better decisions.[102]

In 1926, the Meat Board, with the support of the USDA and land grant universities, organized "Housewives' Meat Schools" and "Better Beef Exhibits" in major urban centers.[103] Such efforts, directed specifically at women, coincided with the emergence of formal education in home economics, bolstered by the passage of the Smith Hughes Act of 1917 which provided federal funding for the same. The USDA also created an entire bureau for that purpose, the Bureau of Home Economics, founded in 1923. There, home economists sought to help women embody the principles of "rational consumption."[104] To the Livestock Division at the USDA,

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[99] "Grow Best Beef" (n.d), in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[100] Ibid.
[101] Staff, "Marketing of Beef Under Grading System is Urged by Specialist," *The Billings Gazette* (Billings, Montana: Oct. 25, 1927), 10.
[102] A similar paternalistic logic fed into the development of modern supermarkets in the 1930s and 40s. See: Tracey Deutsch, *Building a Housewife's Paradise: Gender, Politics, and American Grocery Stores in the Twentieth Century* (Chapel Hill: The University of North Carolina Press, 2010), Chapter 5.
[103] Beef was the meat of choice in urban America for most of the early 20th century, whereas pork was more popular in rural areas. This explains why better beef educational campaigns focused primarily on urban centers.
[104] Carolyn M. Goldstein, *Creating Consumers: Home-Economists in Twentieth Century America* (Chapel Hill, NC: University of North Carolina Press, 2012)

their grades were the very basis of rational consumption and so they went to great lengths to explain it.

The USDA's Better Beef Exhibit, in cities like New York, displayed live animals alongside graded cuts of beef to the consuming public at annual fairs and shows. Live steers of the choice, good, medium, and common grades, selected after the careful inspection of over 3000 animals, were shipped in from around the country for these exhibits. The highest grade bovine was "short, deep and blocky" whereas the common animal had a "gaunt hungry appearance". Each was made to stand next to beef cuts representing their equivalent grades. The exhibits pointed out the color of the flesh, nature of the marbling, and size of the dressed cuts as important factors in determining grades. Such demonstrations sought to "make the housewives generally acquainted with what good beef is."[105]

A typical exhibit of Graded and Stamped Beef as presented at expositions during the year

Image 2: USDA Graded and Stamped Beef Exhibit, Source: Better Beef Association, "Report on Development: Grading and Stamping Beef," *National Livestock and Meat*

[105] "Better Beef Exhibit" (n.d), pp 6, attached to letter from B. F. McCarthy to C. V. Whalin (Nov. 3, 1926), in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

Board (Chicago: 1928), pp. 13, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00, Box 2, NARA.

It is unclear how successful the efforts by the USDA and BBA to reach housewives and educate them had been. Writing for the American housewife, almost a decade later, Dorothy B. Marsh of the Good Housekeeping Institute claimed, "not a few housekeepers confess to us that one of their greatest trials is the interview with the butcher. Knowing little of meats, and unwilling to display their ignorance, [housewives] are often influenced by price."[106] She went on to extol government grading as the answer to every housewife's meat market troubles. No longer did women shopping for beef have to depend on butchers to determine the quality of their purchase. While, the USDA's campaign of consumer education in the 1920s may not have created widespread change in women's beef purchasing behavior overnight, its utility had certainly been acknowledged by leading women's magazines. Everyday consumers would eventually follow.

The USDA's efforts may not have effectively communicated the utility of the beef grades to the consumer, but the juxtaposition of live animals with their carcasses certainly made an impact on those who attended the Better Beef Exhibits. "Every one immediately stopped in surprise to look at the steers and gaze intently at the meat."[107] The animal's "docility" also emerged as an important concern for the organizers, because the animals themselves often drew the attention of the audience. The bovines on display "had never felt the restraint of a halter. But after they were picked out they were tied up by the neck for a week and became quite docile;

[106] Dorothy B. Marsh, "To Market, To Market, To Buy Some Beef," *Good Housekeeping* Vol. 100, No. 2 (New York, February 1935), 86.
[107] "Better Beef Exhibit" (n.d), pp 7, attached to letter from B. F. McCarthy to C. V. Whalin (Nov. 3, 1926), in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

and, after becoming acquainted with their quarters on Broadway, gave no trouble."[108] The choice grade animal, while clearly the favorite, "was inclined to be a bit offish with those who would approach him—he did not see that his presence there was to be one of a petting party."[109] Even as animal life was being equated so obviously with animal death, the individuality of these creatures made a cruel juxtaposition with the lifeless cuts they stood next to.

Cattlemen and breeders have remarked on the temperament of cows throughout history. "The disposition of Brahman cattle is a subject which has been widely discussed," confirms the Western Livestock Journal.[110] For instance, to attract more attention to their bull-riding events, rodeo managers at the turn of the twentieth century wanted to build up the reputation of Brahmans, a breed of cattle from the South Asian subcontinent, as "vicious, wild animals".[111] Indeed, such rambunctious, tough, and sturdy animals were hand-picked by rodeo outfits, "for their ability to be bad-actors."[112] But as one Brahman breeder explained, unlike their rodeo brethren, the regular Brahman bovine, "takes to and covets affection more than any other animal."[113] Indeed, he insisted, "there are no cattle so easily attended to."[114] Although his words were probably biased by his interest in the future of Brahman breeding, this commentator inadvertently brought out the varied individual and subjective differences in the behavior of animals of the same breed. In this way bovine animals were recognized as individuals by the very industry that was out to obscure the quality of their lives with the quality of their meat.

[108] Ibid., pp 1.
[109] Ibid., pp 2.
[110] Jean Barden, "Beef Breeds Come by the Dozen," *Western Livestock Journal* (October, 1948), 33 & 40.
[111] Ibid.
[112] Ibid.
[113] Ibid.
[114] Ibid.

Beef Grading in Practice

The combined publicity campaign of the USDA and the BBA had worked its magic, reaching not only consumers, but producers, retailers, railroads, hotels, and restaurants. With the urging of the Better Beef Association, Secretary of Agriculture, William Jardine, inaugurated voluntary USDA beef grading in nine U.S. cities on an experimental basis starting the 2nd of May, 1927. The USDA and the BBA had one year to prove the efficacy of their new system. In the first two months, only 8000 prime and choice carcasses were graded in nine cities across the country. The packers, upon receiving requests for graded beef from wholesalers and retailers, would select carcasses which they believed eligible for a grade stamp. An official government grader, invited by the packer to inspect the grade, would then pass the final judgement on the carcasses' grade before the roller stamp was applied. The experiment was limited to prime and choice carcasses only and all the grading usually occurred in the slaughterhouse itself.

The retail and consumer response to grading was mixed. Some retailers complained that the scarcity of government stamped beef had artificially raised its prices, in comparison to essentially similar but ungraded carcasses. Others lamented that graded beef "is usually extra fat and fat beef is waste… it is wasty and uneconomical to buy what is not wanted and will be thrown away."[115] While some retailers maintained that "customers who have once received [graded beef] will not receive beef which is not stamped… we are well pleased with the results."[116] The grading experiment was by no means an unqualified success.

Within a few months of the USDA grading experiment, Swift and Company, followed by other packers, began grading and marking beef using their own brand names, such as Swift

[115] G. L. Pearson, "Meat Grading Experimental Yet," *The Armitage News* (Chicago: July 27, 1927) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[116] J. W. Levy of Weill & Isaacs Abattoir to USDA (New York: June 25th, 1927) in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.

Premium instead of USDA Choice.[117] This was simultaneously an endorsement of the principle of grading, as well as a rejection of the government's attempt at national standardization. Notably, the packers' criteria for prime and choice grades were not always as stringent as the USDA's. The Institute of American Meat Packers, the largest packer trade group, eventually published their own grading standards, consisting of ten separate grades, for the industry to adopt as an alternative to the USDA system.

This did not please the Better Beef Association entirely. In November 1927, they passed a resolution to meet with representatives from the four large packers to draft a bill that would make USDA beef grading mandatory, and include Good and Medium grades as well, in addition to USDA Prime and Choice.[118] The BBA would permit packers to use their own branding as long as it met government grades standards and were inspected by USDA graders. The same resolution also sought to combine the current Prime and Choice grades into a single Prime grade, and move the rest of the grades up by one. The packers, however, were loath to agree to mandatory grading and the BBA efforts stalled.[119].

By the end of 1927, the USDA had graded over 30,000 carcasses, and by mid-1928, that number had doubled—still an insignificant fraction of the total supply. Yet, what had started with the approval of only four of the largest packers, by the end of the experiment, included thirty-three packers operating forty-nine plants in the ten selected cities.[120] And requests for grading flowed in from packers, small and large, in cities not covered by the USDA grading

[117] B. F. McCarthy to W. C. Davis (New York: August 13, 1927) in in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00 Box 1, NARA.
[118] Several cities such as Seattle had made federal grading mandatory for all beef sold in the city.
[119] In 1935 Congressman Marvin Jones of Texas introduced a compulsory USDA beef grading bill H.R. 13022 for the interstate beef trade.
[120] Better Beef Association, "Report on Development: Grading and Stamping Beef," *National Livestock and Meat Board* (Chicago: 1928), pp. 13, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00, Box 2, NARA.

service. It soon became clear that USDA grading provided a way for smaller packers, lacking a recognized brand name, to enter markets dominated by the big four on the basis of the government grade stamp. Beef grading also benefitted retailers by taking the guesswork out of sourcing quality beef, reducing expenses. Over the course of the experiment, there remained a steady demand for the grading to be extended to Good grade steers and heifers. And by the end of 1928, not only was federal grading extended to include a third grade, but it became a permanent feature of the American beef industry.

Grading Live Animals

The USDA wanted to train cattlemen to see the animal as its finished product. Over the course of the 1920s, Whalin, had insisted: "The grade of the meat is the same as the grade of the animal from which it was derived."[121] He presented large gatherings with images of the live animals juxtaposed against pictures of their dressed carcasses. Whalin wanted the producers, especially, to be able to "visualize" the carcass when seeing a live animal.[122] Toward that his team had traced the grade factors from thousands of live animals in pens "through the coolers to the retail market and the table," thus correlating life with death in order to make them both comprehensible to the market.

In 1928, the USDA published the "Official United States Standards for Grades of Slaughter Cattle" (A.M.S. 112) to match the grades of dressed beef. Davis felt "the relation of grades as they refer to live animals and dressed meat seem to be inseparable."[123] This

[121] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 58.
[122] Ibid., 87.
[123] W.C. Davis, "A Basis on Which Live Stock Grading May be Established," USDA Bureau of Markets (February 28, 1919) in USDA Livestock Division Papers, RG 136 A1-29, 170-76-7-00 box 2, NARA.

publication, and others, equated the grades of carcasses with those of live animals, purposefully blurring the distinction between life and death.

> Carcass measurements are closely correlated with those of the live animal and can be easily and accurately expressed in terms of live animal measurements… The real objective, therefore, is to determine and define the lines of demarcation between grades of both carcasses and live animals.[124]

In this way the USDA reified, if not instituted, an emerging episteme. James K. Wallace, marketing specialist at the USDA, expressed it most simply when he said that the cattle producer "is not raising cattle, he is raising beef." Wallace went further even, to take the animal out of the equation altogether, the producer, he exhorted, "is converting grass and grain into dollars."[125] The bovine creature in his rendering became a fiction, or at best, an inconvenience in the valorization of surplus capital. Beef production, thus, at least in the minds of USDA livestock officials, was slowly being expunged of the messy reality and sentience of the living creatures at its heart: cows.[126]

Together the USDA grades of dressed beef and slaughter cattle formed the basis of an emerging "beef-on-the-hoof" paradigm that reduced animal lives to the point of death and consumption. The phrase "beef-on-the-hoof" became popular at the turn of the twentieth century, suggesting that cattlemen were already participating in the linguistic reduction of bovine life to just beef—captured so ironically in the phrase itself. However, by juxtaposing the image of grain-fed and grass-fed animals with their dead carcasses and corresponding values at the abattoir, the USDA took this reductionism to a new level. In this view, the bovine diet became

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[124] "Measuring Beef Carcasses," (n.d.) in USDA Livestock Division Papers, RG 136 E29, 170-76-7-00 box 2 part 2, NARA.

[125] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 48-49.

[126] Cattle were the first livestock group to be graded by the USDA. Poultry, Lamb, and Hogs were to follow.

synonymous with beef dollars, and bovine life became obscured by carcass form, finish, and quality. In the words of geographer Kathryn Gillespie, writing about the language of producers in the animal industry: "conceptualizing the animal in this way [as meat or beef] obscures other yet more essential features of their lives. The identity of the animal is subordinated to market forces."[127] USDA officials thus promulgated a new lens through which to view bovine animals, adding to a language of reduction and objectification (that had already emerged in the meatpacking industry) a visualization of animal death in the face of animal life.

By the end of the decade the "beef-on-the-hoof" paradigm had taken hold: "The cattle-buyer who rides the yards daily must not look on the animals which he seeks to purchase as the finished product of the farm or ranch. In looking over a load of cattle, he must visualize them as they will be—so much beef, so much hide, and so much other by-products," a Swift and Company cattle-buyer wrote.[128] This visualization of carcass form, finish, and quality in the face of the live creature was exactly the perspective that Whalin and Davis had tried to further in their efforts to influence the producers of the nation.

Conclusion

As the USDA and BBA had hoped, the production of Prime and Choice beef gradually surpassed all other grades. The stamping of packer-graded beef increased at par with USDA grading. And with the increasing demand for higher quality beef overall, the BBA noticed, "there has been a greater demand on the livestock market for cattle which will produce carcasses eligible to one of the grade stamps… this condition undoubtedly has affected the market value

[127] Kathryn Gillespie, *The Cow With Ear Tag #1389* (Chicago: The University of Chicago Press, 2018), 10.
[128] James H. Boyle, "What your Beef Animals Mean to the Cattle-Buyer," *The Producer* Vol. XII, No. 6 (Nov. 1930), pp. 10.

[of prime and choice cattle]."[129] Before the institution of USDA beef grading, Whalin had estimated that only 0.5% of all beef produced in the U.S. could be described as prime beef, and a mere 5% as choice.[130] By WWII, almost 50% of federally graded beef made the top two grades.[131] This was possible because cattlemen embraced the grain-over-grass logic of the USDA and the Better Beef Association. The BBA and USDA's goals were thus fulfilled, packer-graded-beef notwithstanding. By the end of the 1920s, the grading experiment became a constant fixture of the American beef industry, and the BBA was dissolved, its mission accomplished. Official graders stationed in wholesale centers could be called upon by packers to grade and stamp bovine carcasses at the rate of one to two dollars an hour, depending on the number of carcasses to be graded.[132] Although, small changes occurred periodically, the principle features of the beef grading system described above have remained the same.

In the 1930s, not more than 8% of American beef was federally graded. But with the U.S. entry into World War II and the creation of the Office of Price Administration (OPA) in 1941, government grading was made mandatory for most agricultural products.[133] The OPA used USDA-labeling standards to arm housewives with information about the government regulated

[129] Better Beef Association, "Report on Development: Grading and Stamping Beef," *National Livestock and Meat Board* (Chicago: 1928), pp. 14, in Better Beef Association Folder, Livestock Division, RG 136, A1 29, 170-76-7/8-00, Box 2, NARA.
[130] Bureau of Agricultural Economics, "Market Classes and Grades of Dressed Beef and Cattle: Transcript of Stenographic Minutes, Hearing Held in New York City, December 16, 1925" *United States Department of Agriculture* (Washington D.C.: December 16, 1925), 36.
[131] By the 1980s, 95% of American beef would be graded either Prime or Choice. While this was aided by the lowering of beef quality standards by one grade, from 1950 onwards, that does not explain the trend entirely. Even after 1950, the percentage of federally graded Choice beef production rose from 50% to more than 90%.
[132] In the best of conditions, a grader could grade over 50 carcasses an hour.
[133] In 1939, a single standard was applied to steer, heifer, and cow beef. "Choice Steer" was now simply "Choice"– the same across all classes of bovine animals. That same year, the grading service was transferred from the Bureau of Agricultural Economics to the Agricultural Marketing Service within the USDA. And a few years later, federal grading of agricultural products became authorized through the Agricultural Marketing Act of 1946.

price and the corresponding quality of various commodities.[134] USDA beef grading was made mandatory again during the Korean War. Not only did this familiarize the American citizenry with USDA beef grades, but the percentage of federally graded beef rose significantly after every mandatory period, reaching approximately 25% after WWII and 50% after the Korean War.[135] There was a corresponding decrease in the volume of packer graded beef, whose numbers didn't quite recover after the periods of compulsory USDA grading came to an end.[136]

The irony of the overwhelming adoption of grain feeding practices, and rise of feedlot production inspired by federal beef grading, is that eventually, retailers and packers would complain about over-fat cattle. Over-feeding was leading to carcasses with very thick layers of fat over muscle—layers which had to be cut away and disposed. This led to the introduction of a dual grading system, with the old grades alongside new "cutability" or yield grades indicating the level of saleable beef that a given carcass would yield. Consequently, bovines were being shipped to feedlots and slaughterhouses at younger and younger ages in order to receive higher cutability grades. John K. Matsushima and the National Western Stock Show played a role here, creating the Fed Beef Contest where prizes were awarded to cattlemen whose animals produced the best carcasses—a significant departure from the history of livestock judging. This further ingrained the beef-on-the-hoof paradigm, as shown in a later chapter.

The USDA's emphasis on grain finish in determining the grade of an animal lay on the assumption that grain fed animals displayed greater presence of intermuscular fat, called

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[134] Meg Jacobs, ""How About Some Meat?": The Office of Price Administration, Consumption Politics, and State Building from the Bottom Up, 1941-1946," *The Journal of American History*, Vol. 84, No. 3 (Dec., 1997), pp 910-941.
[135] John C. Pierce, "Beef Grades and Standards: Past and Present," *Agricultural Marketing Service USDA* (Oct. 19, 1959) in National Cattlemen's Association Records, 1713, Box 205, Beef Grading Records 1950-1961 Folder, American Heritage Center, University of Wyoming.
[136] Despite continuing on a voluntary basis again after the Korean War, the volume of federally graded beef continued to rise. Almost 95% of U.S. beef production was federally graded in 2016.

marbling, and that marbling necessitated tender and juicy meat. In other words, the reigning wisdom of the era had been that the tastiest beef came from bovines that had eaten the most corn. But study after study, at agriculture departments around the country, would find little correlation between marbling and palatability.[137] Several studies found "preference for higher grades but in general there was no difference in eating characteristics of "good" and "choice" [beef]."[138] This was a vindication of what grass-fed operators had from the start maintained: grading had never really been about meeting the needs of the consumer. Grading was a project, from the start, that served the interests of the USDA as well as breeders and feeders of grain fed cattle.

The USDA's efforts to rationalize the market for American bovines transformed the life, diet, and death of steers and heifers around the country, and later around the world, as American cattle feeding techniques and the grain-over-grass logic were adopted in Asia, Africa, Australia and elsewhere. The transition to a primarily grain-based diet also allowed the easy introduction of additives such as hormones, antibiotics, and protein supplements to the bovine diet. Finally, by freeing the cattle population from the space constraints of a grass-based diet, USDA beef grading unwittingly laid the groundwork for rising methane emissions and anthropogenic climate change. But all of this depended on a large supply of cheap grains. How that was achieved is the subject of the next chapter.

[137] Find a summary of relevant studies in E. J. Briskey, "An Evaluation of Beef Quality," (1964) in National Cattlemen's Association Records, 1713, Box 205, Beef Grading Report 1960s Folder, American Heritage Center, University of Wyoming.
[138] Ibid., 15.

The Politics of Feed & The Growth of Cattle Feeding

With the bottoming out of feed grain prices during the Great Depression, the cattle feeding industry was on the cusp of dramatic growth, especially outside of the Midwest. The largest government intervention in the history of American agriculture, President Roosevelt's Agricultural Adjustment Act, was around the corner. The New Deal introduced support prices coupled with production controls for select commodities, including corn and eventually other feed grains. And, as we saw in the last chapter, the emergence of federal beef grading, still relatively new, with its attendant grain-over-grass logic, was creating further incentives for the production of prime, i.e. grain-fed, beef. Thus, the political economy of cattle feeding shifted drastically in the 1930s—with important consequences for cattlemen.

Cattlemen, who had organized into national and regional trade associations at the turn of the twentieth century, fought against the inclusion of beef in the New Deal, and in that they succeeded. Further, they secured aid in the form of government beef purchases and other forms of drought relief without submitting to the regulations demanded of other major commodities. This set a precedent for future recessions. Cattlemen felt they were entitled to receive government aid without submitting to production controls and price supports. Yet, cattlemen were hardly free from the influence of New Deal supply management. By putting a floor on the price of corn, despite the protestations of cattlemen, government policies continued to have a large impact on the cattle feeding industry.

The structure of the New Deal's price support and production control policies inadvertently incentivized the over-production of feed grains. This worked in the interest of cattle feeders such as Warren Monfort, especially when support prices remained low. Monfort was amongst those Western cattlemen who, decided take advantage of this political and

economic climate to challenge the corn-belt's hold on the cattle feeding industry. The growth of Monfort, as described in this chapter, provides a window into the expansion of commercial cattle feeding writ large.

The American National Livestock Association (later ANCA) highlighted the crucial significance of the political economy of feed for their industry by exhorting: "The Federal Government should give every encouragement to increase feed production… since feed represents the raw material from which meat is made."[139] As such commodity groups gained more influence in the halls of Congress, and the corn belt (which included many midwestern cattle feeders) came to dominate the American Farm Bureau Federation, cattlemen successfully lobbied for increased government beef-buying programs and lower price supports for corn and other feed grains.

The Eisenhower administration had internalized the grain over grass logic of the USDA and cattle feeding industry. Agricultural Secretary, Ezra Taft Benson, like the American National's leadership, believed that the troubles in the beef economy would only be resolved with less supply management in agricultural economy not more. In 1954, Congress passed a farm bill with flexible price supports, a measured departure from the high 90% parity prices that had prevailed for almost two decades. The Agricultural Act of 1954, lowered price support levels for the first time since the New Deal had introduced supply management of basic commodities as part of the Agricultural Adjustment Act of 1933. And as corn prices fell, cattle feeding boomed.

Monfort and feeders like him, went from small operations feeding less than a thousand animals at a time, to enormous feedlots with a capacity of over 10,000 bovine creatures, dwarfing the corn belt feedlots of the previous era. Business and technological innovations were

[139] "Livestock and Meat Production for Defense," ANCA (1950) in 1713, box 359, NCA.

only one part of the reason for feeders' success. Monfort's efforts could not have yielded such spectacular results were it not for the political economy of feed grains ushered in by the New Deal. Feed grains such as corn were the primary input and biggest variable cost in most animal feeding operations. High feed costs would make cattle feeding especially unprofitable due to the large inefficiencies involved in turning grain into beef when compared with other meats. So, to the extent that government policies kept the price of corn down, cattle feeders prospered.

This chapter argues that the unprecedented government intervention in agriculture during the 1930s, through World War II and into the 1950s, served cattlemen, both in its policy successes and its failures. Cattlemen were benefitted by the particular form of supply management that emerged, as well as in the design of its retreat over the course of the 20th century. By stabilizing feed prices and spurring production through WWII, and then by lowering parity prices and maximizing production from then on, supply management policies were crucial to the rise of industrial animal agriculture in the United States.

This chapter tracks the changing contours of agricultural policy from 1933 to 1958, with special attention to the politics of cattlemen, and its impact on one of the pioneers of cattle-feeding in the West, Monfort of Colorado. Using the American National Cattlemen's Association papers from the American Heritage Center in Laramie, Wyoming, the Monfort collection at the University of Northern Colorado, and the Five Rivers collection at the Greeley Museum as archival sources, this chapter asks: Why did the cattle feeding industry expand when it did and what role did the New Deal play in its growth? How did cattlemen's associations influence the shape of agricultural policy through the 1950s? And finally, how did large feeders like Monfort and others take advantage of the political economy of feed?

The Beginning of the World's Largest Feedlot

Warren Monfort moved to Greeley, CO, with his parents when he was a teenager. He received an undergraduate degree in history from the State Teachers College of Colorado (now the University of Northern Colorado) in 1914 and began a teaching career in social studies and history. But after the demise of his older brother, who became a martyr in World War I, Monfort moved back to his father's family farm north of Greeley, where he began managing the daily operations at the farm. During the war years, farmers around the nation, including Monfort's father, had borrowed heavily to meet the high global demand for agricultural products. With the end of World War I, however, came a sharp drop in prices just as debts became due, forcing farmers into foreclosure.

It was in this climate that Monfort began feeding cattle on a small scale. He was encouraged in his new venture by Colorado Agricultural College (now CSU) which had been encouraging ranchers in Northern Colorado to diversify into cattle feeding by taking advantage of the beet byproducts coming out of the local sugar beet industry. Their experiments had shown that cattle thrived on beet tops and beet pulp.[140] Unable to get a loan for what banks still saw as an uncertain enterprise, Monfort could only use the money from his "army insurance" to purchase a handful of cattle at a reasonable price every fall and fatten them on beet byproducts for a small profit.[141] Because of his father's refusal to mix his farm's assets and earnings with his son's feeding experiment, Monfort was feeding only a handful of bovines a year during the 1920s.

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[140] Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (New York: Houghton Mifflin Harcourt, 2013), 126.

[141] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, p. 56; Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), p. 30-31.

Corn prices had been falling throughout the decade. So Monfort realized that, utilizing cheap corn, he could compete with corn belt farmers, for many of whom cattle-feeding was a side business to corn production. The USDA had begun grading beef in the late 1920s and the demand for "prime" and "choice" beef—from intensively grain-fed animals—was on the rise. Only by consistently producing high grade beef could Monfort hope to convince packers to buy his cattle over corn-belt animals. Seeing an opportunity, Warren Monfort began experimenting with the grain feeding of cattle. For instance, from his observation that hogs would often follow cattle and pick out corn kernels from their manure, Monfort surmised that cattle were not digesting all the corn they ate. So he installed grinders to crush the kernels before feeding them to the cows. This, he believed, helped the animals retain their food better and gain more with less feed. Monfort's willingness to experiment remained a central feature of his feeding enterprise.

After his father's death in 1930, Monfort, saddled with a substantial mortgage on the property, nevertheless began expanding his feeding business on his parents' relatively small 80-acre farm.[142] With the legislation of the Farm Credit Act of 1933, banks could more easily provide farmers with low interest loans and liberal terms of payment for all different types of agricultural production. Monfort was thus able to obtain a $200,000 loan from the First Bank of Denver in the early 1930s.[143] Despite historically low cattle prices that did not recover until 1935, Monfort had paid off the mortgage on his father's farm and was feeding over 3000 animals a year by the end of the 1930s. His success, as highlighted in the remainder of the chapter, was a result of his feeding strategy coupled with favorable government policies.

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[142] Average farm size in 1930 was 157 acres. Farms in the West were typically even larger than in the rest of the country. See: R. Douglass Hurt, *Problems of Plenty: The American Farmer in the Twentieth Century* (Chicago: Ivan R. Dee, 2002), 46.

[143] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, p. 56; Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), p. 30-31.

A New Deal in Agriculture

In response to the Agricultural Depression of the 1920s and the Great Depression of the early 1930s, President Franklin D. Roosevelt sought to raise farm incomes through a system of price supports and acreage reduction on basic agricultural commodities. Net farm income in the U.S. had fallen from $7.1 billion in 1920 to $1.9 billion in 1932.[144] Roosevelt and his "brain trust" believed that if farmers' purchasing power could be increased, it would stimulate the demand for industrial goods, create jobs, and thus reinvigorate the entire American economy. But farm incomes, they felt, could only be increased by addressing the crisis of over-production in agriculture, also known as "the paradox of want amid plenty".

In order to make a profit in highly competitive commodity crops markets, farmers strove to grow and sell as much as possible. They increased their acreage, invested in heavy machinery such as tractors and combines, purchased hybrid seeds, fertilizers, and pesticides, all to expand production to the limit of their capacity. But with the end of World War I, even as American crop supply increased, foreign markets closed their borders to cheap imports in order to protect their own farmers.[145] Domestic demand, being inelastic for most agricultural commodities, failed to rise with the increase in supply, and thus prices began their downward spiral. As crop prices fell, farmers further intensified production in order to market even more of their product, further depressing prices. Many cooperative efforts of the 1920s aimed to voluntarily reduce production to increase prices, but failed without legally enforceable penalties, because individual farmers were incentivized to produce and sell more when prices increased (free-rider problem). When

[144] Jimmy Skaggs, Prime Cut: Livestock Raising and Meatpacking in the United States, 1607-1983 (College Station, TX: Texas A&M University Press, 1986), 131.
[145] Even further so in response to Smoot Hawley Tariff of 1930.

enough farmers were tempted to break cooperative agreements and market their produce, supply exceeded demand and prices began to fall again.[146] The agricultural depression that followed WWI was exactly what FDR's Agricultural Adjustment Act of 1933 sought to address.

The act authorized the Secretary of Agriculture to set prices for the basic commodities: corn, cotton, hogs, milk (and milk products), rice, tobacco, and wheat. Prices were set according to the concept of parity, which aimed to give a unit of a commodity the same purchasing power that it had relative to industrial goods during the base period of 1909-1914: a veritable "golden age" of high prices for agricultural goods. The Agricultural Adjustment Administration (AAA) and the Commodity Credit Corporation (CCC) were both created to administer these price supports. The CCC provided non-recourse loans to farmers at 60 to 70 percent of parity prices to store the commodities in government storage bins. If the market price rose above the loan rate, then farmers could sell their crop and return the loan amount to the CCC. If market prices remained below parity, then farmers kept the loan amount and forfeited their produce to the CCC. By taking commodities out of the market, the CCC worked to stabilize, if not raise prices by controlling supply, while ensuring farmers received an adequate income.

The AAA administered a production control program which aimed to take acres out of production from the land being cultivated under the basic commodities.[147] Acreage allotments were based on a grower's historical production. Thus, by design, the AAA favored large farms. The greater a farm's historical production, more the acres that farm could continue to cultivate. Crucially, farmers who did not adhere to production controls would not receive price supports. Marketing agreements and quotas were also used to limit the amount farmers could sell to

[146] Victoria Saker Woeste, The Farmer's Benevolent Trust: Law and Agricultural Cooperation in Industrial America 1865-1945 (Chapel Hill: The University of North Carolina Press, 1998).
[147] Hogs and milk products were controlled not by acreage restrictions but by number and volume restrictions, respectively.

processors. The AAA also created a program to pay farmers to leave land idle. AAA payments did not need to be shared with tenants—a nod to the power of Southern planters who were loath to share their income with black tenants. When legislation in 1938 required landowners to share AAA payments with tenants and sharecroppers, planters responded by hiring their tenants as wage workers. Thus, price supports and production controls were designed to work together to address the over-production crisis in American agriculture, but it favored large operations and land-owners over small farms and tenants.

Cattlemen and the New Deal

The New Deal in agriculture had the full support of the American Farm Bureau Federation, which at the time, was dominated by a coalition of Southern cotton planters and Midwestern corn growers. But the 1933 law had its opponents too. In order to reduce surplus, the New Deal administration sanctioned the disposal of millions of acres of crops and the destruction of just as many pigs and cows. Such drastic actions in the face of mass unemployment and starvation, raised the ire of many Americans who were disturbed by what they perceived as wanton waste. Small farmers, watching their larger neighbors only set-aside less productive land and still receive large checks for abiding by acreage allotments, felt discriminated against. Further, crop processors rebelled against the processing tax that paid for the AAA program. They filed law suits against the AAA and won, forcing the Roosevelt administration to remove the processing tax.[148]

Corn belt feeders were particularly opposed to AAA marketing quotas, which threatened heavy fines on any corn sold or fed above a farmer's marketing quota. The cattle and hog

[148] In *United States v. Butler,* the Supreme Court declared the AAA unconstitutional by early 1936.

producers of the corn belt no doubt understood that restrictions on corn production were antithetical to the profitability of their animal feeding operations. Hog and cattle feeding counties of Illinois staged protest rallies thousands strong, and organized the Corn Belt Liberty League which spread quickly throughout the Midwest and grew to over ten thousand members.[149] Yet the Corn Belt Liberty League framed its revolt as a principled stand against government intervention in agriculture. They invited speakers, organized townhalls, and published pamphlets and newsletters disparaging the New Deal's imposition on their liberty. Members did not wish the President, Congress, or the USDA to tell them how to farm their land, let alone impose restrictions and fines on overproduction.

Federal authorities had wanted to place beef on the list of basic commodities regulated by the AAA, but cattlemen and their Congressional representatives had blocked all attempts from the start. Cattle producers believed that the problems of the industry rose from marketing and distribution, in other words, packers and railroads, and so were loath to accept production controls on the ranch or feedlot. Further, the cattle industry had performed relatively better than other sectors of American agriculture during the Great Depression, and did not feel the same urgency to adopt New Deal supply management in mid-1933. The American National Cattlemen's Association (ANCA), one historian comments, "reacted with the spirit of rugged individualism of those who had founded their industry" and vigorously opposed the inclusion of cattle as a basic commodity under the Agricultural Adjustment Act.[150]

The ANCA, known as the American National Live Stock Association before 1952, was formed at the turn of the twentieth century, when several state-level livestock associations, had

[149] Lynnita Aldridge Sommer, "Illinois Farmers in Revolt: The Corn Belt Liberty League," *Illinois Historical Journal* Vol. 88, No. 4 (Winter 1995), 222-240.
[150] Charles Burmeister, "Six Decades of Rugged Individualism: The American National Cattlemen's Association," *Agricultural History* Vol. 30, No. 4 (Oct. 1956), 149.

come together to organize a national organization that could "discuss and devise measures for the protection of the livestock industry," and crucially, to "influence the government at Washington to grant relief where needed."[151] The membership not only included cattlemen from Western States, probably the largest segment of the industry represented in the ANCA, but also state and federal officials, feeders, breeders, livestock commission agents, as well as meatpacker, stockyard, and railroad representatives. In its first three decades, the ANCA sought favorable government intervention in matters of grazing rights on public lands, railroad rate regulation, import and export policies, as well as the eradication and control of animal diseases. Despite pleas for government relief being central to the creation of the organization, these cattlemen saw New Deal production controls and price supports as an imposition on their freedom and fundamentally antithetical to their values.

Continued drought and depressed prices, however, soon dampened their "spirit of rugged individualism" and brought cattlemen "from Texas to North Dakota on bended knees begging the federal authorities to come to their aid."[152] Cattlemen's pleas fell on deaf ears. The USDA maintained that in order to receive aid the industry had to accept full AAA regulation and production controls. When cattlemen proposed marketing agreements with the packing industry as an alternative to AAA authority, Agricultural Secretary Henry Wallace refused. Wallace believed surplus beef was at the heart of the cattlemen's woes, as opposed to any processing or distribution problems that the packing industry would be able to address.

Cattlemen did, in the meantime, receive other forms of government aid. The Federal Surplus Relief Corporation (FSRC), empowered to purchase surpluses of any farm product, even

[151] Ibid., 144.
[152] C. Roger Lambert, "Texas Cattlemen and the AAA, 1933-1935," *Arizona and the West* Vol. 14, No. 2 (Summer 1972), 138.

those not on the list of basic commodities, began purchasing beef soon after its creation in September 1933. In Texas, the FSRC began an experimental beef purchase and canning program, employing thousands who were on relief rolls and slaughtering over twenty thousand cattle by the end of the year. The program was lauded by cattlemen, but ended due to a lack of funds. The levels of government beef purchasing did not even come close to what cattlemen were demanding. It was time for the industry to reconsider bending to the will of the AAA.

At the January 1934 meeting of the ANCA, the 1500 or so assembled cattlemen could not agree on a course of action: whether to bow to the demands of the AAA or continue to refuse support prices? Fearing a splintering of the organization, ANCA officers did not let the convention vote on whether or not to make beef a basic commodity. However, the organization decided to let a smaller group of ANCA representatives, called the Committee of Five, negotiate the issue in Washington. The Committee finally relented to pressure from Secretary Wallace and agreed to the inclusion of beef under the basic commodities list under the condition that two-hundred million dollars would be appropriated for beef relief programs and that they would not be required to bear a processing tax. In April of 1934 two Texas Representatives pushed the Jones-Connally Act through Congress, which amended the Agricultural Adjustment Act of 1933 to include beef as a basic commodity, providing two-hundred million dollars as relief for ranchers who adhered to production controls, but retaining the processing tax. Fifty million dollars were also appropriated for government beef purchases and the elimination of diseased cattle.

In May of 1934, when cattlemen and government planners were about to complete a bitterly debated production control program for beef, “the most disastrous drought in American

history struck the cattle country."[153] The plan to put beef on support prices and production control was put on hold and emergency relief was underway. At the center of the emergency project was a massive purchase program designed to reduce cattle numbers to fit the available feed supply. Over the course of a few months, the government purchased over eight million cattle across the nation. Aid also included feed assistance, increased canning, lower shipping rates, and the transportation of animals to pasture in other states. Cattlemen received two checks from the government: one for the value of the animal purchased and the other a AAA payment for the pledge to join a future control program.

While not all cattlemen participated, many used the government purchase program to rid their herds of animals that were either diseased or of poor stock—many of whom would not have survived the coming winter in any case. When the government announced the end of the program in September, there was an uproar from the same cattlemen who only months earlier had voiced opposition to any government intervention at all in the cattle industry. "On at least two occasions the AAA set tentative cut-offs dates, only to back down and extend purchasing."[154] Pressure from cattlemen's associations, the agricultural press, and cattle country politicians ensured that government purchasing continued through January 1935.

Winter brought rains to the drought-stricken plains and prospects for the cattle industry looked hopeful once again. When the AAA proposed a feed-grain reduction plan to control meat production, cattlemen voiced fierce opposition. Their pledges to accept future control programs of the AAA were forgotten. The AAA on the other hand, knew that without compliance from a majority of cattlemen their program would be useless. And as prices remained relatively high until the outbreak of World War II, the urgency of production control had dissipated.

[153] Ibid., 144.
[154] Ibid., 151.

Although the 1934 Jones Connally amendment to the Agricultural Adjustment Act of 1933 had added cattle to the list of basic commodities, the 1933 act was declared unconstitutional by the Supreme Court of the United States in 1936. A new Agricultural Adjustment Act in 1938, dispensed with the unconstitutional processing tax imposed on agricultural processors, and instead funded the supply management system of the AAA with general treasury funds. Because of cattlemen's vocal opposition, the new legislation did not include cattle as a basic commodity, but corn remained regulated for decades to come. Through the control of feed grains the government retained influence over the course of the cattle feeding industry. Subsequent legislation in 1941, 1942, 1948, and 1949 retained high price support levels at 90 percent of parity. The Secretary of Agriculture was given the power to make marketing quotas mandatory and the list of basic commodities grew to include over 150 agricultural products—cattle were not one of them.

Cattlemen's experience during the early years of the New Deal thus taught them that they could receive a government bailout when in dire straits, without having to submit to regulation in times of high prices and steady gains. Major cattlemen's associations such as the ANCA thus maintained an unbending stance against price supports and production controls on the cattle industry during subsequent agricultural recessions. Further, they focused their energy on the deregulation of another commodity, crucial to the feeding enterprise, but highly regulated under the New Deal: corn.

The Price of Feed

Under the early New Deal supply management regime, production controls were primarily based on acreage of production rather than on the actual volume of production. In other

words, farmers were restricted by the number of acres they cultivated per crop but not by how much they could produce per acre. For example, corn belt farmers, in keeping with acreage restrictions, nonetheless aimed for maximum yield, employing hybrid seeds and increasing the use of synthetic fertilizers and pesticides. With price supports, which guaranteed minimum prices, farmers were further encouraged to produce as much as possible on each acre in production, since overproduction would not cause commodity prices to fall below the government guaranteed price floor. The price supports received by farmers remained constant despite the volume they produced, i.e., if the price support of corn was set at $0.80 a bushel, farmers would receive that support price on all the corn they could grow within their allotment acreage. Bill Winders, historian of US agricultural policy in the 20th century, explains: "This inconsistent basis of supply management—production controls on acres, price supports on volume—produced a logic for individual farmers that undermined the primary function of the policy: managing the supply of commodities. This policy encouraged farmers to intensify their production on a smaller number of acres in order to receive the optimal benefit from price supports."[155] So while New Deal agricultural policies had successfully raised farm income by supporting higher commodity prices, they had exacerbated over-production.

In the first decade of the New Deal the price of corn averaged a mere 67 cents on the bushel, whereas it had been $1.44 in 1919. Between 1920 and 1942 average corn prices rose above $1 per bushel only twice (1924 & 1936) and did not reach WWI levels until 1945. In other words, despite New Deal price supports, corn prices remained low, benefitting cattle feeders such as Monfort, and bolstering the expansion of the cattle feeding industry. And because New Deal policies failed to curtail production, prices could not rise through market mechanisms. On

[155] Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009), 138.

the other hand, the Federal Surplus Relief Corporation as well as the Federal Emergency Relief Administration purchased millions of pounds of beef for state welfare agencies at relatively high prices, bolstering the market for fed cattle.[156]

The low price of corn, and large feed grain surpluses, encouraged Monfort to do something no feeder had really done before: Monfort decided to feed cattle for all twelve months of the year. While most cattle feeders marketed their animals once a year during the winter and early spring, creating a market glut and thereby lowering prices, by stockpiling corn Monfort was able to feed and sell his cattle throughout the year and obtain better returns. He was able to get a complete turnover of his feedlot animals two and half times every year. Meaning, not only did he have a high turnover in volume, but also the opportunity to sell during periods of high demand and low supply—which meant better prices. Even though he couldn't completely avoid making sales during periods when prices were down, that would often be balanced by sales made a few months later when prices would likely have recovered from a lull in supply. Monfort was, therefore, no longer holding onto animals until prices rose, but focusing on feed efficiency, throughput, and turnover.

In search of greater feeding efficiency, Monfort read everything about feeding that he could get his hands on.[157] In this way, he came across the European practice of feeding geese in confinement. As a result of confinement feeding, Monfort had read, the animals fattened up "nicely" and the meat was succulent. So, he thought "why not try it with cattle?"[158] Monfort later reflected on the idea, "It just seemed logical to me that if a steer were kept in a small area (like

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[156] Jimmy M. Skaggs, *Prime Cut: Livestock Raising and Meatpacking in the United States 1607-1983* (College Station: Texas A&M University Press, 1986), 141-142.
[157] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, p. 56; Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), 60.
[158] Ibid., 98.

the pens we have) and didn't graze around on pasture, he'd fatten more quickly and the meat would be better."[159] Indeed, his guess paid off. Monfort focused his operations to curtail the subjective desire of bovine animals to roam as their ancestors had. This wasn't new exactly, cattle movement had been constrained by fences at stockyards throughout the 19th century, but few Americans had thought to raise large numbers of animals in confinement for months on end.[160] In this way, having put on more weight than animals allowed to walk around freely, Monfort's cattle regularly topped the Chicago market where they sold for premium prices. His carloads to the Union Stockyards outsold all others 23 times in 1941, 26 times the next year, and 25 times the year after.[161]

World War II

During and after the Second World War "cattlemen achieved unparalleled prosperity," writes Jimmy Skagg, historian of the American meat and livestock industry.[162] Demand for beef from both military and civilian sources skyrocketed. Despite the introduction of the nation's first "Meatless Mondays," Americans ate significantly more meat and more beef per capita during the years of WWII than they had in the 1930s (see Image 1). The nation's population also grew by almost 20 million during the 1940s. From 1941-1944 shipments of meat to the allied powers under the lend-lease program totaled over five billion pounds. Military purchases of meat from the domestic market during the same period amounted to over 10 billion pounds. One-third of federally inspected beef production was purchased by the military in 1944 and 1945.

[159] Ibid.
[160] Animal confinement was more common in Europe because of land constraints.
[161] James McPherson, National Broadcasting Company KOA Denver, letter to Warren Monfort (February 21, 1944) in Box 2, SC 94, University of Northern Colorado, Monfort Collection.
[162] Ibid., 145.

Record corn crops in excess of three billion bushels annually kept feed prices low giving a further boost to the feeding industry. Meanwhile, in order to encourage livestock production, Congress gave the CCC authority to sell grain to farmers as feed, at below parity rates, from its stockpile of 23 million tons. Further, ceiling prices for feed grains were set at levels to ensure favorable livestock-feed ratios.[163] The USDA and experiment stations around the country began to accept "corn as a standard fattening ration," not grass nor hay, and most feeding experiments "used corn as the basal or control portion of the ration."[164] This is exactly the kind of government intervention cattlemen such as Monfort desired (see Image 2).

Table 2.-- Per capita civilian consumption of meats, dressed basis, average 1935-39, annual 1941-47

Year	Per capita consumption								
	Total meat	Beef		Veal		Lamb and mutton		Pork excluding lard	
		Quantity	Percentage of total meat	Quantity	Percentage of total meat	Quantity	Percentage of total meat	Quantity	Percentage of total meat
	Pounds	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
Average 1935-39	126.2	55.2	44	8.1	6	6.8	5	56.1	44
1941	142.8	60.5	42	7.6	5	6.8	5	67.9	48
1942	139.5	60.8	44	8.2	6	7.2	5	63.3	45
1943	146.0	52.9	36	8.2	6	6.4	4	78.5	54
1944	153.5	55.3	36	12.4	8	6.6	4	79.2	52
1945	144.4	59.0	41	11.8	8	7.3	5	66.3	46
1946	153.4	61.3	40	9.9	6	6.6	4	75.6	50
1947	155.0	69.1	45	10.7	7	5.4	3	69.8	45

Image 1: Civilian Meat Consumption during WWII; Source: Grover J. Sims, "Meat Animals in World War Two," *Bureau of Agricultural Economics* Agricultural Monograph No. 9, USDA (February 1951), 10.

[163] Grover J. Sims, "Meat Animals in World War Two," *Bureau of Agricultural Economics* Agricultural Monograph No. 9, USDA (February 1951), 13.

[164] State Agricultural Experiment Stations, USDA, and the Livestock and Meat Industry, "Report of Review Committee," *Conference on Cooperative Meat Investigations*, Vol III (1942). Box 1, RG 08-09-11, University of Nebraska-Lincoln Archives.

Table 1.-- Purchases of meat from domestic supplies by the military and other war agencies, dressed-meat basis, 1941-47

Year	Purchases					Purchases as percentages of federally inspected production				
	Beef	Veal	Lamb and mutton	Pork excluding lard	Total	Beef	Veal	Lamb and mutton	Pork excluding lard	Total
	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Percent	Percent	Percent	Percent	Percent
1941	236	26	13	173	448	4.1	4.3	1.7	2.7	3.3
1942	950	65	49	949	2,013	15.0	9.7	5.6	12.5	13.0
1943	1,770	84	132	1,371	3,357	29.6	14.1	13.8	14.7	19.9
1944	2,211	111	118	1,846	4,286	33.2	12.0	13.3	19.5	23.9
1945	2,381	112	94	1,460	4,047	32.9	13.6	10.3	22.9	26.3
1946	544	49	30	295	918	9.6	7.6	3.5	4.4	6.7
1947	386	34	22	230	672	5.1	3.8	3.1	3.2	4.1

Image 2: Military Meat Purchase during WWII; Source: Grover J. Sims, "Meat Animals in World War Two," *Bureau of Agricultural Economics* Agricultural Monograph No. 9, USDA (February 1951), 9.

But WWII also brought the specter of looming price controls. In the aftermath of Pearl Harbor and America's entry into WWII, the ANCA had met in Salt Lake City, Utah, in January of 1942 to discuss their options. One member of the executive committee stated, "We won't have enough cattle to supply the nation. I think they [the government] realize that… [but] I would rather ask the Senators to leave cattle out of the price fixing."[165] They were speaking specifically of their consistent congressional supporters Republican Senator Rufus Holman of Oregon and Democratic Senators Pat McCarran of Nevada and Joseph O'Mahoney of Wyoming among others. The cattlemen went on to reinforce their objection to price controls on cattle, but decided that in case controls were inevitable, that the parity price of December 15th or January 1st be employed to calculate a ceiling. These cattlemen were aware of the limits of their power,

[165] Mr. Collins in "Meetings of the Executive Committee of the American National Livestock Association held at Hotel Utah, Salt Lake City, Utah January 7 to 9, 1942," ANCA (1942) pp 26-27, in 1713, Box 119, NCA.

especially against the fierce opposition that high beef prices inspired in urban housewives who had often launched boycotts and protests against beef that broke the budget.

As ANCA cattlemen had expected, inadequate supply and high demand sent bovine prices up from $7.13 per cwt in 1939 to over $12 per cwt in mid-1945. Rising prices led FDR to issue a "Hold the Line" order on April 8, 1943, to freeze food prices across the board. The Office of Price Administration was authorized to introduce standardized community ceiling prices on more than 90% of food products, including corn and beef. Packers and feeders decried price controls and threatened looming shortages, despite record earnings.

Even though rationing had ended in late 1945, to cattlemen's unanimous dismay price controls on meat continued until 1946. This was because even though there were many lower grade animals on the market, the military was still purchasing the bulk of the higher grades, sending consumer prices soaring for high quality beef. The consuming public which had grown used to cheap high-grade meat, would not easily settle for the commercial, utility, and canner graded products. Consumer desire for affordable prime and choice beef was at the heart of the extended price ceilings. Those controls only ended when packers purposefully withheld meat from the market, driving public opinion against the OPA, and forcing the Truman administration to end price controls and the OPA for good. But Truman's actions, two weeks before mid-term elections, were too little too late. The resulting "beefsteak elections of 1946" returned control of Congress to Republicans for the first time since 1930. Livestock prices rose 47% and retail meat prices went up 61% before the end of the year. [166]

[166] Meg Jacobs, ""How about some Meat?": The Office of Price Administration, Consumption Politics, and State Building from the Bottom Up, 1941-1946," *The Journal of American History* Vol. 84, No. 3 (Dec. 1997), 910-941. Also see: Christopher Deutsch, *Forging a National Diet: Beef and the Political Economy of Plenty in Postwar America* (Doctoral Dissertation: University of Missouri-Columbia, 2018).

In 1947, the Monfort feedlot, with only around ten employees, was incorporated into Monfort Feed Lots Inc.[167] Next year, Monfort testified to Congress against the OPA, which was soon officially abolished. He wrote: "Everything possible should be done to avert rationing and price control of meats. Also, statements should be broadcast that controls will not be put on so that cattle feeders will have confidence in the future."[168] His words were introduced by the executive secretary of the Corn Belt Livestock Feeders Association with the statement: "Warren H. Monfort of Greeley, [Colorado] is one of the largest feeders in the business. That man feeds 15,000 head of cattle."[169]

As his business and reputation grew, so did Monfort's influence and power. Monfort was a founding member of Greeley's T-bone club with another influential cattleman W. D. Farr who was a close friend of Monfort's and would go on to become the President of the ANCA. Monfort also served as a director of the Colorado Cattle Feeder's Association. Soon Monfort became a director on the board of Greeley National Bank, and a year later, a member of the board at Colorado State University and the Colorado State Board of Agriculture. Within a decade, he was the chairman of the Greeley National Bank's executive board.[170]

Monfort took advantage of wartime conditions to grow his feeding operation to 10,000 cattle a year on just 20 acres.[171] The remaining land, as well as an adjoining 80-acre farm that Monfort had leased, was put to producing feed for his steers and heifers. By 1946, the Monforts had grain elevators that could store 200,000 bushels of feed for his growing feeding business.

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[167] "History and Development of Farming Operations by Monfort Feed Lots Inc and Predecessors in Title" from Greeley Museum, 5 Rivers Collection.
[168] U.S. Congress, Senate, Committee on Banking and Currency, *Meat Control: Hearings Before a Subcommittee of the Committee on Banking and Currency*, 80th Cong., 2nd sess., 1948, pg 99.
[169] Ibid.
[170] Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), p. 26.
[171] "Colorado's Man of the Year" in *The PhilFarmer* (Third Quarter, 1945), p 6, from *The Record Stockman*

And before the end of the decade, the feedlot had doubled again, expanding to 40 acres and feeding 20,000 bovine creatures annually.[172] Such a high level of concentration for months on end—less than a hundred square feet per thousand-pound animal—was unprecedented. The feedlot evolved in other ways as well. It now included an animal hospital, a grain elevator, power sprayers issuing DDT to eliminate pests, a back-up generator, feed mixing trucks, and a control room from where the trucks were directed to deposit specific amounts of feed at particular pens. One journalist commented, "The Monfort operation is a beef factory… everything is aimed at beef production."[173] High cattle prices and low input costs were key to Monfort's factory production of: "premium flesh…inches deep."[174]

Cattlemen such as Monfort were not alone in the intensive capital infusion and technological modernization that was turning farms into factories. By the end of WWII gasoline powered tractors had replaced much human and animal labor on American farms and fertilizer-fueled hybrid seeds greatly increased yields, which were harvested by mechanical combines. Supermarket chains were demanding standardized fruits, vegetables, as well as, animal products, and producers strove to meet their requirements in the hopes of securing large contracts. But standardization required both biological uniformity as well as high levels of quality control, mechanization, and automation. Among animal products the chicken industry changed fastest and most dramatically in this regard. After the "chicken of tomorrow" contest sponsored by A&P in the late 1940s, the mass production of "broiler type" chicken, raised in total confinement to have meaty breasts, white feathers, and high levels of disease resistance, came to dominate the

[172] John E. Picket, "California Could Do It!" *Pacific Rural Press* (September 13, 1947)
[173] Lee Olson, "Feeder Manufactures Beef," The Denver Post (November 16, 1950).
[174] Lee Olson, "Rich Diet Key to Successful Feedlot Plan," The Denver Post (November 17, 1950).

industry.[175] Pig confinement soon followed. Much of this technological change was underwritten by research conducted at land-grant universities, discussed in great detail in the next chapter.

Cattle Feeding in the Corn Belt

Wartime demand for beef, not only spurred the growth of cattle feeding in the West, but innovations in the corn belt as well. Roswell Garst, a prominent Iowan farmer and the owner of a hybrid corn seed company, embarked on a significant cattle-feeding experiment at the end of the war. A friend of Henry Wallace (Roosevelt's Secretary of Agriculture), Garst had supported the New Deal and even served on the National Corn-Hog committee. He understood that in order to take full advantage of both high corn prices and high livestock prices, he would have to search for alternative feeds to corn. For that he did not have to look far: corncobs, stalks, and husks—the byproducts of his own hybrid corn seed operation.

Alongside his engagement in politics and the leadership of the Garst and Thomas Hi-Bred Corn Company in Coon Rapids, Garst also maintained an aggressive interest in the latest farming techniques and technologies. It came to Garst's attention that scientists at the Ohio Agricultural Experiment Station had had some success feeding their cattle a mixture of corncobs and shelled corn.[176] Agricultural experiment stations were legislated into existence in the late nineteenth century by the Hatch Act of 1887, which put in place a network of experiment stations at the nation's land-grant colleges to liaise between local farmers and the scientists at these publicly funded research institutions (discussed in greater depth in the next chapter). Curious to take the Ohio station's experiment even further, Garst wanted to know if a diet

[175] William Boyd, "Making Meat: Science, Technology, and American Poultry Production," *Technology and Culture* Vol. 42, No. 4 (Oct 2001), 631-664.
[176] John Dos Passos, "Revolution on the Farm," *Time Magazine* (1948): 98. Box 45, MS 579, Iowa State University Archives; from here on "Garst Family Collection".

comprised almost solely of corn by-products, but no corn itself, would be viable. After failing to convince the agricultural faculty at Iowa State College to conduct more investigations, Garst decided to take it upon himself.

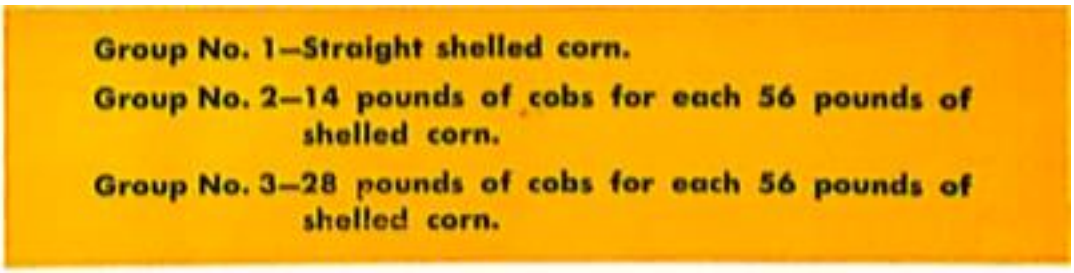

Image 3: Feed combinations fed at the Ohio Experiment Station to three different groups of cattle (the animals also received a protein supplement as well as some hay.) Found in "There's Gold in the Cob Pile" by Garst & Thomas Hybrid Corn Company. Box 67, RS 21-7-12, Iowa State University Archives.

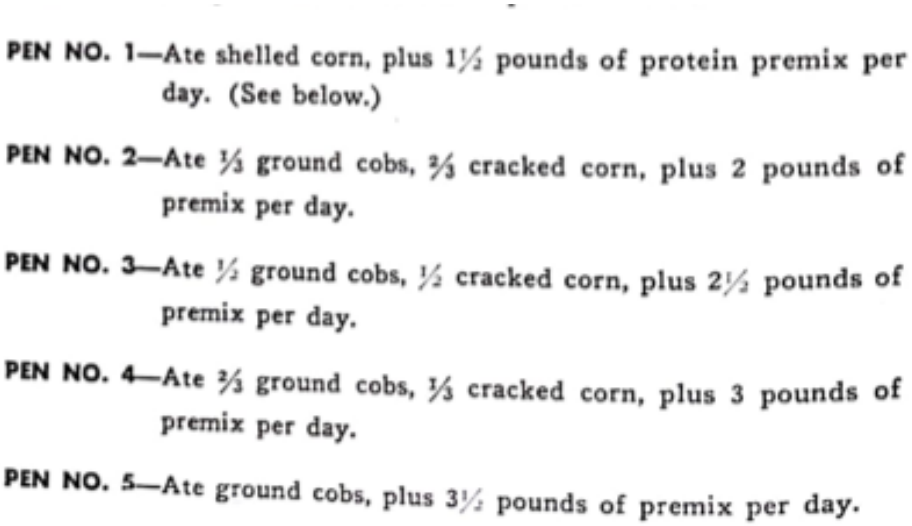

Image 4: Feed combinations fed at Garst's 1946 experiment to five different groups of cattle, found in "There's Gold in the Cob Pile" by Garst & Thomas Hybrid Corn Company. Box 67, RS 21-7-12, Iowa State University Archives.

In the winter of 1946, Garst bought thirty-four cattle from a livestock company in Omaha. Dividing thirty of the animals into five pens, he created a premix of soy meal, molasses,

cod liver oil, and Du Pont's "two-sixty-two" feed compound containing the protein supplement urea. Following the Ohio Experiment Station's methodology (Image 3), each pen received a different combination of premix, corn, corncobs, and hay every day (Image 4). At the end of four months, the animals were weighed and sold to determine the profitability of each pen (Image 5).

	PEN NO. 1	PEN NO. 2	PEN NO. 3	PEN NO. 4	PEN NO. 5
Average Daily Gain	2.14 Lbs.	2.06 Lbs.	1.63 Lbs.	1.67 Lbs.	1.34 Lbs.
Cost per Cwt. of Gain	$26.80	$23.16	$24.99	$23.19	$19.15

Image 5: The results of Garst's experiment found in "There's Gold in the Cob Pile" by Garst & Thomas Hybrid Corn Company. Box 67, RS 21-7-12, Iowa State University Archives.

Even though a Vitamin A deficiency had caused fifteen of the animals to go blind, Garst found that "the steers that ate the straight cobs and five lbs. of supplement, gained 2/3rd as rapidly as the steers that ate straight shelled corn."[177] While cobs hadn't performed as well as corn itself—they did so at a fraction of the cost.

Garst's timing could not have been better. Corn prices had been rising steadily throughout the 1940s and by 1947 the corn crop had suffered from bad weather and shelled corn prices had risen to a historic high of $2.50 a bushel. So by next winter Garst began feeding over five hundred steers on a diet of mainly cobs and protein meal.[178] To emphasize the success of this new diet, he later wrote, "the cattle received no hay whatever—no corn whatever—they had no bedding—no shelter—simply the above ration [of cobs, soybean oil, molasses, and urea.]"[179] In other words, not only had Garst had replaced expensive inputs such as hay and corn with

[177] Garst & Thomas Hybrid Corn Company, "The Use of Corn Cobs, Corn Stalks, and Grain Sorghum Stubble for Cattle Feed," *Garst and Thomas Bulletin* No. 5, in Box 67, RS 21-7-12, Iowa State University Archives; from here on the "Roswell Garst Papers".
[178] John Dos Passos, "Revolution on the Farm," *Time Magazine* (1948): 101. Garst Family Collection.
[179] Garst & Thomas Hybrid Corn Company, "There's Gold in that Cob Pile," in Box 67, Roswell Garst Papers.

inexpensive, yet effective, substitutes, but by recording his experiment he was able to effectively promote it.

Garst's idea of using urea as a protein source had come from a separate study conducted at the University of Wisconsin. The scientists there had concluded that urea was a good replacement for soybean, linseed, or cottonseed meal, for up to one-third of the total protein supplement. Again, Garst sought to take this experiment further and test the efficacy of urea as the sole protein ingredient in cattle feed. He thus successfully combined eleven parts urea and eighty-nine parts molasses, into a total replacement for other high-priced protein meals.[180] By 1949, the Garst Company had built a plant for the large scale mixing of urea and molasses, which were now being shipped by the carload to Coon Rapids.[181]

Garst's experiments, which were a direct result of the high corn prices induced by New Deal policies and wartime demand, attracted serious attention among farmers and animal scientists in Iowa and around the country. This was largely a product of Garst's extensive network of contacts and his tireless promotion of agricultural trends.[182] The Garst corncob experiments were repeated at Iowa State and their results confirmed. A testament to his success, the entire faculty of the Animal Husbandry Department in Ames visited Garst's cob feeding operation at Coon Rapids, which by 1949 was over a thousand cattle strong. His feedlot tripled in size over the next few years.

In his correspondences with scientists and farmers, Garst explained that the traditional ruminant diet of "green grass," is just, "cellulose with protein," and that all he'd done was to

[180] Garst & Thomas Hybrid Corn Company, "The Use of Corn Cobs, Corn Stalks, and Grain Sorghum Stubble for Cattle Feed," *Garst and Thomas Bulletin* No. 5, in Box 67, Roswell Garst Papers.
[181] The Garst Company, "Feeding Ruminants on Corn Cobs," in Box 67, Roswell Garst Papers.
[182] Harold Lee, "The Citizen and the USDA: The Case of Roswell Garst," *Agricultural History* Vol. 64, No. 2 (Spring 1990), 262-270.

replace what he saw as the two main constituents of grass with two separate ingredients: corncobs as the cellulose and a molasses-urea supplement as the protein.[183] What Garst's experiments had achieved was to determine for ruminant creatures an alternative to a grass-based diet that would be cheaply available in all seasons.[184] To that effect he later declared: "hay is obsolete!"[185]

Garst's attempts to replace corn-feeding with the feeding of corn by-products were replicated throughout the Midwest, but his ideas about the substitutability of grass in the ruminant diet, had even greater significance. As his son later confirmed, "farmers feeding only grass and hay can no longer compete. Land is too expensive! Today the biggest opportunity to lower costs is with feed grains!"[186] David Garst put into words a grain-over-grass logic that had gained widespread acceptance at the USDA, and now with the promotion of Garst's experiments, among cattlemen too.

Cattlemen's Caravan to Washington

As the military's demand for beef declined, the post-war boom in cattle prices fizzled out by the early 50s.[187] Eager for the return of wartime demand, cattlemen ramped up production at the outbreak of the Korean war, creating a bubble in the cattle market. Prices initially skyrocketed, leading to the reintroduction of price controls, but subsequently plummeted. The return of drought conditions further forced cattlemen to send many more cattle to slaughter in the

[183] Roswell Garst to W. E. Connell (March 28, 1949), in Box 22, Roswell Garst Papers.
[184] Garst estimated that feeders could save up to $20 for every ton of feed switched from corn to cobs.
[185] Roswell Garst to Francis Kutish and Wise Burroughs (January 14, 1954), in Box 23, Roswell Garst Papers.
[186] David Garst, "Cows and Calves on a Feed Grain Farm," *Garst and Thomas Bulletin* No. 7, in Box 67, Roswell Garst Papers.
[187] Cattlemen rejected the Brannan plan which was proposed in 1949 by Truman's Secretary of Agriculture Charles Brannan. Not only were cattlemen generally opposed to price support, the cattle market was doing relatively well and demand for beef was strong, obviating any need for supply management.

second half of 1952, leading to a precipitous decline in cattle prices, which fell by a third, or more than $10 per cwt, over the next two years. In early 1953, owner of Farr Feeders Inc., another feedlot pioneer from Colorado and friend of the Monforts, complained that "there are more cattle on feed than ever… [and] there will be more next year," and that in the prevailing market his bottom line would suffer heavy losses.[188]

Corn, meanwhile, remained supported at high parity levels by the Secretary of Agriculture. At a June 1953 meeting of the ANCA, attended not only by ranchers and feeders, but by representatives from national retailers, packers, land grant universities, the agricultural press, and national and state farm bureaus, many expressed the need to lower corn supports. Cattlemen from Iowa to Texas felt that "corn was sealed at too high a figure" and that "a new parity level is needed."[189] A Swift and Co. representative described the issue thus: "the basic problem bothering feeders and bankers was the cost of feeding at 30 to 35 cents a pound, whereas they could only sell at 20 to 25 cents a pound."[190] The situation was becoming dire.

By October of that year, over 350 cattlemen from about 30 states, backed by the National Farmers Union (NFU), an organization of smaller farmers and ranchers, had descended on Washington demanding price supports on beef. Chartered buses from Colorado, Utah, Idaho and Washington State carried desperate ranchers to an audience with the Secretary of Agriculture Ezra Taft Benson. This was a stark reversal from less than a year ago when most cattlemen voted for Dwight D. Eisenhower in the hopes that he and his administration would leave the cattle market alone. Dennis Driscoll of Colorado Springs opined that if the government did not give

[188] Secretary F. E. Mollin, "Minutes of a Meeting of the Cattle and Beef Industry Committee in the Muehlebach Hotel, Kansas City, Mo.," (January 5, 1953) in 1713, Box 57, NCA.
[189] Cattle and Beef Industry Committee, "Minutes of June 20, 1953 Meeting" (Hilton Hotel, Chicago, IL: June 20, 1953) in 1713, Box 57, NCA.
[190] Ibid.

them immediate aid, "they would have to sell their herds and get out of the cattle business when they got back home."[191]

The NFU outlined three ways that Secretary Benson could alleviate the plight of the nation's cattlemen. First, the government could nationalize the cattle market, paying the packers a fee for slaughtering and distributing the nation's beef, and in the process assuring cattlemen and consumers of stable prices. Second, the secretary could set minimum prices for live cattle, and reimburse packers for the difference between the price floor and market prices. Third, the government could send cattlemen a periodic check for the difference between parity and the average market price. While the first option likely served as shock value, purely to make the other options seem tame in comparison, the second had been attempted during WWII and had resulted in much fraud. The third option was in essence the same Brannan plan, sponsored in 1949 by the same NFU, which cattlemen and most other agricultural associations had soundly rejected just a few years prior.[192]

While most cattlemen agreed that government supports on feed grain prices had bound them tightly in a cost-price squeeze, they disagreed on the solution. Unlike the NFU, the ANCA leadership remained fixed in its rejection of price supports on beef, instead it preferred the lowering of price supports on corn as well as an increase of government beef purchasing for relief programs. Secretary Benson, a free market ideologue bent upon dismantling New Deal supply management, was more inclined to agree with the ANCA and thus lukewarm in addressing the NFU-sponsored cattlemen's caravan to the Capitol. "I don't say it's not possible," referring to price supports on cattle, "but it would be a terrible thing if we got into this program

[191] Thomas L. Stokes, "Middle Class Revolt," Newspaper Clipping (Washington, 1953) in 1713, Box 350, NCA.
[192] James Daniel, "Farmers Union Offers 3 Plans for Beef Price Subsidies," Rocky Mountain News (Colorado: Oct. 26, 1953), 3.

and found it wouldn't work," explained the Secretary of Agriculture.[193] He also cited failures of the price support program for other perishable products like hogs and potatoes, suggesting that beef storage by the government would present high risks at astronomical costs to taxpayers. Meanwhile, Benson, as well as Congress, continued to bolster the cattle market by purchasing beef for military and civilian purposes and support CCC drought relief measures involving the sale of feed at subsidized levels to feeders in need.

Turning the Tide of Supply Management

Over the course of 1953, in the build up toward next year's farm bill, the House Agricultural Committee held dozens of hearings on the subject of price supports and acreage controls. Cattlemen from across the United States voiced their opinions and preferences. President of the Iowa Livestock Feeders Association, a cattle feeder and a member of the Farm Bureau, testified before the House in favor of low price supports on corn and wheat, no price supports on other feed grains, nor any on livestock, and against acreage controls altogether.[194] Later that year, cattlemen from Wyoming, Colorado, Utah and elsewhere expressed diverse opinions on the subject of price supports on cattle. Many were against price supports on principle, but were nonetheless desirous of drought aid, emergency buying programs and other relief measures—an expectation they had internalized from their experience during the Great Depression. One rancher, sympathetic to the cattlemen's caravan, speaking for price supports on cattle, felt that larger operations were against price supports in the hopes that they could ride out

[193] Staff, "Benson Rejects Farm Union Plea," Rocky Mountain News (Colorado: Oct. 26, 1953) in 1713, Box 350, NCA.
[194] U.S. Congress, House of Representatives, Committee on Agriculture, *Long Range Farm Program: Hearings Before The Committee Agriculture House of Representatives* (Serial R Part 7), 83rd Cong., 1st sess., 1953, pg 1025.

the depressed market even as it squeezed out smaller competition.[195] Large outfits such as Monfort of Colorado would have certainly fit this description. Meanwhile, established trade groups such as the American Stockyards Association met with President Eisenhower at the White House to reinforce that government price supports for cattle would be "unworkable and undesirable."[196]

In early 1954, the President of the ANCA gloated, "but isn't it nice to have everyone, including President Eisenhower, helping us?"[197] Not only had the Eisenhower administration kept beef out of the list of basic commodities, provided relief in the form of drought aid, and purchased beef for the armed forces and the national school lunch program, but soon enough successfully ushered in the first lowering of price support levels since 1933. This helped alleviate some of the price-cost squeeze felt by feeders. Ike's Secretary of Agriculture, Ezra Taft Benson, with the help of the National Cattlemen's Association and the Farm Bureau and its Corn belt membership, was able to push back against the machinery of federal price supports for agricultural commodities.

In the throes of the Cold War, Secretary Benson, like many others, saw the buildup of agricultural surpluses as wasteful, especially in the light of global poverty and malnutrition. American agricultural bounty, he believed, could be used as a potent weapon in fight against communism. He thus actively promoted the legislation of P.L. 480, later known as the Food for Peace program, which aimed to sell surplus commodities to friendly nations in order to further the foreign policy goals of the United States. To this end he revitalized the Foreign Agricultural

[195] Lee Olson, "Hearing Airs Pros and Cons on Supports," Denver Post (Nov 3, 1953) in 1713, Box 350, NCA.
[196] Staff, "Stockyards Men Call at White House," Newspaper clipping in 1713, Box 350, NCA.
[197] Jay Taylor, "Opportunities in Appetite," *Excerpts From the Annual Address by President Jay Taylor of the American National Cattlemen's Association* (Jan. 10, 1954) in 1713, Box 32, NCA.

Service at the USDA to promote the sale of American farm stockpiles in other parts of the world.[198]

But P.L. 480, would not be enough to bring U.S. surpluses entirely under control nor would it benefit the ailing cattle industry. For both, price supports needed to be lowered. Benson, like the cattlemen we heard from earlier, understood that the crisis in the cattle industry was a result of the artificial price floor on feed grains. Describing the undesirable situation with respect to corn in 1954, Secretary Benson addressed Congress: "Corn, because we have had these supports on it… has thrown it out of relationship with livestock… because of this relationship, there has been a tendency to move away from grain feeding in certain areas where they have adequate pasture and forage."[199] This was directly opposed to USDA's grain over grass logic, so Benson lobbied for a plan to lower price supports for corn in order "to maintain a better relationship between corn and livestock."[200]

The Agricultural Act of 1954, bearing the undeniable stamp of Ezra Taft Benson's politics, thus, created a sliding scale of 82.5 to 90 percent parity prices for 1955, and 75 to 90 percent parity for price supported agricultural products thereafter—these came to be known as flexible price supports. This was the first real reduction in price support levels since the New Deal had introduced supply management as part of the Agricultural Adjustment Act of 1933. Until this point, the strength of the cotton-wheat coalition in Congress had kept supply management at the forefront of US agricultural policy.[201] But the passage of flexible price

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[198] Shane Hamilton, *Supermarket USDA: Food and Power in the Cold War Farms Race* (New Haven: Yale University Press, 2018), 66-67.
[199] U.S. Congress, House of Representatives, Committee on Agriculture, *Long Range Farm Program: Hearings Before The Committee Agriculture House of Representatives* (Serial R Part 21), 83rd Cong., 2nd sess., 1954, pg 4038.
[200] Ibid., 4039.
[201] Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009).

supports was a sign that cattlemen's lobbying power in Congress and the USDA was on the rise, but they still lacked the reach of the corn segment of US agriculture.

The corn belt's support for the AAA system of price supports and acreage control had started waning by the 1940s. The rising demand for meat during WWII had turned many corn belt farmers, such as Roswell Garst, into livestock producers and their interests no longer aligned with high price supports and production controls. The Farm Bureau, which was increasingly dominated by midwestern corn farmers, began to change its tune on supply management. By the time President Dwight D. Eisenhower took office, the national Farm Bureau leadership had transitioned to a new kind of corn belt farmers, like its president Allan Kline—an Iowa hog producer. The Farm Bureau thus began to lobby for flexible price supports and an end to acreage control.

Corn belt farmers wanted to keep feed grain prices low because corn was increasingly sold in the form of livestock (via feeding). And lower the price of corn, the greater the profit feeders could make, and the higher the prices they could offer for feeder cattle. Effectively, the entire livestock industry stood to gain from lower grain prices. Additionally, corn belt farmers did not want more competition in the livestock feeding arena. However, production controls on cotton, rice, tobacco, and wheat were encouraging farmers in the south and elsewhere to also produce competing sources of corn and soybeans and increasingly enter the feeding industry. So not only did corn belt farmers want to end production controls and price supports on all grains, but also on these other commodities.

The Farm Bureau also argued that because meat consumption was on the rise, which boded well for increased consumption of feed grains by livestock, grain surpluses would not be an issue even if production controls were removed. Bill Winders writes, "coupled with emerging

livestock complex, which rested on intensive and industrial production methods, this increasing consumption of animals made supply management policy less necessary for feed grains, especially corn."[202] Thus, as power in American agriculture shifted from the South to the corn belt, the Agricultural Act of 1954 introduced a system of flexible price supports, lowering support prices across the agricultural spectrum (except for tobacco). Further, corn marketing quotas, which had so irked corn belt farmers in the 1930s, were dropped completely.[203]

Another sign of the cattle industry's shifting political fortunes: In the Spring of 1956, Eisenhower vetoed the Agricultural Act of 1956, also known as the Soil Bank Act. Among his objections to the legislation was the provision for mandatory supports on feed grains. Mandatory price supports would raise the price of grains such as sorghum, barley, rye and oats—essential for the feeding of livestock around the United States. The President feared that "livestock production would come to depend more on forage and less on grain."[204] This was clearly a validation of the USDA's grain over grass logic and an affirmation of the livestock industry's trend away from grass feeding and toward a greater and greater intensity of grain feeding that had begun over a decade ago.

When, a month later, President Eisenhower signed Congress' revised bill with reduced price support levels, but nonetheless mandatory support for feed grains, cattlemen were furious. They complained that "livestock, dairy, and poultry farmers are being grossly discriminated against."[205] Feeders, whose input costs would rise, would have to lower the prices they paid for

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[202] Ibid., 91.
[203] Douglas Bowers, Wayne D. Rasmussen, and Gladys L. Baker, "History of Agricultural Price Support and Adjustment Programs, 1933-1984," *Agricultural Information Bulletin* No. AIB-485 (Dec. 1984), 21. Obtained From: https://www.ers.usda.gov/publications/pub-details/?pubid=41994 Obtained on: July 16, 2020.
[204] Committee on Agriculture and Forestry, Agricultural Act of 1956, 84th Cong., 2d sess., 1956, H. R. 10875, Minority Views, 33.
[205] Ibid., 34.

feeder cattle. Thus, higher price of feed grains would lower the price received by western cattlemen who grazed cattle for sale to feedlots. This would be especially true in feed deficit regions. And as cattlemen would be forced to shift away from grains toward grass feeding, the market for feed grains would shrink, leading to an increased pile up in government storage bins. More so, those encouraged by price supports to plant feed grains on acres taken out of cotton and wheat, would enter livestock production and depress livestock markets further, or so cattlemen feared. Within a couple of years, however, the outlook for corn prices soon shifted dramatically, once again, incentivizing cattlemen to switch back from other feed grains to corn.

Following from the passage of the Agricultural Act of 1958 (PL 85-835), corn producers "won the right to vote themselves out of the parity system altogether."[206] Corn farmers and feeders voted in a referendum for a new corn program which eliminated acreage allotment altogether and reduced price supports to 90% of the average price received by farmers in the preceding three years (not less than 65% parity). This effectively lowered the price support levels for corn. While other commodities remained supported at 82.5 to 90 percent of parity, USDA's 1959 price support for corn, due to the new calculation ushered in by the referendum, stood at a mere 66 percent of parity.[207] This was a major victory for American cattle feeders. Not only were acreage allotments on corn, which had been reinstated after the Korean War, now suspended, the price support levels for the most common feed grain were significantly reduced.

Maureen Ogle has claimed that "the midcentury birth of commercial feeding operations had little to do with corn…But the grain that drove feedlot expansion in the mid-twentieth

[206] Jonathan Coppess, "Reviewing Farm Bill History: the Agricultural Act of 1954." *Farmdoc Daily* (7):29, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, (February 16, 2017).
[207] Committee on Agriculture, Adjustment of Price Supports for Feed Grains, 86th Cong., 1st sess., 1959, H. R. 5432, Minority Views, 16.

century was sorghum."[208] This is misleading because not only was corn the primary feed grain used in the Midwest and in large Western operations like Monfort's, both as grain and as silage, the price supports for other feed grains such as barley, rye, oats, and sorghum were pegged to the price support levels for corn in agricultural legislation since the 1950s. As corn prices fell—which they did consistently throughout the 50s and 60s—so did price supports for all other feed grains.

Bolstered by the political economy of feed in the mid 1950s and the new-found application of DES (discussed in the next chapter), Monfort purchased another 220 acres of farmland and doubled his operation. 50,000 bovines consumed so much grain each year that additional feed was shipped from Monfort-owned-and-operated grain elevators in Nebraska and Kansas, by Monfort's own freight cars. Monfort of Colorado also pre-contracted much of its corn and silage needs with local Weld County farmers. By contracting in advance Monfort was often able to receive below parity prices for corn. The company would provide the seeds and harvest the crop for a fixed price per bushel, even providing technical assistance to the farmers, in order to ensure a steady supply of quality feed. After harvesting the crop, Monfort trucks transported the feed into the feedlot's enormous grain silos and even larger silage pits (seven times larger than a football field!)[209] Such large investments in the procurement and storage of corn were exemplary of cattle feeders in the late 1950s and a direct result of abundant corn and low prices ushered in by the agricultural policies of the Eisenhower administration.

[208] Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (New York: Houghton Mifflin Harcourt, 2013), 135-136.
[209] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, 111-117.

Image 7: Aerial view of the 30,000-head capacity Greeley feedlot in 1958. Source: Box 2, SC 94, University of Northern Colorado, Monfort Collection.

Monfort of Colorado was not an exception, and its growth was reflected in other feeding operations of the era. In Collinsville, California, for instance, Fontana Farms was another large year-round cattle feeding operation that grew to enormous scale during the post-war years. This feedlot was the brainchild of A. B. Miller, a businessman from the East, who had figured out the basic factors of the cattle cycle (just as Warren Monfort had and around the same time in 1928). Feed from the surrounding 15,000 acres of the Sacramento delta was brought by barges into the 160-acre feedlot complex and stored in huge hay and grain warehouses. From there the corn, barley, alfalfa, and hay was processed on-site in a 10-ton chopping mill. The feed would then be

transferred from the mill into a storage bin set on stilts, so that trucks could pass underneath and the mixture be poured directly into them. Alongside, there stood a massive "quarter mile long," beet pulp silo.[210] In a separate 75,000-ton pit, the beet pulp was mixed with molasses and bonemeal—an "evil smelling" mash—and piled into different trucks. These trucks had specially constructed sides and beds that allowed the feed to be unloaded into all 20,000 feet of feeding bunks, spread over a 100 pens, automatically—not dissimilar to the Monfort trucks.[211] In every pen were 130 to 140 animals, with two feet of trough space each. In this way over 25,000 bovine creatures were fed every year at this California feedlot and shipped off to San Francisco packers.[212]

Writing in 1950, a journalist described the Fontana Farms feedlot as "the end of the trail for the… open range."[213] The rise of grain feeding spelled doom for the idyllic pastures where bovine creatures, in times past, spent up to four or five years of their life. This "city of cows" was much more like a "modern townsite, with lanes separating the huge pens as streets and avenues do city blocks."[214] The basic idea of confined feeding, of a large number of animals, on a high-energy diet served in a technologically modern, highly-controlled, industrial facility had made its way around the landscape of the American West. This was possible because of the changing political economy of feed, new innovations in feeding technology, and growing demand for prime and choice beef that began to emerge over the course of the first half of the twentieth century.

[210] Mary Terrill, "Reflections from a California Feedlot," *Canadian Cattlemen* (Oct. 1950), 31.
[211] Mary Terrill, "Reflections from a California Feedlot," *Canadian Cattlemen* (Oct. 1950), 26.
[212] Mary Terrill, "Reflections from a California Feedlot," *Canadian Cattlemen* (Oct. 1950), 31.
[213] Mary Terrill, "Reflections from a California Feedlot," *Canadian Cattlemen* (Oct. 1950), 26.
[214] Ibid.

Conclusion

While the first two decades of the New Deal agricultural program gave an unintentional boost to corn production, the policies of the Eisenhower administration led to a drastic lowering of corn prices—all of which laid the foundation for the explosion of the cattle feeding industry in the 1950s and 60s. Between 1933 and 1956 total corn production in the United States had risen from 2.10 to 3.07 billion bushels per annum—that is an increase of almost 50% over pre-supply management production levels.[215] However, the New Deal's supply management policies as well as wartime price controls had steadily pushed the price of corn received by farmers from 0.80 dollars per bushel in 1934 to 1.48 dollars per bushel in 1954—an 85% increase. Given the high levels of post-war inflation, this increase in the price of corn was relatively insignificant.[216] During the same period, the price of cattle quadrupled. So while, the New Deal regime spurred production, corn prices remained stable, and the cattle-corn price ratio became quite favorable.

With the retrenchment of supply management, signaled by the Agricultural Act of 1954, corn prices actually began to fall. By 1971, the average price of corn received by farmers had fallen to 1.08 dollars per bushel, a 30% decline over the last two decades. Cattlemen took maximum advantage of this fall in feed costs. In 1951 there were 82 million bovines in America, but by 1971 there were 114.5 million—a 40% increase. Whereas in the period between 1933 and 1951, when corn prices had been on the rise, the total cattle population in the U.S. had risen by only 17%. This suggests that the political economy of feed ushered in by the Eisenhower administration, with the support of the ANCA and the Farm Bureau, bolstered the expansion of cattle feeding around the nation.

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[215] USDA historical corn production data set obtained from: https://quickstats.nass.usda.gov/

[216] What one could purchase with one dollar in 1934 was worth almost two dollars in 1954, due to inflation.

The Monfort feedlot was replicated all over the American West. Between 1935 and 1963, the percentage of beef cattle on feed around the country more than doubled. Of these fed cattle, more and more came from large commercial operations, such as Monfort's, feeding more than a thousand animals at a time. By 1973, less than one percent of the largest feedlots in the nation produced nearly half the fed cattle on the market.[217] This was the result of a highly regulated feed grain market that made feeding cattle a diet of cheap grains laced with hormones a reality. But indispensable to the success of large cattle feeding operations and their ability to dominate animal agriculture from the mid-twentieth century on, was government funded science and technology coming out of the nation's land grant universities—the subject of the next chapter.

[217] Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (New York: Houghton Mifflin Harcourt, 2013), 135, 152.

Animal Science & Feedlot Capitalism

"For five months, its as close to paradise as any pampered bovine can expect." These were the words of an enamored observer, describing "the speckled sea of beef-on-the-hoof," at Colorado's Monfort Feedlots in 1972.[218] There, upon a cramped 300 acres of dirt and dung, stood over a hundred thousand cattle contained in rectangular pens.[219] From the control room overlooking the spectacle, a team of nutritionists ran a complex feeding operation powered by a large mainframe computer buzzing with switches, dials, and flashing lights. The IBM processor helped the technicians regulate the exact flow of ingredients from enormous grain silos, silage pits, and feed bins, into a fleet of trucks. The trucks were then directed to deposit their custom loads at particular pens, specified by the computer, at least twice a day. Miles of feeding troughs lined the pens, which were provisioned with self-filling and electrically-heated tanks that supplied the sea of creatures with over 1.5 million gallons of water a day.[220] Into the troughs, the trucks poured thousands of tons of steaming hot flaked-corn laced with hormones, antibiotics, and other additives, with not a blade of green grass in sight.[221] How did American cattle go from a life of grazing on the open range to living in a highly controlled, heavily capitalized environment, eating a diet altogether devoid of grass? Who was responsible for this transformation? What were the implications, for humans, animals, and the cattle industry?

This shift was driven, not simply by the genius of entrepreneurial farmers, but by the research conducted at the nation's land-grant colleges and universities. World War II and the Cold War that ensued had drawn land-grant universities more than ever before into the project of

[218] International-Stanley Corporation, "Inside Story," Winter 1972-73. OCC-024-5Riv, Box 7, Hazel Research Center, Greeley Museum; from here on the "Monfort Collection."
[219] That's more than 300 bovines an acre.
[220] OCC-023-5Riv, Box 6, Monfort Collection.
[221] New cattle were placed on a starting ration of 60% roughage (including alfalfa hay) but within 3 to 6 weeks transitioned to a diet of less than 8% roughage.

proving American technological supremacy. In this climate, armed with GI Bill funding, animal scientists at the nation's land-grant colleges played a crucial role in forging the modern feedlot. It was through a combined effort of feeders and animal scientists that the seasonal practice of fattening cattle on corn became a year-round business and a standard exercise in scientific research.

Feedlot capitalists vied for the guidance of the nation's top animal scientists. Scientists such as John K. Matsushima, in contrast to his predecessors, such as Wise Burroughs, were drawn out of their laboratories and into the fields and feedlots of influential feeders such as Monfort of Colorado.[222] This interaction had two major impacts: the goals of animal scientists increasingly came to agree with the prerogatives of agribusiness, and in the process, the lives of farm animals changed significantly. This chapter finds that even as farmers tried to speak the language of science, animal scientists reciprocated by showing an unprecedented degree of engagement with farmer-capitalists, and on the latter's terms: profit. Their singular focus, however, led to the deterioration of animal welfare.

This chapter argues that the research questions, goals and, methods of animal science were transformed by the interactions between animal scientists and feedlot capitalists. At the behest of large commercial feeders, Burroughs and Matsushima, both responded to the needs of their clients in ways that changed the course of their scientific disciplines, the feeding industry, and the lives of bovine creatures. This post-World War II story illustrates important continuities with nineteenth century scientific agriculture, a time when land-grant scientists worked closely

[222] Alan I Marcus, "The Newest Knowledge of Nutrition: Wise Burroughs, DES, and Modern Meat," *Agricultural History,* Vol. 67, No. 3 (Summer 1993): 67; Stephanie Statz, "Fruit Cocktail, Rations, and By-Products: The University of California-Berkeley and Modern Food," in *Service as Mandate: How American Land-Grant Universities Shaped the Modern World 1920-2015,* ed. Alan I Marcus (Tuscaloosa: The University of Alabama Press, 2015), 223.

with prominent farmers. [223] The scientists in this chapter continue in this nineteenth century vein, working hand-in-glove with large agribusinesses. Far from making them wage-slaves in the capitalist project, these scientists had far greater influence on the feedlot enterprise than the feeders themselves. By exploring the close connections between influential scientists and leading agribusinesses, through published memoirs, research papers, and farm journals, this chapter uncovers the intertwined relationship between animal scientists and feedlot capitalists.

Land-Grant Colleges and the New science of Animal Nutrition

The rise of a large-scale, year-round, cattle feeding industry was deeply intertwined with the land-grant college research complex, instituted by the Morrill Land-Grant Act of 1862, which funded the establishment of colleges specializing in the study and instruction of agriculture and the mechanical arts in every state. At the behest of state legislatures, agricultural science came to dominate these early institutions. An ethos of science as service was emphasized over and above science for science's sake.[224] Many land-grant scientists felt especially burdened by the task of responding to public inquiries and pleas for assistance, stifled in their ability to conduct original research. As a result of political pressure through professional associations, the Hatch Act of 1887 provided federal funds for the creation of experiment stations associated with each of the land-grant colleges, where scientists could pursue basic and applied research as long as it served their rural constituencies.

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[223] Jim Hightower, *Hard Tomatoes, Hard Times: A Report of the Agribusiness Accountability Project on the Failure of America's Land Grant College Complex* (Cambridge, MA: Schenkman Pub. Co., 1973); Charles E. Rosenberg, *No Other Gods: On Science and American Social Thought* (Baltimore: Johns Hopkins University Press, 1976); Alan Marcus, *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870-1890* (Ames: Iowa State University Press, 1985); Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890-1940* (Ithaca: Cornell University Press, 1990);

[224] Alan Marcus, ed., *Science as Service: Establishing and Reformulating American Land-Grant Universities, 1865-1930* (Tuscaloosa: University of Alabama Press, 2015).

By the early twentieth century the tide was turning in favor of the pursuit of original research at land grant universities. With the help of the USDA Office of Experiment Stations land-grant colleges brought about the passage of the Adams Act (1906), which increased funding for original investigation and thus justified basic research of the scientist's own choosing. Again, less than a decade later, the Smith-Lever Act (1914) formalized the creation of an extension service, which put in place a network of extension agents to liaise between farmers and the agricultural college. The land-grant scientist was thus putatively freed from, what many felt, the burden of directly dealing with the farm constituency.

By the 1920s, experiment stations served as the laboratories for scientific investigation into agriculture and the extension service brought the results of said research to the rural populace through highly successful practical demonstrations by county agents. Animal scientists rarely ventured onto private enterprises, much less conducted research there in coordination with farmers and feeders.[225] This began to change in the mid-twentieth century, with the rise of large-scale feedlots.

The mid-century transition from laboratory experimentation to feedlot research also overlapped with the emergence of a "new" science of animal nutrition.[226] Exemplars of this new method were ruminant nutritionists like H. H. Mitchell, his student Wise Burroughs, and John K. Matsushima of Colorado State University. Such scientists, historian Alan Marcus explains, moved away from earlier notions of a "normal" or "proper" diet for livestock to the new idea of a "balanced" ration.

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[225] Alan I Marcus, "The Newest Knowledge of Nutrition: Wise Burroughs, DES, and Modern Meat," *Agricultural History,* Vol. 67, No. 3 (Summer 1993): 67; Stephanie Statz, "Fruit Cocktail, Rations, and By-Products: The University of California-Berkeley and Modern Food," in *Service as Mandate: How American Land-Grant Universities Shaped the Modern World 1920-2015,* ed. Alan I Marcus (Tuscaloosa: The University of Alabama Press, 2015), 223.
[226] Alan I Marcus, "The Newest Knowledge of Nutrition: Wise Burroughs, DES, and Modern Meat," *Agricultural History,* Vol. 67, No. 3 (Summer 1993): 66-85.

The older science had presumed that proper or normal growth was synonymous with maximum growth. A "normal" or "healthy" diet, in other words, would automatically produce the meatiest animal.[227] Working under this paradigm, scientists investigated the energy content of various feeds and the nature of specific vitamins and minerals and their corresponding deficiencies. Early twentieth century animal nutritionists developed standards for "maintenance" expressed in Total Digestible Nutrients (TDN). Early feed formulations thus took into account the list of ingredients (including fats, proteins, carbohydrates, vitamins, and minerals) that when fed to an animal led to its total or complete development and healthfulness.[228]

The new idea of a "balanced" ration, however, was less concerned with all-round healthfulness and instead pursued specific combinations of ingredients that produced singular objectives, such as greater weight gain, irrespective of any other (ill) effects and consequences. "What emerged as crucial to this new animal scientist generation were results… the newest knowledge of nutrition suggested that a ration that fostered growth was one that fostered growth, nothing more."[229] Practitioners of this new science of animal nutrition recognized that individual ingredients interacted dynamically to produce specific effects. So, they sought to manipulate animal diets in ways that would bring increasing efficiencies to livestock production. In this way, rather than creating diets in the interest of the animal, these scientists were able to formulate diets in the interest of the feeder. Further, they adopted methods of "least cost formulation" introduced by agricultural economist Frederick Waugh in the 1950s, to compound feeds that were not only effective at increasing feeding efficiencies but at reducing costs.[230]

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[227] Ibid, 68-69.
[228] T. C. Byerly, "Changes in Animal Science," Agricultural History Vol. 50, No. 1 (Jan. 1976), 258-274.
[229] Alan I Marcus, "The Newest Knowledge of Nutrition: Wise Burroughs, DES, and Modern Meat," *Agricultural History,* Vol. 67, No. 3 (Summer 1993): 69.
[230] T. C. Byerly, "Changes in Animal Science," Agricultural History Vol. 50, No. 1 (Jan. 1976), 258-274.

Thus, not only did the methods of animal science change, so did their goals. How did the goals of animal scientists come to agree so well with the prerogatives of agribusiness? In order to understand the reasons behind these connected transitions from an older science of animal nutrition to the newer paradigm and from research in the laboratory to research on the feedlot, I first consider the relationship between Wise Burroughs and Roswell Garst, and then John K. Matsushima and feedlot capitalists Warren and Kenneth Monfort, whose intertwined careers are exemplary of this transformation.

Wise Burroughs and DES: Hormones in the Bovine Diet

A native of Iowa, Wise Burroughs received his PhD in animal nutrition from the University of Illinois in 1939. At his first academic appointment at Ohio Agricultural Experiment Station, Burroughs worked with Paul Gerlaugh on the original corncob experiments that had so inspired corn belt feeder Roswell Garst (discussed in the previous chapter). And so Garst began to advocate for, and indeed, insist on Burroughs' appointment at Iowa State College in the hopes that Burroughs would expand on his experiments and promote the results.[231] By 1950 Wise Burroughs was hired and set to the task of "making new uses of hormones and growth stimulants and new uses of high-cellulose feeds (cornstalks, corncobs, straws, etc.), [and] synthetic urea."[232] Much to Garst's satisfaction the latter of these investigations were on the very ingredients he had used in his own experiments and the ones he had repeatedly urged the Iowa State and other colleges to pursue.

[231] Alan I Marcus, *Cancer From Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: Johns Hopkins University Press, 1994), 11-12.
[232] Floyd Andre to Roswell Garst (December 11, 1951), in Box 14, Roswell Garst Papers.

The role of land grant scientists had changed significantly in the post-war era. They were deployed by the State, often in coordination with private enterprise, to achieve military supremacy, national security, and international hegemony. The ability of well-funded research scientists to develop groundbreaking technologies such as radar, penicillin, and the atomic bomb during WWII, set a precedent for dramatically increased funding for science and engineering. Meanwhile, these new technologies and the expertise behind them flowed seamlessly from government to private businesses—often free of charge. After the war, swelling university enrolments, courtesy the GI Bill, brought more federal funds to land-grant institutions, which in turn improved facilities, upgraded equipment, expanded departments and created new ones. Land-grant scientists in the 1950s were, therefore, well-funded, but expected to meet specific demands, solve problems, and deliver solutions for both government and business institutions—not shy away from clients or remain aloof in the pursuit of rarified scholarly goals.

In this post-war context Burroughs and Garst, animal scientist and agribusinessman, maintained an active correspondence that developed into a friendship. Garst regularly solicited Burroughs' help on a variety of livestock feeding questions.[233] His letters were detailed and always attentive to quantities, costs, and other market considerations. But Garst wasn't one to stop at questions. He was quick to give suggestions and bold enough not only to propose research but also to convey what he thought Burroughs should write, where he should publish his writing, and even what to conclude![234] For instance, in a proposed publication with the national periodical, *Farm Quarterly*, Garst asked Burroughs to write about the benefits of urea-nitrogen as a protein source for ruminant animals in combination with corncobs. He pressed:

[233] Roswell Garst to Wise Burroughs (1951), in Box 9, Roswell Garst Papers.
[234] Roswell Garst to Wise Burroughs (1952), in Box 23, Roswell Garst Papers.

> If you have nerve enough—and I think you ought to have nerve enough—I think you ought to quote from the bulletin you gave me to the effect that the cellulose in legumes seemed to be tied up—that you got greater digestibility from corncobs and cornstalks, than you got from clover hay or alfalfa hay at the ratio of 75 to 45. I think it might be wise for you to point out that Beeson gets a pound and a half a day with cobs supplemented with protein when he only gets .75 of a pound per head per day gain with the clover hay... I am satisfied in my own mind that leguminous hays are actually handicapped in the feeding of ruminants. I think you basically believe this same thing. I don't think if you were on a farm you would put up much clover. I don't know why you shouldn't say so… it takes an expert like you to do it.[235]

Burroughs' responses were unerringly respectful and usually just as detailed—either pointing Garst to past and ongoing research or offering his own ideas or hunches, albeit sometimes untested. By Burroughs' own admission, he found Garst's letters "quite stimulating."[236]

The bulk of Burroughs' research occurred at Iowa State's experimental feeding sheds and laboratories. There he developed an artificial rumen, to study ruminant metabolism outside of bovine bodies. Despite Burroughs' close relationship with Garst, increasingly common between feeders and animal scientists, Burroughs did not conduct his research at the Garst feedlot—Garst's invitations notwithstanding. His influence on the Garst operation was considerable, yet his methods remained faithful to the generation of animal scientists before him who preferred the laboratory setting to the messy reality of feedlot operations. This is likely because the Garst operation, like most feeders in the Midwest, did not have the facilities that Western feedlots like Monfort were fast developing.

[235] Ibid.
[236] Wise Burroughs to Roswell Garst (1957), in Box 30, Roswell Garst Papers.

In 1952, at the university's feeding sheds, Burroughs observed that a particular lot of cattle were, in his words, "eating their heads off… consuming almost 4% of their live weight."[237] He confided in Garst (perhaps the only person outside of his department to hear about it), that "my guess is that we've got a hormone in this hay which is the spark which is at work in these cattle. We are making tests for hormone activity which I am hoping will tell the story."[238] Using the mouse bioassay method, which involved feeding young female mice the suspected estrogenic ingredient and weighing their uteri afterwards to measure any hormonal effect, Burroughs gained enough evidence to be convinced that his hormone theory was indeed the reason for the greater gains in the ruminant animals.[239]

The poultry industry had been using the synthetic hormone DES, or Diethylstilbestrol, the first artificial estrogen and animal growth stimulant, since the 1940s. Experimenters found that male chickens who received DES injections or implants in large doses developed female characteristics and "much more succulent meat."[240] But similar studies on cattle, at Purdue University, revealed that large doses of DES instead led to deterioration in the quality of meat, and made ruminant animals much more difficult and dangerous to handle. The difference in Burroughs' tests was that his laboratory creatures had only received a tiny fraction of the dose of estrogen administered in previous experiments and therefore his animals did not show any of the negative-consequences that had plagued past studies. This was a tremendous breakthrough, and Burroughs began working on a patent on behalf of Iowa State.

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[237] Wise Burroughs to Roswell Garst (February 13, 1952), in Box 14, Roswell Garst Papers.
[238] Ibid.
[239] Alan Marcus, *Cancer from Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: The Johns Hopkins University Press, 1994), 14.
[240] Ibid., 13.

Garst was feeding three to four thousand cattle at his feedlot, when in 1954, Burroughs announced the discovery that "tipped the balance from open-field grazing to confined feeding, and encouraged the creation of large commercial feedlots." [241] As illustrated by the graph below (see Image 6), the number of cattle on feed in the United States began its dramatic increase in the early to mid 1950s, also coinciding with the retrenchment of supply management. Burroughs' successful application of the synthetic hormone DES in cattle feed led to an increase in weight gains of more than 10% overnight. Not soon after Iowa State had publicly announced Burroughs' DES findings, Burroughs himself helped Garst design a corncob-based cattle feed that contained DES.[242] By the end of the decade, the Garst cattle operations had doubled in size. By the early 1960s, as many as 95 percent of the nation's cattle feeders were using DES to stimulate increased feedlot production.

[241] Alan Marcus, *Cancer from Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: The Johns Hopkins University Press, 1994), 1.
[242] Glenn Cunningham, "We Can Produce 8-cent Beef," *Iowa Farm and Home Register* (June 6, 1954): 9-10, in Box 1, RS 9-11-54, Iowa State University Archives; "Wise Burroughs Papers" from here on.

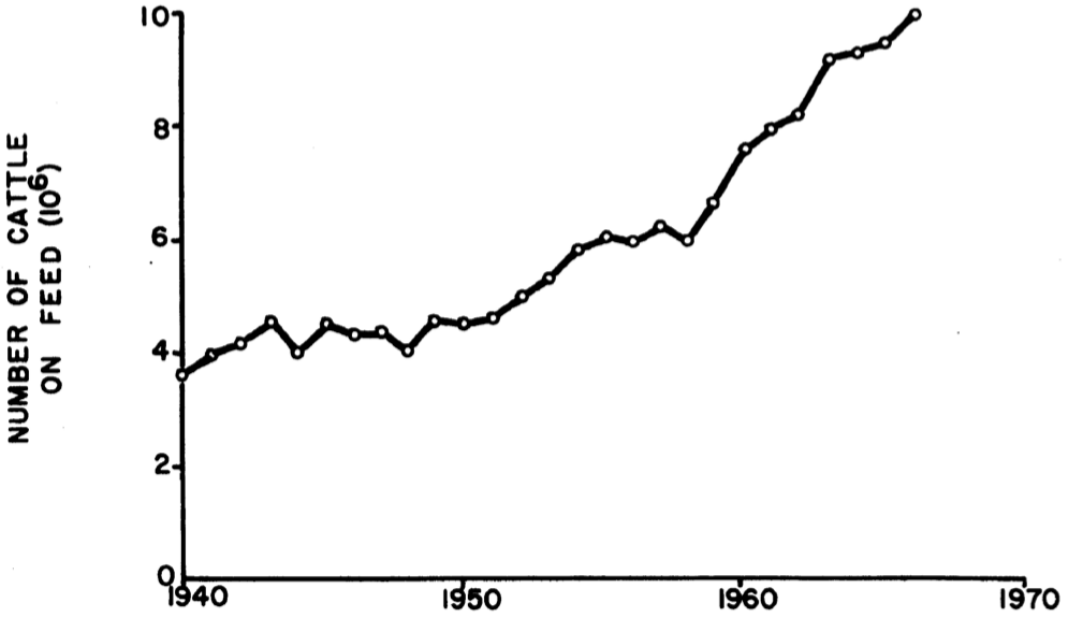

FIGURE 5
NUMBER OF CATTLE ON FEED
1940-1966

Image 6: Showing the dramatic growth of cattle feeding in the mid-1950s, corresponding to a retrenchment in the supply management of feed and the introduction of DES in cattle rations. Source: Raymond C. Loehr, *Pollution Implications of Animal Wastes—A Forward Oriented Review* (Ada, OK: Robert S. Kerr Water Research Center, Federal Water Pollution Control Administration, US Dept. Of Interior, 1968), 18.

Burroughs' innovation with DES is exemplary of the new emphasis on 'growth for growth sake' in the field of animal nutrition. His relationship with feeders such as Garst surely influenced him in his quest for feeding efficiency and weight gain in ruminants. Burroughs' eagerness to share experimental and unpublished results with Garst, was indicative of his desire for approval (and perhaps, more funding) from his feeder clients. Further, his steady communication and direct assistance to Garst, unmediated by extension agents, was a sign of the

changing relationship between animal scientists and feedlot capitalists—taken even further by Monfort and Matsushima as discussed in the remainder of the chapter.[243]

Matsushima, Monfort, and Colorado A&M

Matsushima, a third generation Japanese-America, was born in 1920, to parents who worked in the sugar beet fields of Colorado. He had known of Warren Monfort since his high school years. As student president of the Platteville 4-H club, Matsushima had competed with Monfort's sons Dick and Kenneth at county, state, and national livestock shows. By age 15, Matsushima had already won prizes at the National Western, often alongside the youngest Monfort, Ken. Warren Monfort, who was on the State Board of Agriculture and greatly involved with the expansion of Colorado A&M, gave regular talks at the college's Livestock Club, when Matsushima was an undergraduate there. His time at CSU, also coincided with the Japanese Internment of WWII, which Matsushima recalls evading with the help of sympathetic friends and neighbors.[244]

After the end of the war, Matsushima chose to pursue his childhood interest—cultivated during his early years with the 4-H— in livestock agriculture. Thus, he began a PhD in animal

[243] In 1988, Iowa State University's animal science department invited faculty, animal producers, and industry representatives to form the Animal Growth and Development Research Council to further the "exchange of ideas and research" between the assembled groups—already a long tradition at land grant universities. At their first meeting, the council announced the Wise Burroughs Memorial Endowment. Garst's granddaughter, Elizabeth Garst, on behalf of the Garst Group, announced a $100,000 donation—the largest contribution—to the Endowment. "There has been a positive and vital interaction between the Garst Family and Iowa State University's department of animal science since my grandfather Roswell Garst began working with Wise Burroughs in tshe '50s," she explained. Garst and Burroughs' relationship had lasted almost three decades, until 1977 when the former passed away. See: Iowa State University Information Service "$300,000 Endowment to Support Animal research at ISU" (July 20, 1988) in Box 1, Wise Burroughs Papers.

[244] Rachel Gabel, "A Cattle Feeding Giant Turns 100," The Fence Post (December 18, 2020) Obtained from: https://www.thefencepost.com/news/a-cattle-feeding-giant-turns-100/ Accessed on: Feb. 17, 2021.

science at the University of Minnesota.[245] And after graduating in 1949, he joined the staff of the Animal Husbandry Department at the University of Nebraska (Lincoln) where he became responsible for cattle feeding and nutrition research. It was here that he made his first breakthrough in ruminant nutrition—the successful application of antibiotics in cattle.

Every year Nebraska's experiment stations lost a significant percentage of calves to diarrhea (scours). Matsushima thought to feed the newborn calves aureomycin (chlortetracycline) tablets in order to prevent it. In the late 1940s researchers at American Cyanamid had stumbled upon the "antibiotic growth effect."[246] Antibiotics administered through feed had increased weight gain in chicks by 10% or more. Further studies by independent land-grant scientists found that aureomycin spurred the growth of hogs by as much as 50%. The FDA approved the use of antibiotics in animal feed in 1951. Early investigations on the effect of antibiotics on ruminant animals, however, were less conclusive and yielded no significant gains or benefits.[247]

Perhaps, Matsushima had chosen aureomycin to treat calf scours after studying the work of Iowa State hog scientists, who had found that the antibiotic gave hogs less trouble from scours while also stimulating impressive weight gains.[248] Matsushima's experiment with calves found that not only did the antibiotic aureomycin reduce the incidence of calf scours at Nebraska's Experiment Station, it solved a problem with much more significance for the feedlot industry.

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[245] John K. Matsushima interviewed by Frank Boring, *Society of Senior Scholars Oral History Project* (Jan 9, 2018), Accessed at: https://mountainscholar.org/videoplayer/index.php?kid=0_7inanr0b

[246] Mark R. Finlay, "Hogs, Antibiotics, and the Industrial Environments of Postwar Agriculture," in *Industrializing Organisms: Introducing Evolutionary History* ed. Susan R. Schrepfer and Philip Scranton (New York: Routledge, 2004), 243-244.

[247] University of Illinois, Beef Cattle Division, Animal Science Department & Experiment Station, "Project 294: Antibiotics for Beef Cattle, 1952-53" in *25th Annual Cattle Feeders' Day*, (Oct. 23, 1953): 13. Box 3, Wise Burroughs Papers.

[248] J.L. Anderson, *Industrializing the Corn Belt: Agriculture, Technology, and the Environment, 1945-1972* (Dekalb: Northern Illinois University Press, 2009), pg. 93.

When Matsushima's calves eventually went to the slaughterhouse, he discovered that those fed aureomycin did not have abscessed livers—a common ailment in grain fed cattle.[249]

A feedlot's corn-based diet changes the rumen bacteria in the stomachs of ruminant animals. Not adapted to consuming large amounts of grain, the rumen's pH drops in feedlot cattle, causing acidosis. The acid damages the rumen wall, and allows bacteria to pass into the liver causing abscesses.[250] Not only did scarred livers, otherwise valuable organs, have to be condemned by the slaughterhouses, but they also caused reduced weight gains in the affected feedlot animals.

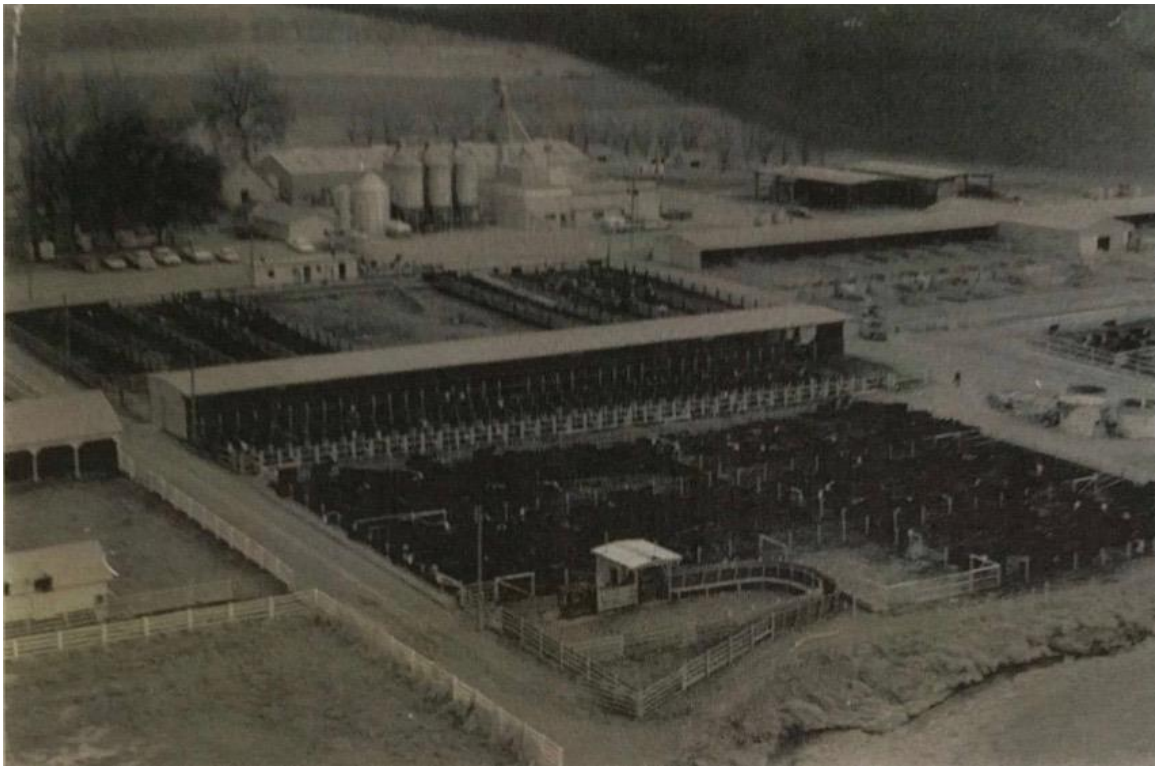
Matsushima's use of aureomycin would thus bring millions of dollars in savings to the beef industry. And while antibiotics might have been some small comfort to feedlot animals suffering the consequences of their alienation from grass, antibiotics also enabled and perpetuated further and greater confinement. Diseases that would have overwhelmed populations in a feedlot's closely packed quarters could now be kept in check by the antibiotics. The advantages of antibiotic-enabled confinement feeding that were being reaped by the poultry and hog industries were finally opening up to cattlemen.

Aureomycin made its way into feedlots around the nation and Matsushima became a sought-after animal science consultant. He would regularly meet with three of the leading cattle feeders of 1950s: Warren Monfort, Louis Dinklage, and Earl Brookover. At one such visit to the Dinklage feedlot in Nebraska, Monfort asked Matsushima if he would be willing to return to his native Colorado; the subtext being, "come work for me." As Matsushima tells it, before he could

[249] Jack Guinn, "John Matushima: Genius of the Feedlots," *Empire Magazine, The Denver Post* (Aug 13, 1967)
[250] John Campbell, "Liver Abscesses Still Significant Challenge for Cattle Industry," *The Western Producer* (Jan. 8, 2015). Retrieved from: https://www.producer.com/2015/01/liver-abscesses-still-significant-challenge-for-cattle-industry/ Accessed on: Oct. 21, 2018.

make up his mind, Dinklage offered him a brand new Cadillac if he would stay in Nebraska. And not soon after, Brookover tried to hire Matsushima as the manager of his feedlot in Kansas.[251]

These cattle feeders clearly understood the value of animal science to their businesses and realized the competitive edge that Matsushima provided. Farmers had long sought the assistance of scientists at land-grant colleges. What was novel in the 1950s, was the fact that Matsushima was going to the farmers instead—except that these weren't farmers, they were agribusinesses. He was going directly to their fields and feedlots, discussing the business of animal production over meals, and weighing offers to move from one land-grant college to another based on the research and monetary opportunities each represented.



[251] John K. Matsushima interviewed by Jim E. Hansen, *Society of Senior Scholars Oral History Project* (March 2, 2010), Accessed at: https://mountainscholar.org/handle/10217/82593

Image 1: Aerial view of Ridgen Farm, the CSU research facility where Matsushima conducted feeding trials on up to 3500 beef cattle every year. Found in John K. Matsushima, *Broad Horizon: I Fear No Boundaries* (CreateSpace: 2011).

In 1961, Matsushima decided to take up Monfort on his offer. Monfort and the Colorado Cattle Feeders Association sweetened the deal by securing funding for brand new cattle feeding facilities at CSU (see Image 1). One of the preeminent cattlemen of Colorado, W. D. Farr, admitted, "[Matsushima] is on the faculty of CSU because of the insistence of Colorado Cattle Feeders."[252] Matsushima recalls the presence of cattle feeders at his interview with the director of the experiment station. Farr and his fellow cattle feeders believed that with Matsushima's help CSU would be able to develop "field testing at the feedlot level, rather than in the small five and ten head units," at other experiment stations.[253] They wanted to ensure that the science conducted at their land-grant university could be easily replicated at their own feedlots. Further, they enticed Matsushima to visit their individual feedlots and study their operations in search of greater gains and efficiencies.

The cattle feeders' sway at CSU was not just limited to their financial contributions to the university. Warren Monfort served on CSU's governing board for eight years, four of which he served as chair. Monfort was also a close friend and adviser to Bill Morgan, CSU's President from 1949 to 1969. Monfort's son, Kenneth, not only went on to serve on CSU's governing board as well, but was elected to the Colorado General Assembly in the 1960s. CSU's website to this day states, "Collectively, no single family has done more for Colorado State University than

[252] W. D. Farr to C. W. McMillan (1962) in Box 65, 1713, ANCA Collection, American Heritage Center, University of Wyoming; "ANCA Collection" from here on.
[253] Ibid.

the Monforts."[254] Thus, Monfort's desire to have Matsushima hired at CSU would have held considerable power.

The stunning growth and resulting opportunities that the Monfort operations in Colorado presented, were not lost on Matsushima either. By the end of the year 1960, the Greeley feedlot could hold near 35,000 cattle on 135 acres.[255] With control over such an enormous supply of bovine creatures, that year, Monfort's son Kenneth had convinced his father to purchase a packing plant in Greeley.[256] Vertical integration was paradigmatic of agribusiness in this era.[257] Poultry feeders were some of the earliest in the meat industry to integrate feed mills, hatcheries, contract chicken production, and processing. Although, in the cattle industry some packers did enter the feeding business, Monfort was one of the only feeders to integrate forward. The slaughterhouse tightened Monfort's grip on an animal's life, and in turn helped the company make it through the highs and lows of the cattle cycle. When fed cattle prices were low, the packing plant would more than make up for the feedlot's losses.

Monfort's integration into meat packing played an important part in Matsushima's decision to take Monfort up on his offer. The Monfort packing plant had begun to pioneer "boxed beef," pre-fabricated cuts sold directly to retailers—a game changing innovation in meatpacking. The plant became a launching pad for the Monfort business empire and Ken, Matsushima's childhood friend, became the moving force behind the company's growth. The packing plant created a powerful feedback loop for the growth of the feedlot, which grew to 160

[254] Colorado State University, "Monfort Excellence Fund," CSU, Obtained from : https://monfort.colostate.edu/monfort-family/ Accessed on: Feb. 17, 2021
[255] Larry Faas, "Monfort Feedlots turnout 80,000 head a year," *The Cedar Rapids Gazette* (January 8, 1961), 12.
[256] The Monfort's started Greeley Capitol Packing Co. as a joint venture with Dave Averch and his brother Meyer Averch who were Denver Packers. But within a year, the Monfort's had bought them out.
[257] Shane Hamilton, *Supermarket USA: Food and Power in the Cold War Farms Race* (New Haven: Yale University Press, 2018), Chapter 5.

acres with a 60,000 capacity by 1965, and a staggering 100,000 cow-capacity over 300 acres by 1968.[258] Matsushima's expertise and business sense were essential to Monfort's expansion in the 1960s, and it was only with his invaluable assistance, that the Monfort feedlot in Greeley gained the distinction of becoming the world's largest feedlot, with a hundred thousand cattle.[259]

The Transition to a Flaked Corn Diet

Before his move to Colorado, Matsushima had struck upon his next big idea. Over a hot oatmeal and cornflakes breakfast with several cattle feeders one morning, he asked: why not feed hot cornflakes to cattle in the feedlot?[260] This, he thought, would increase the animal's appetite on cold Colorado mornings and the moisture content of the flaked corn would result in more gains per pound of grain consumed by feedlot cattle, in other words, it would increase feed efficiency.[261] The feeders around him, including Monfort, were obsessed with feed efficiency at their operations and Matsushima was thinking exactly like the other feedlot capitalists at the table. It is, perhaps, unsurprising that the language of "feed efficiency" entered the vocabulary of animal nutrition and the pages of the *Journal of Animal Science* around the same time as large-scale feedlots began to emerge.[262]

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[258] Willard Haselbush, "Cattle Go Big for Hot Cornflakes," *The Denver Post* (August 21, 1966); Bruce Wilkinson, "Warren and Ken Monfort Commercial Feeders of the Year," *Feedlot Management* (February 1974)

[259] Eric Schlosser, *Fast Food Nation: The Dark Side of the All-American Meal* (New York: Mariner Books Houghton Mifflin Harcourt, 2001), pp. 151; The Tribune, "Warren Monfort, One of Weld's 1st Entrepreneurs," *The Tribune* (Jan. 21st, 2011), Retrieved from: http://www.greeleytribune.com/news/local/warren-monfort-one-of-welds-1st-entrepreneurs/ Accessed on: Sept. 17th, 2017.

[260] John K. Matsushima interviewed by Jim E. Hansen, *Society of Senior Scholars Oral History Project* (March 2, 2010), Accessed at: https://mountainscholar.org/handle/10217/82593

[261] Jack Guinn, "John Matushima: Genius of the Feedlots," *Empire Magazine, The Denver Post* (Aug 13, 1967)

[262] Aside from two early mentions in articles on pig breeding (1927) and lamb nutrition (1936) "feed efficiency" gained sustained usage in the late 1940s and especially from the 1950s on. The first article in cattle nutrition to have the term in it's title was: J. P. Baker, R. W. Colby, C. M. Lyman, "The Relationship of Feed Efficiency to Digestion Rates of Beef Cattle," *Journal of Animal Science*, Volume 10, Issue 3 (August, 1951): 726-732.

As work progressed on building a prototype corn flaking machine, Matushima recalls, Monfort remaining "very generous" toward him and maintaining an active interest in his research. Matsushima visited the feedlots in Greeley regularly and conducted experiments there.[263] He would later recall of the Monfort feedlot at Kuner, "this was [my] laboratory."[264] A large portion of the experimental cattle from the university's research farm was also marketed at the Monfort packing plant where Matsushima would often visit to inspect the carcasses for yield.[265]

By 1962, Monfort had began sending his son Kenneth—future CEO of the Monfort Company—to visit Matsushima. Ken and Matsushima got along well, and built upon their childhood acquaintance. At one such meeting, Matsushima explained how the flaking process would save the Monforts ten to fifteen percent in grain feed costs. And the capital outlay required for the steam flaking machines would be earned back in feed savings within two years. Matsushima was speaking in terms that a businessman could appreciate. Before long, both Monforts were convinced, and by 1966 had invested over a million dollars in sixteen flaking machines of Matsushima's design.[266]

Large investments in grain-feeding technology were a sign of cattle feeder's confidence in the politics of corn. The 1960s saw the Farm Bureau fall out of favor in Congress, and a rise in the fortunes of commodity groups such as the National Livestock Feeder's Association and the U.S. Feed Grains Council, representing the interests of large cattle feeders such as Monfort of

[263] John K. Matsushima and W. D. Farr, *A Journey Back: A History of Cattle Feeding in Colorado and the United States* (Colorado Springs: Cattlemen's Communications, 1995): 131-133.
[264] Coleman Cornelius, "CSU's beef-feeding innovator is Citizen of the West," *Today @ Colorado State* (Jan. 7, 2013).
[265] Jack Guinn, "John Matushima: Genius of the Feedlots," *Empire Magazine, The Denver Post* (Aug 13, 1967)
[266] John K. Matsushima and W. D. Farr, *A Journey Back: A History of Cattle Feeding in Colorado and the United States* (Colorado Springs: Cattlemen's Communications, 1995): 134.

Colorado. Throughout the decade, the USDA worked with such groups and grain companies such as Cargill (later to become one of the world's largest meat processors) to establish animal feeding operations around the world—expanding markets for US feed grains.[267] Because surpluses continued to rise, agricultural legislation in the 1960s again created voluntary acreage reduction programs for corn and other feed grains. Nonetheless prices remained low. CCC loan rates were reduced as well, lowering the price floor on corn.[268] These were halcyon days for cattle feeders and land grant scientists such as Matsushima took full advantage of the situation to further their grain feeding ideas and research.

Matsushima had designed a process that would increase weight gain in corn-fed cattle by a whopping ten percent. Four 10-ton natural-gas-powered Catterpillar engines supplied 16 steam cookers with the energy to heat 1.3 billion pounds of corn a year at 250 degrees for approximately 18 minutes. The steam-cooked corn would then be rolled into flakes and served hot to the feedlot animals. The process would add six percent moisture to the corn and the flaking would fracture the starches and sugars into a more digestible product for the ruminant creatures. The accompanying boost in feeding efficiency when coupled with the growth inducing effects of DES and antibiotics in bovine diets amounted to an explosion of the grain-feeding industry and skyrocketing cattle numbers.

Kenneth Monfort would later say of the flaking process: "I think this is the biggest improvement in the cattle feeding business since stilbestrol."[269] But Matsushima would leave his mark on hormone research as well. Stilbestrol, or DES, was most effective at putting gains on

[267] Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009), 156.
[268] Stephanie Mercier, "Corn: Background for 1990 Farm Legislation," Staff Report No. 89-47, Commodity Economics Division, Economic Research Service (Washington D.C.: USDA, Sept. 1989), 29.
[269] Jack Guinn, "John Matushima: Genius of the Feedlots," *Empire Magazine, The Denver Post* (Aug 13, 1967)

castrated male steers but not the female heifers. Matsushima found a synthetic female hormone that promised to do for heifers what DES had done for steers. It was called melengestrol acetate or MGA, and unlike DES, continues to be used by cattle feeders today.[270]

In Matsushima's report to the Colorado Cattle Feeders Association he described the MGA tests he had conducted with over 1500 feedlot heifers at three different Colorado feedlots. He emphasized that MGA-treated animals averaged twelve-pounds more gain and between 3% and 18% greater feed efficiency than the control animals. Ever conscious of his audience, he also monetized these total savings as a combined advantage of "$6.41 per head" in favor of the MGA-treated heifers.[271] Conducting large scale research at private feedlots made Matsushima, in a sense, beholden to them. So it is not surprising that he often boiled down his findings to what ultimately mattered to feeders: the bottom line.

Life and Work at Monfort of Colorado

The adoption, by the Monforts, of Matsushima's cutting-edge corn flaking technique necessitated several notable feeding innovations and a transformation of life and work at the feedlot, for both humans and animals. With so much feed to deliver right to the cattle, close to 3 million pounds a day over more than 600 individual trips from grain bin to feeding trough, the Monforts began to devise an automated system of feed delivery.[272] As rural labor pools shrank,

[270] In 1971, Boston researchers found extremely rare cancers in young women whose mothers had taken DES during their pregnancies. The ensuing "DES Daughters" issue became a battle cry for more research and eventually drove concerned citizens, scientists, and congressional representatives to force a ban on most uses of DES, including its use as a feed additive, by 1979. For more on DES see: Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010)
[271] Information Service Colorado State University, "New Hormone for Feedlot Heifers: CSU Scientist Says Compound Increases Gains, Lowers Costs" (August 25, 1966), 2, in Box 121, ANCA Collection.
[272] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, 102.

increasing mechanization and automation were the need of the hour. Monfort employees worked closely with an engineering company to develop a more efficient way of delivering exact amounts and proportions of feedstuff to specific pens. The result was a novel computerized feeding process that gained widespread use in feedlots around the world.[273]

REGISTER PHOTO BY MAURICE HORNER

Feeding cattle with the help of electronic equipment at the Monfort feedlot is Carol Luark. Rations for each pen are mixed and weighed automatically.

Image 4: Carol Luark, a Monfort employee, inserting an IBM punch card into the computerized equipment at the Greeley feedlot's control room. Source: Ronald Harley, "Giant Feedlot: A Threat to Iowa Farmer" Des Moines Sunday Register (Oct. 17, 1965)

[273] Ibid., 101.

The heart of the new feeding system was the control room, where trained employees, would communicate with foremen on the ground who pointing them to pens that needed a refill. Workers in the control room would scan the extensive CCTV network to locate the pen and cattle in question, to corroborate the foreman's observation. Checking the computer to see which animals were in that exact pen, how old they were, how long they'd already spent in the lot, and the record of their daily custom diet, the employees would decide the contents of their next meal. Manipulating the buttons, knobs, and dials on the electronic equipment they would set in motion a weighing system in the elevator which would batch out the correct quantities and proportions of each ingredient into a truck waiting underneath the chute. The truck driver would then be directed to the target feeding bunks, while the ingredients would be churning within the mixer attached to the truck. The IBM data processing system would simultaneously record every detail of all such deliveries, creating a database for the Monforts to analyze and thus improve.

At Monfort feedlots it was usually men who filled the role of foremen and truck drivers, but women, like Carol Luark, who worked in the control rooms and administrative offices. Working with animals could be dangerous work, largely considered ill-suited for women. It was not uncommon for bovines to kick and shove handlers when scared or provoked. Traditions of human-bovine interaction, with roots in the nineteenth century cattle trails, made cattle feeding a strongly gendered industry.[274] Temple Grandin, a female feedlot equipment designer, was an exception not the norm.[275]

Not only was there a gendered division of labor, but a racial one as well. Since the 1960s, low-skill roles at the feedlot were often filled by Mexican immigrants, who had arrived in the

[274] This division of labor did not extend to packing plants. More than half the workforce at the Greeley slaughterhouse comprised of women in the 1980s, many of them single mothers.
[275] For instance, not one woman has been inducted into the Cattle Feeders Hall of Fame since its founding in 2009. Kenneth Monfort was inducted in 2010.

United States under the Bracero program to find work in Colorado's sugar beet industry. Pedro Rodriguez was one such immigrant worker who had moved to Colorado with his family in 1958 to work for the Great Western Sugar Company. At the time Monfort of Colorado had a primarily white work-force, paying reasonable wages. But with increased industry-wide competition during the 1960s, Monfort began to hire low-wage immigrant labor. In 1969, Pedro and his brother-in-law, Tomas, started work at the Greeley feedlot repairing fences. Tomas went on to work at Monfort for over two decades, before he was injured in a work place accident which the Monfort's refused to recompense.[276]

In every way, it was not humans but bovines that were at the heart of every feedlot operation, working and creating value around the clock. Selecting the right feeder cattle was crucial to the success of the feeding enterprise. Monfort sought out young animals with heavy hindquarters that weighed about 600 pounds at the Denver and Chicago stockyards. In later years he described exactly the kind of animal he liked:

> The medium sized type… I don't like the little dumpy ones and I don't like the big, rough, 'horsey' kind either… the typical good feeder—one with plenty of middle, the 'well pushed together' type with good width and depth. I like to have them carry well back through the hindquarters and have a deep flank. There shouldn't be any narrowness back of the shoulders and, more than anything else, we like to buy the good-headed ones. The heads are indicative of just about everything, especially quality…a short, broad head, dished a bit below the eyes to the muzzle. We like a good wide muzzle. The eyes should be set well apart.[277]

Thus, looking each animal in the eye, Monfort would buy hundreds of such bovines, at a time, and ship them by train and truck to Colorado. After feeding them for 6 to 8 months in Greeley, he would ship them back for sale, twice as heavy, to Denver or Chicago, and there buy a hundred

[276] Carol Andreas, *Meatpackers and Beef Barons: Company Town in a Global Economy* (Niwot, CO: University Press of Colorado, 1994), 16.
[277] H.P. White, "How Does Monfort Do It?" *Western Livestock Journal,* Vol. 35, No. 3 (October 1949), 11.

more "feeders". In this way, he managed purchasing at his feedlot, all-year round, with the help of only a handful of full-time employees.[278]

The dry and mild weather of Weld County, Northern Colorado, was well-suited to bovine animals. Year-old steers and heifers arriving at Monfort lots, from pastures around the country, were first dipped from head to toe in tanks of antiseptic solution to destroy external parasites, then vaccinated, and finally quarantined for a few days of observation before being placed in pens with other cattle. If, during their first few days of isolated surveillance, they were found to be ill or ailing in any way, they would be sent to the feedlot's hospital section to be examined by a team of veterinarians and brought back to health. The incoming animals would all be grouped together into pens, not by the herds they came in, but by weight, resulting in pens where the animals had to re-socialize with strangers who were within a 50 pound weight range. Each pen, with up to 400 bovines, would be marked by Monfort's coding system according to time of arrival, weight range, type of feeding, and the date of delivery for slaughter—"a kill schedule".[279]

Monfort not only took charge of these bovine lives, but also pre-determined the time of their deaths; all in service of a capitalist calculus. This calculation of life, labor, and death was made explicit in the accounting of costs at the feedlot. In the computer system, each individual pen of bovine creatures was charged the cost of their feed, so that their productivity and profitability upon sale could easily be calculated on a per head basis. By measuring individual

[278] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, 79.
[279] *Rocky Mountain Industries* (Feb, 1971) in file 2, box 7, OCC-024-5Riv, Greeley Museum; "Meatpacker: Beef it up" *Business Week* (Aug. 30th, 1969), in file 2, box 7, OCC-024-5Riv, Greeley Museum

animal productivity, feedlot operators implicitly acknowledged the labor of their creatures. One journalist paraphrased Monfort's system as: "cost control, pen by pen and cow by cow."[280]

But eating a corn-heavy diet did not come naturally to these ruminants. Cattle new to the feedlot, and used to pasture, needed to be weaned off of grass. They were placed on a starting ration of 60% roughage and 40% concentrate. The roughage was gradually reduced as the grain concentrate was increased over 3 to 6 weeks until the animal ate 92% to 95% concentrate for the remainder of their lives. The concentrate included not just corn and other grains, but hormones and antibiotics to speed up growth and keep the bovine creatures free from any disease that would otherwise have decimated such a closely packed population. Despite such precautions, and being closely watched at all times, 30,000 animals were treated in the sick bay in 1970 alone, i.e. more than 10% of the animals that came through. The most common ailment was respiratory. An underground sprinkler system was thus installed to dampen the dust generated by the massive herd of bovine creatures. Because all the animals were visually inspected at least once every day by "cowboys" on horseback, the feedlot employed a large team of such "checkers".[281]

The feedlot operators aim was to move the cattle *at most* three to four times during their entire residence at the feedlot. In order to constrain the animals' movement, Monfort constructed feedlot pens using 20,000 steel fence posts and 126 miles of cable in between. Everything had to be brought to the animals instead of the other way around. The feed was brought by a fleet of trucks and poured into 18 miles of feeding bunks. And the water was provided in self-filling heated tanks by 32 miles of underground pipes supplying 1.5 million gallons a day from 9 wells. It was only when the scheduled kill date arrived that the animals had to be moved a significant

[280] Willard Haselbush, "Cattle Go Big for Hot Cornflakes," *The Denver Post* (August 21, 1966)
[281] "Inside Story," *International Stanley Corporation* (Winter, 1972-73) in file 2, box 7, OCC-024-5Riv, Greeley Museum; Bob Reynolds the nutritionist at the Greeley Feedlot provides the rations in File 6, Box 6, OCC-023-5Riv, Greeley Museum. Also see File 7, box 7, OCC-024-5Riv.

distance—one mile down the road from the feedlot, to the Monfort packing plant. There, just 28 minutes elapsed between the time an animal was killed with a special bullet, and when the carcass was ready for the cooler.[282] The carcasses of these corn-fed animals would yield 65% beef, 93% of which was choice grade.[283]

Bovine life at the Monfort feedlot was representative of conditions in large operations around the nation. The number of such operations was on the rise, while smaller feedlots continued to decline (see image 5). This structural change was facilitated by the increasing efficiencies made possible by capital intensive technologies developed by animal scientists at land grant universities. Unable to afford large corn flaking systems, smaller feeders could not compete in an increasingly competitive market. This market was shifting toward lean beef and Matsushima was called upon to translate this to cattlemen around the nation.

National Feedlot Structure, 1962 and 1973

Lot Capacity in Head	*Number of Lots*		*Cattle Marketed (000 head)*	
	1962	1973	1962	1973
Under 1000	234,646	144,380	9,045	8,968
1000 – 3,999	1,186	1,336	1,723	2,425
4000 – 31,999	326	635	3,419	9,105
32,000 and over	5	69	314	4,833
Total	236,163	146,420	14,501	25,331

Calculated from statistics in *Number of Feedlots by Size Groups and Number of Fed Cattle Marketed 1962-64*, USDA-SRS-9, June 1966, and Cattle on Feed, USDA-SRS, Jan. 18, 1974.

[282] William M. Blair, "Broad Changes Sweep Cattle Industry," *New York Times* (April 30, 1966)
[283] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, 107.

Image 5: Changing structure of cattle feeding between 1962 and 1973. Image Source: Joseph C. Meisner and V. James Rhodes, "The Changing Structure of U.S. Cattle Feeding," Special Report 167, University of Missouri-Columbia (November 1974), 6.

Fed Beef Contest

From his early experiences in livestock judging contests, Matsushima knew that the outward appearance of an animal did not always correspond to its retail value. In fact, this discrepancy caused him to quit judging livestock for a time. It was a stock show in Omaha during the 1950s, when Matsushima found out that the steer he had awarded "grand-champion" at the fair had the "worst carcass" with about an "inch of fat."[284] This would prove to be a formative moment for him and shape his search for the ideal beef animal—ideal in the eyes of packers and retailers that is.

On one of Matsushima's regular visits to the Monfort Packing Plant in Greeley he noticed an "exceptional" carcass with an unusually large rib eye—the size of which is a reliable indicator of the carcass' saleable meat and retail value. Matsushima was so impressed with the rib eye, that he got Ken to give him half the carcass and bought another "average" half-carcass of similar weight to compare it with. The astonishing result of his tests revealed that the extraordinary animal had more than hundred dollars of saleable meat in comparison with its average counterpart. "It was a terrific find," thought Matsushima.[285] Monfort went further:

> Somewhere along the line in the correlation between breeding and proper feeding we're going to find out how to produce animals like this—and I think it'll take people like John Matsushima to do it.[286]

[284] John K. Matsushima interviewed by Jim E. Hansen, *Society of Senior Scholars Oral History Project* (March 2, 2010), Accessed at: https://mountainscholar.org/handle/10217/82593
[285] Jack Guinn, "John Matushima: Genius of the Feedlots," *Empire Magazine, The Denver Post* (Aug 13, 1967)
[286] Ibid.

This statement, as well as Matsushima's access to the Monfort operations, was a sign of the promise (of greater profits), that many feeders felt, animal scientists held the key to.

By the 1960s, packers like Monfort and retailers like Safeway were no longer interested in the "fat" cattle that remained popular at stock shows. The rise of grain feeding had led to the production of overly fat animals that yielded less saleable meat per pound of flesh and were increasingly eschewed by health-conscious consumers. Thus, the general manager of the National Western Stock Show approached Matsushima to "take the guess out of picking the desirable market beef animal."[287] This is reminiscent of the USDA's efforts to translate market needs to producers in the 1920s.

In the new era of agribusiness, large national retailers like Safeway had built enormous distribution networks for agricultural goods, and therefore held tremendous sway over production.[288] But the relatively few integrated cattle feeding and packing operations (Monfort was an exception in this), made it harder for them exert the kind of control over cattle producers and feeders that they had over broiler production. Integrated feeders and processors, engaged in contract farming of livestock, could respond relatively swiftly to changing retailer preferences. But with cattle, and their long gestation cycles and several months spent weaning calves, it was much harder to coerce thousands of independent producers, largely free of contracts, to respond swiftly to consumer demand.[289]

To this end—changing the standards of cattle feeding and production to meet retailer demand—Matsushima, with help from a Colorado cattle feeder and a PR manager at Safeway

[287] John K. Matsushima and W. D. Farr, *A Journey Back: A History of Cattle Feeding in Colorado and the United States* (Colorado Springs: Cattlemen's Communications, 1995): 98-100.
[288] Shane Hamilton, *Supermarket USA: Food and Power in the Cold War Farms Race* (New Haven: Yale University Press, 2018).
[289] Forward contracting of fed cattle became more common starting in the 1980s.

Stores, designed the Fed Beef Contest at the National Western Stock Show. The contest aimed to help cattlemen recognize animals that would yield carcasses with less fat and more beef, and therefore encourage their production. In other words, Matsushima sought to turn the attention of cattlemen from the animal itself to the carcass it was destined to become, an attempt to further establish the "beef-on-the-hoof" paradigm that the USDA had begun instituting with its beef grading program in the 1920s.

Each participant at the contest selected a given number of live steers or heifers that, in their estimation, would have the most profitable carcasses. These animals would then be slaughtered at a designated packing plant where the carcasses would be evaluated by judges. The contest effectively became a way to educate cattlemen about the importance of carcass yield. This was especially the case with the introduction of another aspect: each participant would predict the outcome on the carcass evaluation of the animals in their entry, prior to slaughter. Those whose predictions came closest to the final results would win prizes and awards. In this way members had an opportunity to compare live animals with their corresponding carcass values. And further, to visualize the carcass when seeing the animal.

In this way, the Fed Beef Contest began changing the ways in which cattlemen viewed their creatures. The contest grew in participation and sponsorship since its inception in 1965, and became one of the most successful contests at the annual conventions under Matsushima's two decades as Superintend. Every year, retail cuts from the grand and reserve champion animals were exhibited in a Safeway refrigerated display at the National Western Stock Show—where attendance topped 200,000 people in 1967 and kept growing through the decades.[290] Within a

[290] For more on the history of attendance at the National Western see: https://nationalwestern.com/about/history/

few years, feeders began to realize that "we are producing meat that is fatter than our customer wants."[291] This was the realization of Safeway's desires.

Matsushima's experience at the Monfort packing plant was crucial to his search for high yielding carcasses and so also his ideation of the Fed Beef Contest. In recognition of the animal scientist who started it, one of the awards at the Safeway Fed Beef Contest was named the Matsushima Revolving Trophy.[292] This is not only evidence of yet another way in which agribusiness channeled land-grant expertise to achieve private ends, but also of how scientists like Matsushima had a tremendous impact on the cattle industry, arguably more-far reaching than any individual feeder ever.

Conclusion

In their effort to aid, assist, and even learn from feeders, animal scientists revised ruminant nutrition in a way that reified and magnified the practice of grain feeding. They also helped change the very ways in which the animals were viewed, by bolstering what I have called the "beef-on-the-hoof" paradigm. But these scientists did not act in isolation. Leading agribusinesses played an unprecedented role in directing the research that transformed animal agriculture, by drawing scientists out of their laboratories and into the field. They coaxed scientists to conduct experiments on their properties and in their operations, and succeeded in changing the goals of publicly funded research to suit their individual needs. In working closely with feedlot operators, animal scientists adopted the language, priorities, and goals of feedlot capitalism.

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[291] Bartell Nyberg, "Ken Monfort is optimistic: Cattlemen will survive," *Empire Magazine*, Denver Post (March 2, 1975), 9.

[292] In 1991, the contest was renamed the Safeway Fed Beef Contest in recognition of the retailers continued support. And in 2013, John K. Matsushima received the National Western Stock Show's prestigious Citizen of the West award.

In this new era of global ecological change American bovines went from grazing on green pastures to being served steam-rolled corn at concentrated animal feeding operations. These factory farms were equipped with IBM mainframe computers, CCTV networks, veterinary hospitals, fleets of custom-built trucks, and entire feed processing plants. But this bovine "paradise" came at a cost. With the introduction of synthetic hormones and antibiotics to their diet, bovine life expectancy in the beef industry shrank to less than two years even as the practice of confined feeding became widespread.

This transformation was envisioned and enacted by the concerted effort of animal scientists and feedlot capitalists. Monfort and Matsushima, especially, went far beyond anyone else in their attempts to control and dominate every aspect of the lives of bovine creatures. That very endeavor, however, made their enterprise totally dependent on the animals that they sought to manipulate. The modern feedlot reorganized nature in ways that led to drastic environmental hazards, including water pollution, fish kills, and resulting ocean dead zones, the subject of the next chapter.

Feedlot Pollution & The Search for a Sanitary Feedlot

The odor and waste from a hundred thousand cows overcame every effort of the Monforts to diffuse it. During the 1970s, close to 300,000 bovines were "finished" in the Greeley feedlot every year, with an average stay of 140 days or 4.67 months, eating 23 to 30 lbs of feed a day and gaining 3 lbs on average daily.[293] This intensively fed and highly concentrated population of cattle created thousands of tons of manure a day—enough to make any effort to keep the water table clean, and the surroundings free from flies and foul-odor, seem inadequate. Monfort of Colorado's struggle against animal metabolism was expensive. They consulted with agricultural engineers to build a runoff containment system consisting of holding ponds that collected fluid waste in order to prevent the runoff from seeping into the underground water channels. The liquid was then pumped into irrigation ditches and sprayed onto surrounding agricultural land through surface irrigation. The remaining solid manure was collected and sold as fertilizer in order to recuperate some of the costs of the runoff containment system.

Despite their best efforts, however, the nearby Cache La Poudre river was getting so heavily polluted by the animal waste coming from the Monfort operations, including the packing plant, that they had to install a one-million-dollar regional sewage treatment lagoon system. The system consisted of 4 primary lagoons and 2 secondary lagoons handling up to 35,000 lbs of BOD per day. Through an agreement with Greeley authorities, however, Monfort got the city to put forward three-quarters of the cost.[294] Even the EPA contributed a grant of $300,000 toward the lagoon system.[295] In the end, Monfort of Colorado remained responsible primarily for

[293] "Inside Story," *International Stanley Corporation* (Winter, 1972-73) in file 2, box 7, OCC-024-5Riv, Greeley Museum

[294] Bruce Wilkinson, "Warren and Ken Monfort Commercial Feeders of the Year," *Feedlot Management* (February 1974)

[295] "Greeley Sewage Lagoon System Nears Completion," *Monfort of Colorado* Vol.8, No.1 (1973) in Box 5, SC 94, University of Northern Colorado, Monfort Collection.

maintenance costs.[296] Monfort may have been among the few feedlots large enough to secure massive local and federal government subsidies to bolster its pollution mitigation efforts, but it was not alone in its struggle to contain the externalities of cattle feeding.

By the 1950s, animal waste was becoming obsolete as a fertilizer, largely replaced by synthetic chemicals, while manure piled up at feedlots around the nation, poisoning rivers, streams, and lakes, eventually killing aquatic life in large swaths of the ocean.[297] In response to public complaints, legal challenges, and environmental legislation, feeders, large and small, aided by feedlot engineers, like Raymond Loehr, strove to contain this overabundance of animal waste. Agricultural engineers conceived of manure detention ponds, basins, and lagoons to accelerate manure decomposition. Through the USDA's extension service, they recommended diverse waste management systems, increased animal concentration and "complete confinement" to control feedlot pollution. Feedlot operators and scientists even took to feeding animals their own waste as a method to recoup costs and control the accumulation of waste. How these innovations would impact animal lives was not even spared a thought.[298]

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[296] Monfort's power to sway the local government in their favor owed much to the fact that they paid over a million dollars to Weld County every year in taxes. The growth of sunbelt states in the post-war years was the result of exactly such business progressivism in local politics. City, county and state government subsidized industrialization through tax exemptions, low cost utilities, government sponsored training, and policies facilitating the availability of cheap labor. Monfort's influence went further. Kenneth Monfort had held a seat in the Colorado General Assembly during the 1960s. Although he lost the primary race for US Senator in 1968, his influence in the Greeley community was bolstered by his active philanthropy. The University of Northern Colorado's Business School was named after him, among many other local initiatives, including several clinics and a park. Monfort of Colorado's Vice President, Hank Brown, served in the Colorado Senate during his time at Monfort in the 1970s, going on to represent Colorado in U.S. House of Representatives and eventually the U.S. Senate. On business progressivism see: James Cobb, *The Selling of the South: The Southern Crusade for Industrial Development, 1936-1990* (Baton Rouge: Louisiana State University Press, 1982)

[297] Raymond C. Loehr, *Pollution Implication of Animal Wastes—A Forward Oriented Review* (Ada, OK: Robert S. Kerr Water Research Center, US Dept. of Interior, 1968), 92.

[298] This argument builds on scholarship in environmental history and the history of technology that has suggested that efforts to contain waste, either displace it to another medium (in this case animal bodies), or create unintended consequences within the larger system (deteriorating animal lives). See: Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH: University of Akron Press, 1996); Martin Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000).

Farmers and public health officials in states such as Nebraska, that had a large number of feedlots, were among the first to seek legislation to curb pollution from concentrated animal feeding operations. Cattlemen chaffed against these statues which required most feedlots in the state to adopt expensive waste management systems. But the problem of feedlot waste just kept getting bigger. By 1972, animal feedlots represented the largest single source of solid wastes generated in the United States, over two billion tons, annually.[299] That year, the Clean Water Act specifically outlined "concentrated animal feeding operations" as point sources of pollution that needed to be regulated by the Environmental Protection Agency (EPA). But the implementation of the Act by the EPA, and its specific definition of "concentrated animal feeding operations," left a wide loophole for the majority of feedlots to escape regulation altogether. The EPA thus effectively lowered the bar for feedlot pollution regulation, leaving states to legislate more restrictive statutes independently, while arming critics with the justification that the federal standards were sufficient.

Nonetheless, the Clean Water Act of 1972 (CWA) became the first piece of federal legislation in the twentieth century to directly regulate the discharge of livestock wastes into public waters. In doing so, it drew the attention of disparate interests to the feedlot as a site of contestation. New stakeholders, such as sanitation engineers, public health officials, and environmentalists, thus began to shape the trajectory of feedlots in the United States and the animals within them. The cattle industry, whose waste management practices had long gone unquestioned, adopted new technologies and adapted to legislation in ways that benefitted larger operations to the detriment of small feeders.

[299] Paula M. Recker, "Animal Feeding Factories and the Environment: A Summary of Feedlot Pollution, Federal Controls, and Oklahoma Law," *SMU Law Review* Vol. 30 (3) (1976), 556.

Why and how did feedlot waste become such a problem so as to be singled out—the only agricultural operation to be called out by name—in the CWA? How did cattle feeders respond? What role did agricultural engineers play in helping feeders meet regulatory standards? And how did these changes impact feedlot animals around the nation? This chapter finds that state-level environmental regulation and public outrage were catalysts for the search for a "sanitary" feedlot in the United States. This search led agricultural engineers to transform feedlot design, and in the process cast greater animal density, increased concentration—the very source of the feedlot pollution problem—as the solution to managing feedlot waste. Faced with an opportunity to question the core logic of feedlots: animal concentration, to get at the very root of CAFOs' threat to the environment, engineers, legislators, even environmentalists instead focused on how to keep the problem away from the nation's waters.

Fertilizers: From Arms to Farms (to Oceans)

Animals (and their excreta), for millennia, had formed crucial links in a regenerative agronomic cycle taking the shape of mixed-farming practices across the planet. These practices were disrupted with the large-scale adoption of synthetic fertilizers in the mid-twentieth century.[300] The production of synthetic fertilizers got a large boost from the war time production

[300] After over a hundred years of investigation, by generations of scientists seeking the production of reactive nitrogen in order to replenish soil productivity, Fritz Haber finally synthesized significant levels of ammonia in his German laboratory in 1909. Within a year Carl Bosch turned Haber's method into a commercially viable process removing "the most ubiquitous limit on crop yields, opening the way for…the multiplication of global harvests." But not only did the production of synthetic ammonia and nitrates greatly improve soil fertility, it also helped displace the traditional use of manure as fertilizer, creating an ecological rift that led to the over-accumulation of animal waste in feedlots around the world. To be sure, animal manure and compost had low nitrogen content compared to synthetic fertilizers such as anhydrous ammonia and urea, but animal manure had nonetheless been considered an important fertilizer for centuries in many different parts of the world. See: Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2001), xv.

of explosives in both WWI and WWII. This is because fixed nitrogen is not only an essential component in the manufacture of fertilizers but also explosives. Lagging behind the European powers in the production of fixed nitrogen, the United States Congress had written a twenty-million-dollar appropriation for munition plants into the National Defense Act of 1916. According to the Act these factories would be turned to the peacetime production of cheap fertilizers when the war ended.[301] At the end of the World War I, the U.S. Secretary of War also created the Fixed Nitrogen Research Laboratory (FNRL), a federal effort to put leftover explosives and related technology to civilian agricultural use. The FNRL "helped deliver a blast of powerful and cheap chemical fertilizers in the United States for the first time in the late 1920s."[302] Further, FNRL research and patents were shared freely with American chemical manufacturers. Still by 1939, most farmers still fertilized their fields by recycling animal manure, and the application of synthetic nitrogen fertilizer "amounted to less than ¼ of all nitrogen received by the world's farmland every year from atmospheric deposition of ammonia and nitrates."[303]

World War II gave a great boost to synthetic nitrogen production in America. The U.S. government constructed ten ammonia production plants during WWII to fulfill the wartime demand for nitrogen based explosives such as TNT. After the war, "the federal government leased the tax-payer funded explosives factories to fertilizer and chemical companies for pennies on the dollar."[304] In this way, the transition from using manure to synthetic fertilizers on

[301] Timothy Johnson, "Nitrogen Nation: The Legacy of World War I and the Politics of Chemical Agriculture in the United States, 1916-1933," *Agricultural History* Vol. 90, No. 2 (Spring 2016), 209-229.
[302] Ibid., 211.
[303] Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2001), 139.
[304] Timothy Johnson, "Nitrogen Nation: The Legacy of World War I and the Politics of Chemical Agriculture in the United States, 1916-1933," *Agricultural History* Vol. 90, No. 2 (Spring 2016), 226.

American farms across the nation, was enabled and thoroughly subsidized by the U.S. government. Between 1940 and 1950, the use of synthetic fertilizers in the United States had doubled.

Feed grain cultivation, and the corn crop especially, had traditionally been fertilized by letting pigs and cattle out into the fields to feed before being sent to market. In the process the animals would fertilize the soil with their excreted urine and manure. Farmers also collected animal excreta throughout the year to apply on the soil. But by the mid-1960s, 90% of all corn fields in the United States received nitrogen fertilizers.[305] This divorced much feed grain agriculture from animal husbandry. The production of synthetic fertilizer therefore, increasingly freed up grain farmers from the need to keep livestock on the farm. The adoption of nitrogen fertilizers simultaneously boosted crop yields allowing the feeding industry to take advantage of an increased supply of cheap feed grains. Cattle feeding thus shifted from a side-business for grain farmers, to an industry in its own right. But this industry soon faced a major challenge: what to do with all the animal waste that farmers no longer depended on?

A feedlot cow can produce over 80 pounds of manure a day. At an average density of about 280 animals per acre, feedlots can produce over 22 tons of manure per acre in a day.[306] Manure in such enormous quantities can become an environmental hazard when it is carried by rain into surface and subsurface waters, bringing high concentrations of organic matter, nutrients, and disease organisms into lakes, streams, rivers and ultimately the ocean. Feedlot runoff that enters waterways can cause severe depletion of oxygen and is lethal to aquatic life. This is because feedlot runoff is high in organic content; Water with high organic content depletes

[305] Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2001), 151.
[306] Ibid., 557.

oxygen levels, measured by BOD (biochemical oxygen demand). Higher the BOD, greater the oxygen depletion, and therefore, lower the actual level of dissolved oxygen. While drinking water has a BOD of under 5 ppm, high in oxygen content, feedlot runoff can have BOD levels between 100 to 10,000 ppm, sometimes higher.[307] The additional presence of high concentrations of nitrogen, phosphorus, magnesium, potassium, and sodium in feedlot runoff, also causes algal blooms in lakes and other water bodies, further lowering oxygen levels and increasing acidification. Feedlot waste that enters aquatic ecosystems, therefore, leads to fish kills, eutrophication, ocean acidification, and what have been labeled "dead zones" in places like the Gulf of Mexico.[308]

Early Feedlot Pollution Regulation

Neighbors have filed nuisance claims against livestock farmers for centuries, usually complaining of noxious emissions and odors that result in the devaluing of nearby properties.[309] Feeders, especially, have long been defendants in cases claiming injury from the buildup of manure and the attendant odors resulting in the deterioration of fresh air. In antebellum Philadelphia, for instance, a distiller was successfully charged with feeding up to one thousand pigs the by-products of his distillery within the city limits, creating a stench "so intolerable as to make it almost impossible to pass through the street… without nausea."[310] But with the

[307] Ibid., 570.
[308] Oliver Milman, "Meat Industry Blames for Largest-Ever 'Dead Zone' in Gulf of Mexico," *The Guardian* (Aug 1, 2017). Obtained from: https://www.theguardian.com/environment/2017/aug/01/meat-industry-dead-zone-gulf-of-mexico-environment-pollution Obtained on: Aug 28, 2020.
[309] Jonathan Morris, ""One Ought Not Have so Delicate a Nose": CAFOs, Agricultural Nuisance, and the Rise of the Right to Farm," *Environmental Law* Vol. 47, No. 1 (Winter 2017), pp. 261-286.
[310] Ibid., 270.

emergence of large commercial feedlots around the country, legislators began to recognize the need for the specific and pre-emptive regulation of fluid runoff from animal feeding operations.

By the 1960s, rural residents, public health officials and environmental scientists across the West and Mid-West had begun observing high BOD levels and concomitant fish-kills downstream of feedlots. In 1967, the agricultural extension service in Nebraska reported that, "complaints of extreme pollution have been registered by citizens living downstream from Nebraska feedlots."[311] After Iowa, Nebraska had more cattle on feed than any other state American state. Together Iowa and Nebraska fed over 30% of the bovines in the nation by 1970 (see Image 1).[312] But the problem of feedlot pollution wasn't restricted to states with the largest livestock numbers.

[311] Tom D. Leisy and Deon D. Axthelm, "Feedlot Pollution," University of Nebraska College of Agriculture, Extension Service, CC 206 (1967) in RG 11-10-03, Box 51, University of Nebraska-Lincoln Archives (from here on: UNL)
[312] L. N. Mielke, J. R. Ellis, N. P. Swanson, J. C. Lorimor, and T. M. McCalla, "Groundwater quality and fluctuation in a shallow unconfined aquifer under a level feedlot," *Agricultural Research Service, USDA* (Jan 1970) in 1713, Box 238, NCA.

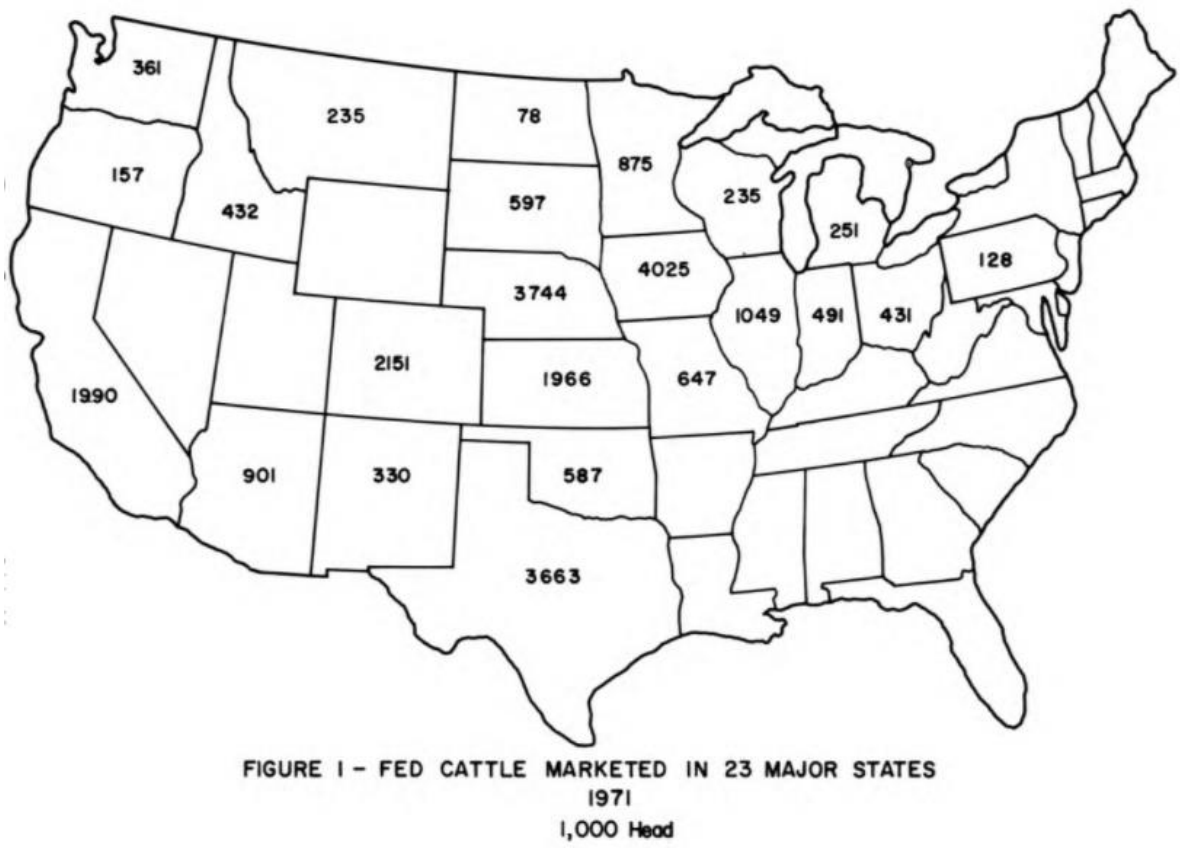

Image 1: Number of Cattle in Feedlots by State in 1971. Source: Lynn R. Shuyler, "National Animal Feedlot Wastes Research Program," *Environmental Protection Technology Series*, EPA-R2-73-57 (Corvallis, OR: February, 1973)

A few years earlier, Kansas had reported 15 different fish kills attributed to feedlot pollution. Feedlot runoff had been recognized as a problem in Kansas since the late 1950s. And by 1962 researchers from the Kansas State Department of Health had shown that water samples from a river downstream of a feedlot following a heavy rain showed increased BOD levels, ammonia concentration, and bacterial population. "Septic conditions soon developed and within a few days a massive fishkill was in progress."[313]Agricultural experts across the Midwest and

[313] Norris Swanson, Lloyd Mielke, and Jeffery Lorimor, "Hydrologic Studies For Evaluation of the Pollution Potential of Feedlots in Eastern Nebraska," *USDA Agricultural Research Service* (March 1970) in 1713, Box 238, NCA.

Great Plains acknowledged that the concentration of large numbers of animals in small areas meant that it was no longer possible for livestock waste to be dropped on pastures and absorbed by the environment without any undesirable-consequences. A natural fertilizer, in "unnatural" quantities, had become a toxic nuisance.

In the late 1960s, legislatures in both Nebraska and Kansas enacted some of the earliest pollution control laws that required feedlot operators to register with state authorities to maintain compliance. The Kansas State Department of Health required feeders with over 300 cattle to construct water pollution control facilities that met the minimum design requirements of the department. Specifically, the department prescribed "retention ponds capable of containing three inches of surface runoff from the feedlot area…"[314] Further, the legislation permitted government personnel to inspect feedlots in order to determine the effectiveness of water pollution control efforts or to investigate the pollution of public waters. In Nebraska, feedlots with over 300 cattle were required to register with the Nebraska Water Pollution Control Council (NWPCC), as did smaller feedlots if they were near watercourses. Legislators empowered the council to administrate and enforce the law, set up standards, rules, and regulations, conduct hearings, inspect disposal facilities, and make periodic checks of rivers and streams. Penalties for violation were set to be between 100 and 500 dollars, with the option to levy an additional 10 dollars a day for the duration of the violation.[315] Cattlemen in these states were alarmed and soon alerted the rest of the industry to the imminent end of unregulated feedlot waste disposal.

Nebraska feeders and researchers at the University of Nebraska, worked closely with the NWPCC to come up with the feedlot pollution control program. The same year that the NWPCC

[314] "Regulation of Agricultural and Related Wastes for Water Quality Control," N/A (November 3, 1966) in 1713, Box 115, American Heritage Center, WY, National Cattlemen's Association Papers (from here on: NCA).
[315] Tom D. Leisy and Deon D. Axthelm, "Feedlot Pollution," University of Nebraska College of Agriculture, Extension Service, CC 206 (1967) in RG 11-10-03, Box 51, UNL.

was legislated into existence, feeders from around the state formed the Livestock Waste Control Advisory Committee as a part of the Nebraska Livestock Feeders Association. The committee worked with the NWPCC to grant the feeders two years for researching the feedlot waste problem before any regulations were imposed.[316] These feeders had gone largely unregulated since the birth of large scale feeding in the 1940s, and were not in favor of the permit system.

The Nebraska Livestock Feeders Association expressed their preference for a voluntary compliance program instead of mandatory permits. They argued that the mandatory program would be expensive to enforce, and required definite criteria which research was yet to substantiate. Further, they suggested that current laws were sufficient to address the problem and that it was only a small percent of feedlots that were to blame for runoff, not the vast majority. The majority, therefore, should not be unnecessarily burdened for others' mistakes. Finally, they threatened that the logic behind such regulation would not stop at feedlots, and would eventually have to extend to all farms.

Nebraska feeders also felt unduly criticized and maligned in the public eye, by both outsiders as well as other farmers. Particularly offensive to these cattlemen was the claim that "one cow will produce the fecal effluent equal to that of 16.4 people."[317] This statement was attributed to a USDA official, and later repeated with varying degrees of specificity in news outlets and publications such as *Successful Farming*, the *Omaha World Herald*, and the *Lincoln Evening Journal*. To combat this "derogatory publicity," the Chairman of the Nebraska Livestock Waste Control Advisory Committee, a feeder himself, argued, "that 1 human is equal to 100 steers [in terms of] pollution potential."[318] To arrive at that number he did some simple, if

[316] William Krejci, "The Feeders Viewpoint on Waste Control," (1970) in 1713, Box 238, NCA.
[317] William Krejci, "The Feeders Viewpoint on Waste Control," (1970), 4; in 1713, Box 238, NCA.
[318] Ibid., 8.

questionable, mathematics, using a feedlot runoff estimate from an unpublished study and compared it to an uncited BOD per capita figure from municipal plants.[319] In essence, Nebraska feeders decided to draw attention to human waste as a way to deflect the spotlight from feedlot pollution.

Republican Senator Roman R. Hruska of Nebraska sympathized with that cattle feeders in his constituency and made statements suggesting that cattle were a scapegoat in the pollution issue. He promised that close to a hundred and fifty thousand dollars in federal funding was going to be spent on animal waste research in Nebraska in 1970 and that more funds would be directed toward the effort in the future. In their calls for research, Hruska and other feeders implicitly acknowledged the existence of the feedlot pollution problem even as they denied its severity. Hruska even admitted that Nebraska was, "ideally suited as an outdoor laboratory to assess the pollution problem arising from animal feedlots."[320]

These rhetorical strategies of denial and delay were similar to those honed by tobacco companies in the 1950s, and then mimicked by other large industries, such as oil and auto, threatened by environmental regulation.[321] But the evidence against the cattle industry was not invisible, like the buildup of global warming gases, or easily masked by scientific uncertainty, as with the link between tobacco and cancer. Manure was literally oozing out of feedlots in enormous, undeniable quantities, turning waterways into sewers. Further, compliance with

[319] His claims were repudiated by study after published study on feedlot waste coming out of land-grant universities.

[320] Staff, "Hruska Hits Criticism: 'Scapegoat Sought in Pollution Issue'," *Lincoln Evening Journal* (Lincoln, NE: Mar. 24, 1970), pp 21 or 42.

[321] Naomi Orekes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*, (New York: Bloomsbury, 2010); Gerald Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution* (Berkeley: University of California Press, 2002); Nancy Langston, *Toxic Bodies: Endocrine Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010); Pete Daniel, *Toxic Drift: Pesticides and Health in the Post-World War II South* (Baton Rouge and Washington D.C.: Louisiana State University Press in association with the Smithsonian National Museum of American History, 2005).

expensive waste management regulation was one way for larger feeders to squeeze smaller competitors out of the business. And so, some cattle feeders took a proactive approach to the pollution problem and the opportunities it presented.

In November of 1970, the National Livestock Feeders Association sponsored the Midwestern Animal Waste Management Conference in Des Moines, Iowa for the first time. Over two dozen speakers, including high ranking USDA officials, university researchers, and bank representatives, addressed the particulars of handling livestock waste according to the legal context in several different states, the cost of waste management systems, the available sources of funding, and further research that was being conducted on the subject.[322] Associate Director of the Iowa State Hygienic Laboratory and member on the Iowa Pollution Control Commission told conference delegates that "cattle feeders should make no mistake about the fact that the state's fishing streams will be protected."[323] Faced with such views and outbursts of public outrage playing out in rural communities across the nation—such as Greeley, CO, described in the next section—cattlemen began seeking solutions to feedlot pollution.

Greeley's Fresh Air Committee

Monfort of Colorado, the largest feedlot in the world, had solicited experts at Colorado State University to research odor and waste containment strategies for their feedlots, not out of fear of regulation per say, but in response to complaints by the citizens of Greeley. In 1966, Kenneth Monfort had presented Greeley's "odor committee" with an "eight point report" on Monfort's efforts to control odor, including hauling out manure, resurfacing pens, and installing

[322] Staff, "Animal Waste Management Session Planned Nov. 10-11," *The Columbus Telegram* (Columbus, Nebraska: Oct. 3, 1970), 2.
[323] Staff, "Pollution Control Official Speaks at Iowa Meeting," Argus-Leader (Sioux Falls, South Dakota: Nov. 13, 1970), 10.

better drainage.[324] They eventually began using an odor counteractant aerosol spray over the entire operation to further suppress the foul smell generated by their feedlot conditions. But the citizens of Greeley remained convinced that the smell was keeping new industries and new jobs from coming to their town.

In 1970, Monfort's plans to open another feedlot in Gilcrest, CO, were opposed by a group calling themselves the "Fresh Air Committee." Wealthy residents of an exclusive housing subdivision south of Greeley believed that the "odor and dust would seriously devalue their properties."[325] This particular housing development was planned to include 80 homes worth between $75,000 and $85,000 at a time when the average house in Colorado cost $17,300.[326] Others argued that with the new feedlot the city of Greeley would become locked in by feedlots in all directions. Faced with opposition, within a month, Monfort withdrew his application to the Weld County Planning Commission, saying they would consider a new location for the feedlot and packing plant.

Monfort's withdrawal drew a wide backlash against the homeowners. A petition signed by 6000 people requested Monfort to reconsider their decision. Operation Fresh Air had many detractors who stood to benefit from the jobs that another feedlot would bring. Labor unions, the Weld County Builders Association, and the Colorado Cattle Feeders Association (of which Warren Monfort was a founding member) sponsored ads in the *Greeley Tribune* in support of the feedlot claiming that it would create thousands of jobs and greater income for nearby feed crop farmers. Floyd Oliver, an engineering contractor for Monfort, organized "Citizens for Monfort

[324] Frank Colohan, "Kenneth Monfort Reports on Odor-Control Steps," The Greeley Daily Tribune (March 23, 1966).
[325] Gary Gerhardt, "Nobody Nose What's Next in Feedlot Controversy," *Rocky Mountain News Northern Colorado* (June 6, 1969).
[326] Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), p. 66.

Expansion," in favor of the new feedlot.[327] Encouraged, Monfort reapplied, got approval, and the Gilcrest lot opened as planned in 1970. As a compromise, the Monforts planted a 50-foot wide greenbelt around the perimeter of the feedlot and offered to purchase the homes of the home-owners in the area at the appraised market value.[328] But the nauseating stink of so many animals crowded into one place did not go away, and after years of push-back, Monfort decided to shut down the original Greeley feedlot in 1972. Two years later, a new feedlot was built, 12 miles east of Greeley, in Kersey, CO, with a capacity of 150,000.

This is part of the story of suburbanization in the post-war period, when the increasing accessibility of natural landscapes to urban populations led to the development of positive environmental values. Americans' rising standard of living and consumeristic expectations for a better quality of life—which came to include clean air and clean water and led to legislation by those names during the 1960s and 70s—shaped an emerging environmental movement. Adam Rome has argued that the environmental movement was a response to environmental loss and destruction at the edge of cities. It had to do with the visible impact of bulldozers in the countryside and the loss of open spaces in their proximity[329]. Other have shown that it was homeowners' yearning for, and proximity to, "suburban nature," that led them to political action.[330]

In the case of Greeley, it was "nature" itself, not bulldozers and pesticides that spurred environmental consciousness in its residents and forced Monfort to adapt. Nature organized in a rather "unnatural" way, perhaps, but still bovines concentrated in large numbers proved to be a

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[327] Eric Lundberg, "La Salle Meeting Boosts Monfort Expansion Plans," Greeley Tribune
[328] Walt Barnhart, Kenny's Shoes (West Conshohocken, PA: Infinity Publishing, 2008), p. 65-67.
[329] Adam Rome, *Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (New York: Cambridge University Press, 2001)
[330] Christopher Sellers, *Crabgrass Crucible: Suburban Nature and the Rise of Environmentalism in the Twentieth Century* (Chapel Hill: University of North Carolina, 2012), 4.

nuisance to Greeley residents seeking "fresh air". Ultimately, animal life became the impetus for social, economic, and environmental change in Greeley and its surrounding areas. Capital was forced to respond to the creatures it sought to control.

Feedlot Waste Management Systems

Agricultural experts began to recognize that "the era of "getting rid" of livestock manure is over... The livestock producer is now faced with a definite management and disposal problem."[331] Specifically, it was agricultural engineers like Raymond C. Loehr who were called upon to research waste management and disposal systems for feedlots around the country. Loehr, wrote:

> Historically, animal wastes have been recycled through the soil environment with a minimum of direct release to the water environment. The change to intensive livestock production has weakened the complimentary relationship between crop production and livestock production… One of the largest problems associated with the confinement production of livestock involves waste disposal.[332]

Loehr published one of the earliest comprehensive studies on feedlot pollution for the Department of Interior's Federal Waste Pollution Control Administration in 1968.[333] His work on the treatment of cattle waste won him the Rudolph Hering Medal of the American Society of Civil Engineers.

After receiving his PhD from the University of Wisconsin in 1961, Loehr had joined the faculty at Kansas University where he served as the director of the Environmental Health

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[331] O. E. Cross and E. A. Olson, "Livestock Liquid Manure Disposal Systems," University of Nebraska Extension Service (1968) in RG 11-10-03, Box 16, UNL.
[332] Raymond C. Loehr, "Animal Wastes—A National Problem," *Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers*, Vol. 95, No. SA2, April, 1969.
[333] Raymond C. Loehr, *Pollution Implication of Animal Wastes—A Forward Oriented Review* (Ada, OK: Robert S. Kerr Water Research Center, US Dept. of Interior, 1968).

Engineering Research Laboratory. Fish kills from feedlots were a big issue in Kansas during the 1960s, killing between 300,000 to 500,000 fish in the spring of 1967.[334] This urgent need fueled his research into the treatment of cattle feedlot waste and secured him funding from the Federal Waste Pollution Control Administration.[335] He was elected Water Conservationist of the Year by the Kansas Wildlife Federation in 1967 for his pollution mitigation research in the state. From Kansas he moved to Cornell University in 1968 where he became the director of the environmental studies program. In 1971, he also served as the president of the American Association of Professors in Sanitary Engineering.[336]

Loehr did not shy away from calling feeders out for their role in the pollution crisis. Feedlots, he wrote, "have been developed with little planning and concern for the nuisance and pollutional *(sp.)* characteristics inherent in the facilities." Further, "many of the most obvious cases of pollution could have been prevented."[337] He even spelled out feeders' worst fears: "At present, there is no profitable method of livestock manure utilization and it is unlikely that one will be developed. Animal waste handling, treatment, and disposal will cost something."[338] Not only did he highlight the significant costs of waste treatment, Loehr observed that the government was awakening to the need to regulate feedlot pollution and that, in his opinion, "efforts of both federal and state authorities [to regulate feedlot pollution] should be increased."[339] No doubt, Loehr saw an opportunity for himself and his profession in the increased regulation of feedlots.

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[334] Ibid, 56.
[335] Staff, "Feedlot Waste project," *Daily Tribune* (Great Bend, KS: April 27, 1966), 13.
[336] Staff, "Cornell Environmental Studies Program Begins," *Ithaca Journal* (August 9, 1972), 4.
[337] Raymond C. Loehr, *Pollution Implication of Animal Wastes—A Forward Oriented Review* (Ada, OK: Robert S. Kerr Water Research Center, US Dept. of Interior, 1968), 67.
[338] Ibid., 108.
[339] Ibid., 150.

Loehr recognized that "wastes produced under [feedlot conditions] will contain more material capable of causing nuisance and pollutional *(sp.)* problems than will waste produced under conditions where weight gain is less critical."[340] Yet, he did not suggest a return to grazing operations—not entirely surprising, because that would leave professionals like him with less of a role. Instead he suggested, that "complete confinement will reduce the runoff pollution."[341] This is in spite of his earlier statements that "wastes caused by animals in confinement are likely to cause the greater pollutional *(sp.)* problems."[342] In other words, even though Loehr knew that feedlot confinement was the cause of disastrous water pollution resulting in fish kills, ground water contamination, disease transmission, and eutrophication, he accepted the technological trajectory of feedlot production as irreversible. Further, he felt that the only way to minimize the environmental destruction was to take the feedlot's logic of confinement to its end: "complete confinement".

Following Loehr's lead, farmstead engineers at the University of Nebraska agriculture department defined the "ideal system" of feedlot waste management as one that "allows efficient and sanitary production of animals."[343] They sought to create a system that not only completely prevented water pollution, but controlled odor and air quality and eliminated breeding places for flies and mosquitos, with a minimum of maintenance, hauling, and handling. Thus, continued their search for a sanitary feedlot.

Through the extension service network at public universities and presentations at agricultural conferences, engineers recommended one of four different systems for feedlot waste

[340] Ibid., 26.
[341] Ibid., 60.
[342] Ibid., 48.
[343] O. E. Cross and E. A. Olson, "Livestock Liquid Manure Disposal Systems," University of Nebraska Extension Service (1968) in RG 11-10-03, Box 16, UNL.

management to feeders around the nation. The retention pond, also known as a detention pond, prescribed by the Kansas State Department of Health, was the most common. In essence, such a pond detained feedlot runoff until it could be disposed. The ponds were relatively easy to construct and were ideally fitted with a seal at the bottom in order to prevent leaching into the soil. They were built to be able to contain 3-4 inches of runoff from the surrounding feed yard. With very little scope for decomposition, most of the runoff had to eventually be pumped out and distributed onto farmland as fertilizer. The main disadvantage of detention ponds was the likelihood of overflow due to heavy rainfall, and the subsequent contamination of waterways.

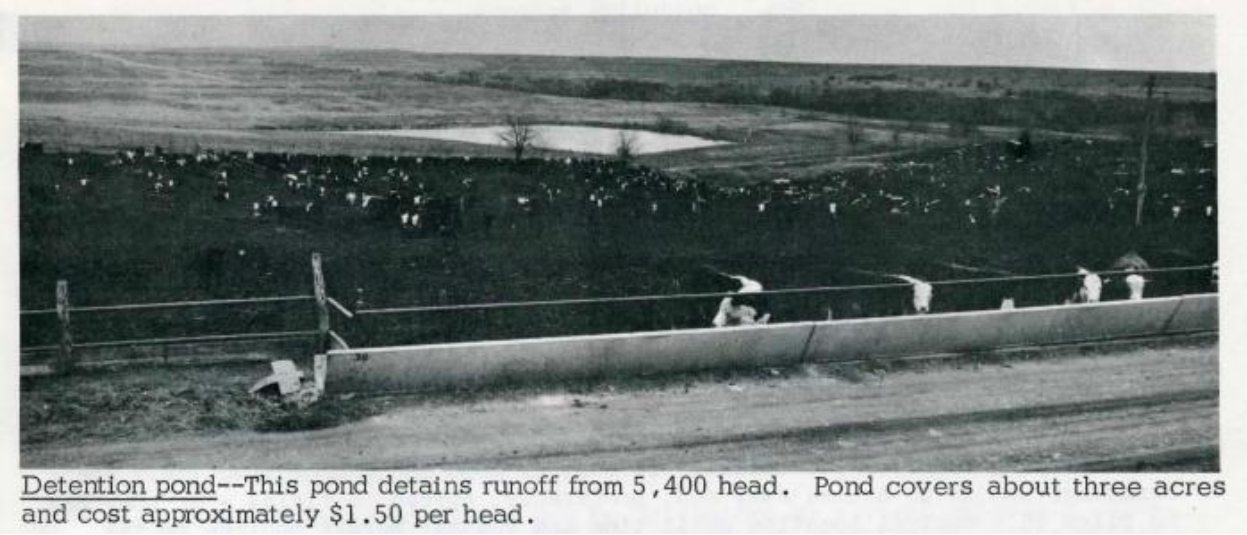

Image 2: A Detention Pond in the background. Image Source: Tom D. Leisy and Deon D. Axthelm, "Feedlot Pollution," University of Nebraska College of Agriculture, Extension Service, CC 206 (1967) in RG 11-10-03, Box 51, UNL

Another method was to use a settling basin in conjunction with a detention pond. The settling basin was a smaller and shallower pond that allowed the solid waste to settle as the liquid waste flowed into a larger detention pond. The bed of a settling basin was ideally constructed from concrete on a long, relatively flat waterway. This would ensure a slow rate of flow of

runoff, enabling the solid waste to settle at the bottom of the basin. Further, the concrete base allowed the solid waste to be easily removed with a tractor once the liquid had drained into the larger pond. By preventing the accumulation of solid waste at the bottom of the detention pond, a settling basin prevented the gradual decrease in holding capacity common in standalone detention ponds. Agricultural engineers at the USDA's Agricultural Research Service in Beltsville, Maryland, recommended that a settling basin have a capacity ten times the total daily volume of feedlot waste runoff.[344]

A third system of feedlot waste management, and increasingly popular among larger feeders, involved the use of lagoons. One handout for agricultural engineers referred to them as "open cesspools".[345] Agricultural researchers at the University of Missouri were early proponents of the lagoon system.[346] A lagoon differed from a detention pond in that it used bacterial action to decompose the solid waste. The bacteria naturally occurring in manure was given the right conditions in which to break down the waste into water, gases, and other byproducts. Shallow lagoons, four to five feet deep, operated by aerobic decomposition and produced very little odor. This process could break down 75 to 80% of the organic solids in the lagoon but produced the byproducts water and carbon dioxide, as well as nitrites and nitrates which in high concentrations in drinking water could lead to blue baby syndrome. The aerobic process required a lot of land and water and was prohibitive to large cattle feeders whose operations generated so much waste as to make the land area required for aerobic lagoons economically unfeasible. This made anaerobic lagoons more suited for larger operations. Anaerobic decomposition occurred in

[344] Tom D. Leisy and Deon D. Axthelm, "Feedlot Pollution," University of Nebraska College of Agriculture, Extension Service, CC 206 (1967) in RG 11-10-03, Box 51, UNL.
[345] University of Nebraska Lincoln, "Lagoon Manure Disposal," *Agricultural Engineer' Digest* EC 63-724 (1963) in RG 11-10-03, Box 13, UNL.
[346] E. A. Jeffrey, W. C. Blackman, and R. L. Ricketts, "Aerobic and anaerobic digestion characteristics of livestock wastes," *University of Missouri Engineering Series* Bulletin 57 (1963).

lagoons six to fifteen feet deep, but produced undesirable odors as a result of byproducts such as hydrogen sulfide and ammonia—both potentially toxic for humans. Under ideal conditions anaerobic bacteria could decompose 50 to 75% of the organic solids while emitting methane and carbon dioxide as additional byproducts. A series of lagoons was considered more efficient than a large lagoon of the same surface area. Some aerobic lagoons, or oxidation ditches, had to be mechanically supplied with oxygen to maintain conditions suitable for aerobic decomposition. A combination of aerobic and anaerobic systems was claimed to decompose up to 97% of organic solids.[347]

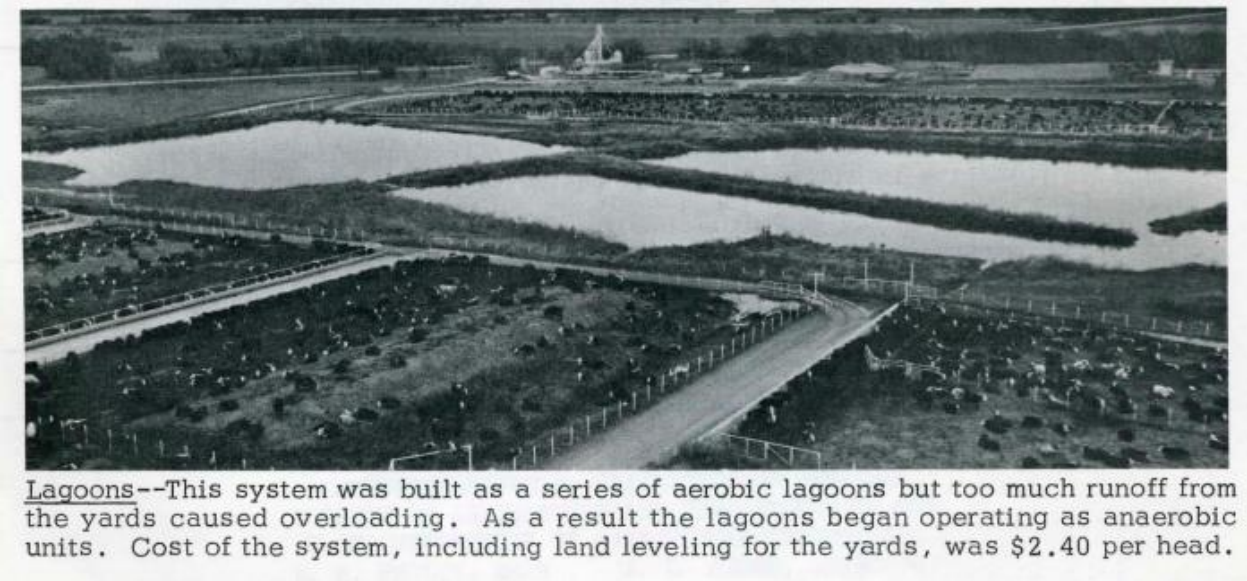

Image 3: Series of Lagoons. Image Source: Tom D. Leisy and Deon D. Axthelm, "Feedlot Pollution," University of Nebraska College of Agriculture, Extension Service, CC 206 (1967) in RG 11-10-03, Box 51, UNL

Slotted floors were probably the least common waste management system in the cattle feeding business. They were used largely in the hog and swine industry, where most feeding operations were indoors. The early adoption of antibiotics in these industries enabled greater

[347] O. E. Cross and E. A. Olson, "Livestock Liquid Manure Disposal Systems," University of Nebraska Extension Service (1968) in RG 11-10-03, Box 16, UNL.

levels of animal density in indoor operations while keeping diseases at bay. The animals were kept inside buildings whose slotted floors stood right on top of a waste collection tank. The tanks could function either as simple retention ponds or lagoons, both aerobic and anaerobic. The buildings on top had to be thoroughly ventilated, as the sewage tank would release gases that could, and sometimes did, suffocate both the animals and the operators working inside the enclosure above. [348]

Whatever the disposal system, a diversion terrace was necessary to keep outside water from emptying into the waste management systems. Ideally only runoff from the feedlot would make it into the detention ponds and lagoons. A diversion terrace allowed operators to drain everything but feedlot runoff into alternate waterways. This increased the life and efficiency of the feedlot's waste management system, but required rebuilding every few years. New feed yards were designed to drain directly into the disposal system, as opposed to through other yards into the retention pond or lagoon. All in all, feedlot waste management required a serious investment of energy and funds.

The first thing feeders had to decide was whether they wanted to maximize the chemical and monetary value of the manure as a fertilizer or prioritize decomposition in the disposal system. The former required frequent waste collection and transport, the latter reduced it to minimum, making it possible for waste to accumulate and break down for years at a time without much interference. This was ultimately a decision between increasing revenue or reducing costs.

[348] Since none of these systems was able to totally digest all the waste, each required the use of pumps for the removal and distribution of whatever remained. Special pumps were designed with large inlets fitted with chopping blades to reduce the size of the solid waste. The manure was pumped from ponds into tanks or wagons that would transport it to be used as fertilizer elsewhere. Other feeders installed a pipe and sprinkler system to distribute the waste as fertilizer over adjoining fields. The sprinklers were designed especially for high volume, high pressure use and had large orifices to accommodate solid waste. Some ponds were also equipped with an agitating mechanism to suspend the pieces of solid waste in the liquid before being pumped to their next destination.

The periodic scraping and cleaning of feed yards was nonetheless an important waste management practice. The scrapings were either hauled and spread immediately onto fields or piled in a central location, before being transported away at a later time. Even if the sale of fertilizer was not a priority for the feeder, the more manure that could be removed from the feedlot by scraping, the less that would end up in the waste disposal system—increasing its effectiveness and longevity.

No matter what combination of methods a feeder chose to use, complete feedlot waste management was complex and expensive—even the least costly systems could add up to thousands of dollars in capital overlays. Despite the specificity of their recommendations, engineers at the University of Nebraska admitted that the "problems of pollution are complex" and that "complete and firm recommendations are not now possible."[349] But they were confident that further research would bring improved methods. Yet they warned feeders that the "individual characteristics of each feedlot make it necessary to adapt the recommendations to achieve best results."[350]

Feeders were not only discouraged from building new feedlots near streams and waterways but also near population centers. The fear was that "feedlots adjacent to small towns or urban areas may present problems due to objections of odors, dust, noise and runoff."[351] The implication was that the host of environmental conditions at the best managed feedlot might still be a disturbance to urban folk no matter what—and there was little to do about it but relocate (as illustrated by Monfort in Greeley). And the feeders themselves weren't immune either. Agricultural engineers directed feeders to "place the lagoon as far as practical from the farm

[349] University of Nebraska, "Supplementary Notes on Feedlot Waste Management," *Beef Housing & Equipment Handbook* EC 63-716 (1969) in RG 11-10-03, Box 13, UNL.
[350] Ibid.
[351] Ibid.

home—300' minimum… where summer breezes, usually from the SE or SW, will carry odor away from the house."[352]

Lagoons and other open-air detention ponds were not just an unsightly and smelly nuisance. These "cesspools" were also dangerous. These lagoons and waste retention ponds were toxic to both animals and humans. Feedlot workers sometimes lost their lives from falling into animal waste lagoons or inhaling the gases that are released from the process of manure decomposition.[353] Experts warned feeders to fence lagoon embankments "to keep out animals and trespassers. Post warning signs. Keep gate locked."[354] And this statement was made before the threat of hidden cameras, undercover citizens, and the specter of animal rights activism which has made CAFOs increasingly wary of public exposés of feedlot conditions.

Concentration as the Solution to Pollution

Crucially, agricultural engineers also weighed in on the concentration of bovines for ideal waste management in a feedlot. "Space requirements for confined beef cattle are directly related to surface drainage."[355] Some studies found that doubling feedlot density from 200 animals per acre to 400, only "increased pollution potential by about 25 percent."[356] On the other hand Nebraska's extension service warned that, "oversized lots," where bovines had more space than the recommended 200-400 sq. ft. per animal, created "more runoff," and consequently

[352] University of Nebraska Lincoln, "Lagoon Manure Disposal," *Agricultural Engineer' Digest* EC 63-724 (1963) in RG 11-10-03, Box 13, UNL.
[353] Staff, "Liquid Manure Storage Can Pose Serious Dangers," *The Brownstown Banner* (Brownstown, Indiana: July 19, 1978). Death of workers from contact with feedlot waste continues today: Tim Craig, "Deaths of Farmworkers in Cow Manure Ponds Put Oversight of Dairy Farms Into Question," *The Washington Post* (Sept. 24, 2017)
[354] Ibid.
[355] University of Nebraska Lincoln, "Research Project: Management and Control of Beef Feedlot Waste" *USDA Agricultural Research Service* (July 1969) in 1713, Box 238, NCA.
[356] T. M. McCalla and F. G. Viets, Jr., "Chemical and Microbial Studies of Wastes From Beef Cattle Feedlots," *USDA Agricultural Research Service* (May 23, 1969) in 1713, Box 238, NCA.

"increase[d] the size and cost of waste control facilities."[357] Researchers observed that dirt feedlots required an average of only 200-250 square feet per head (the size of a one-car garage). Even this, they claimed could be reduced by 70% if concrete feedlot surfaces were in use.

For hard surfaced lots, engineers at UNL suggested that just 55 square feet per animal (a space only slightly larger than a king size bed) would be sufficient for ideal waste management. In time, researchers further decreased their recommendations of animal density. A report from Texas Tech in 1971 concluded, "stocking rates above 40 square feet per animal on concrete surfaced lots do not appear to enhance animal performance. At this stocking rate, the quantity of runoff per animal is somewhat less…"[358] Another report stated, that "under controlled environmental conditions and highly mechanized feeding systems," feeders had attained densities "as low as 20 sq. ft. per head."[359] The paradoxical quest for a "sanitary" feedlot therefore further reinforced the concentration of animal bodies and the deterioration of animal lives.

Both surfaced and unsurfaced lots had pros and cons. While surfaced lots allowed greater animal concentration, they required more frequent removal of manure. The buildup of manure, however, reduced runoff, soil erosion, as well as its seepage into ground water. Conversely, cleaner feedlots created more surface runoff. Unsurfaced lots that had a low gradient, also required greater manure management and more space per animal. On the other hand, unsurfaced lots that had a high gradient could allow greater animal density with minimum manure

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[357] E. A. Olson, "Waste Management for Feedlots," *University of Nebraska Extension Service* E.C. 71-795 (1971), 7 in RG 11-10-03, Box 18, UNL.
[358] Texas Tech University, "Characteristics of Wastes From Southwestern Cattle Feedlots," Water Resources Center (Lubbock, TX: 1971), 1. Obtained from: https://babel.hathitrust.org/cgi/pt?id=mdp.39015002032905&view=1up&seq=5 Accessed on: March, 8, 2021.
[359] University of Nebraska Lincoln, "Research Project: Management and Control of Beef Feedlot Waste" *USDA Agricultural Research Service* (July 1969) in 1713, Box 238, NCA.

management. However, a greater slope made the runoff harder to intercept and handle. It also led to soil erosion and the subsequent problems of rilling and gullying in feedlot surfaces.

Because roughage in the diet led to the production of more manure, it was implicitly discouraged—yet another nod to the grain over grass logic. "The quantity of solid waste accumulating on the feedlot floor is a direct function of the fraction of roughage in the finishing ration."[360] Meaning, that the lesser the roughage in the bovine diet—which had already been reduced drastically by the transition from traditional grazing to grain feeding operations—the lesser the manure that the animals produced. Researchers took this logic to the extreme, suggesting that "reducing the roughage content of finishing rations for cattle from 12 percent to zero would alone eliminate approximately one-half of the solid waste accumulation on the feedlot surface."[361] Similarly, the addition of straw bedding complicated manure removal for feedlot employees and was thus rejected by agricultural engineers.

Finally, the removal of manure from feedlot soil surfaces was also discouraged, because it was shown that manure buildup reduced erosion, runoff, as well as ground water contamination. Accordingly, some feeders cleaned feedlot surfaces only once in 10 or 15 years, leaving animals to lay, eat, and sleep ankle-deep in their own excreta for a large portion of their lives. In pursuit of efficiency and savings in waste management, researchers reduced living space, removed bedding, encouraged manure buildup, and denied roughage to feedlot animals. In this way, feedlot engineers prioritized "animal performance" with no consideration to animal behavior and welfare.[362]

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[360] Texas Tech University, "Characteristics of Wastes From Southwestern Cattle Feedlots," Water Resources Center (Lubbock, TX: 1971), 1. Obtained from: https://babel.hathitrust.org/cgi/pt?id=mdp.39015002032905&view=1up&seq=5 Accessed on: March, 8, 2021.
[361] Ibid., 3.
[362] University of Nebraska, "Supplementary Notes on Feedlot Waste Management," *Beef Housing & Equipment Handbook* EC 63-716 (1969) in RG 11-10-03, Box 13, UNL.

A Feedlot "Without Pollution"

Not only did agricultural engineers suggest increased stocking rates as a solution to feedlot pollution, but also the complete confinement of cattle in enclosed facilities. One report explained why: "no runoff occurs from roofed feedlots."[363] While hog and poultry operations could accommodate thousands of animals in enclosed buildings, with the use of antibiotics, cattle—being much larger creatures—were harder to confine in great numbers. Enormous roofed enclosures for cattle would have much higher costs of construction per animal than hog or poultry operations. So it wasn't until the influx of outside capital and the emergence of custom feeding in the late 1960s and early 70s that the confinement feeding of cattle became a reality.

The tremendous gains made possible by a controlled diet of cheap grains laced with hormones and antibiotics drew thousands into the cattle feeding industry during the 1960s and early 70s. During this period of expansion, custom feeding emerged as a new type of operation distinct from the Monfort model. Custom feeders did not own their cattle. They collected fees ("yardage" plus the cost of feed) from the cattle owners who wanted to outsource grain feeding to specialists without losing ownership of the animal. Such custom feeding operations increasingly became a popular option for feeders because they shifted some of the risks of the feedlot business onto the ranchers. One study found that by 1970, most of Texas' cattle were custom fed and the larger the feedlot the more likely it was to be a custom feeding operation.[364]

Custom feeding was attractive not only to cattlemen looking for more control over their animals' destiny but to a variety of investors in search of a tax break. "We have the big-time oil

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[363] Texas Tech University, "Characteristics of Wastes From Southwestern Cattle Feedlots," Water Resources Center (Lubbock, TX: 1971), 3. Obtained from: https://babel.hathitrust.org/cgi/pt?id=mdp.39015002032905&view=1up&seq=5 Accessed on: March, 8, 2021.
[364] Joseph C. Meisner and V. James Rhodes, "The Changing Structure of U.S. Cattle Feeding," Special Report 167, University of Missouri-Columbia (November 1974), 5.

operators, we have the owners of tire companies, movie stars, TV stars, pension funds of the unions, and big corporations… [and] churches using tax-free money, building empires in the ranching business," opined one speaker at the Colorado Cattle Feeders Association Convention in 1966.[365] Since 1951, the Internal Revenue Code had been amended to include profits from a variety of livestock operations as capital gains subject to a lower tax rate than regular income. This made livestock a lucrative investment for people who had no experience or prior interest in agriculture. This was especially so, for cattle feeding which, after the Tax Reform Act of 1969, became one of the few investments with a low barrier-to-entry still a viable tax shelter.[366]

The influx of outside capital fueled the search for a sanitary feedlot. One new celebrity custom feeder sought to build the largest indoor cattle feeding operation in the world; one "without pollution".[367] In 1970, Ohio Feed Lot Inc., located in South Charleston, Ohio, constructed eight buildings capable of feeding a total of 20,000 bovines annually. Each massive structure was 67 feet wide, and over a quarter of a mile long. Through indoor climate control the new feedlot hoped to attain gains of 50 pounds per head over and above traditional open-air operations. William C. Hackett, former all-American football player turned veterinarian and feeder, who founded the company, said, "In the past, weather conditions affected the amount of gain for cattle. A particularly harsh winter meant minute gains per head. Now we are able to harness the environment and make it work to our advantage and to the advantage of the owners and the community as well."[368]

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[365] Martin R. Domke, "Where Do We Go From here?" in *A Journey Back: A History of Cattle Feeding in Colorado and the United States* ed. John K. Matsushima and W. D. Farr (Colorado Springs: Cattlemen's Communications, 1995), 161.
[366] Staff, "Cattle Feeding---And Lassoed Investors," *Dun's Review* Vol. 98 (3) (Sept 1971) in 1713, Box 123, NCA.
[367] "Indoor Cattle Feeding—Controlling The Environment Without Pollution," *Steel Products News Bureau* (May 1970) in 1713, Box 221, NCA.
[368] Ibid.

By putting a roof over the cattle, Hackett had eliminated runoff from rain and snow—the primary way in which feedlot waste contaminated fresh water sources. The buildings were covered by a galvanized steel roof which was supported only by structural steel trusses, which eliminated the need for vertical columns, creating an uninterrupted pen surface, similar to open-air lots where manure removal was relatively easy. And in the absence of water mixing with the animal waste, there was very little hydrogen sulfide and methane and their associated malodors being emitted. Instead ammonia and carbon dioxide were the primary gases being released by the collected waste. Higher concentrations of ammonia however can be toxic. So the feedlot had electrically operated lumite curtains for its west wall that could be raised or lowered depending on the circulation needs within the feedlot and weather conditions outside. The buildings were oriented according to the direction of the prevailing winds to provide maximum circulation of wind through the open east wall.

The surfaced lots had a density of one cow every 30 square feet—even more concentrated than the maximum density of 55 per square feet recommended for ideal waste management of surfaced lots by agricultural engineers at UNL a few years earlier. Instead of going for slotted floors common in other enclosed facilities, the feedlot's earthen surface was made impermeable using a 50-ton compactor to roll the soil in the pen areas. A front-end loading tractor was used to pick up manure and deposit it in 20-ton dump trucks. The trucks transported the waste to a compost pile and by 1972 to a specially designed digester. Hackett worked with Searle Agriculture Inc, to design the "first 150,000-ton capacity cattle waste fermenter."[369] The fermenter produced methane, which could be used as fuel, and digested manure that could be

[369] "Distinguished Alumni Awards," *Speculum* Vol. 37 (2) (1984: Ohio State University), 7. Obtained from: https://kb.osu.edu/handle/1811/44905 Obtained on: May 12, 2020.

used as fertilizer. Hackett was interested in researching ways of reusing the digestate as roughage in cattle feed. He went on to organize a separate firm that developed smaller fermenters for processing animal waste.

Ohio Feed Lot Inc. was a custom feeding operation that billed cattlemen according to the cost of the diet fed to their animals, as well as the "yardage" fees. When bovines arrived at Hackett's operation, they were weighed and tagged with the owner's identification number. Over the course of their stay the animals transitioned through four different feed rations, starting with high roughage content and graduating to higher and higher energy grain concentrate, all made at the Ohio Feed Lot's own feed mill and mixer. By the time the animals left, after four to six months on a corn-heavy diet, they were twice their initial weight.

Hackett kept complete records of every individual animal's performance for the owners' benefit. Feeding trucks that transported the feed to the animals, twice a day, seven days a week, were equipped with scales to weigh the feed for each pen. The scales produced a color-coded stamped ticket which was sent to the owners twice a month, along with other animal performance numbers. Hackett kept track of each animal's feed efficiency (pounds of feed to produce one pound of beef) as well as profit per head per day. Hackett believed that "the enclosed environment insures top gains for all the cattle" and he used this data to validate his claims.[370]

Hackett wasn't alone in believing that greater confinement was the answer to higher gains and better waste management in feedlots. Unlike Hackett however, others were experimenting with slatted feedlot floors. Researchers at North Dakota State University, seeking solutions to snow and cold weather, were looking to combine slatted floors with basement

[370] "Indoor Cattle Feeding—Controlling The Environment Without Pollution," *Steel Products News Bureau* (May 1970) in 1713, Box 221, NCA.

storage where the manure could be collected and eventually scraped out from beneath the animals.[371] A sloped basement floor would enable the liquid waste to slowly drain from the structure and pumped into a lagoon, eliminating the need for water. The challenges of noxious gases in an enclosed structure nonetheless remained, and required extensive ventilation and humidity control.

Nebraska feeders Timmerman and Sons were another early custom feeding operation that had invested in an "open-front, slatted-floor barn."[372] Below the slatted floors was an oxidation ditch waste management system. The feeders picked a site on the crest of a hill, high enough to catch summer breezes—crucial for ventilation—and with sufficient slope to let the oxidized effluent flow by gravity into nearby lagoons. The ditch below the feedlot's floor was equipped with four motorized wheels, each wheel sprouting steel paddles operated at 98 rotations per minute immersed in 9 inches of liquid waste. The agitation of the waste forced oxygen into the contents of the ditch, leading to the odorless aerobic decomposition of about 75% of the solid waste.

[371] "Manure disposal still a problem in confinement livestock housing" (July, 1970) in 1713, Box 221, NCA.
[372] Warren Kester, "This big Corn Belt custom feedlot tries confinement," *Farm Journal/Beef Extra* (September 1971), 10 in 1713, Box 245, NCA.

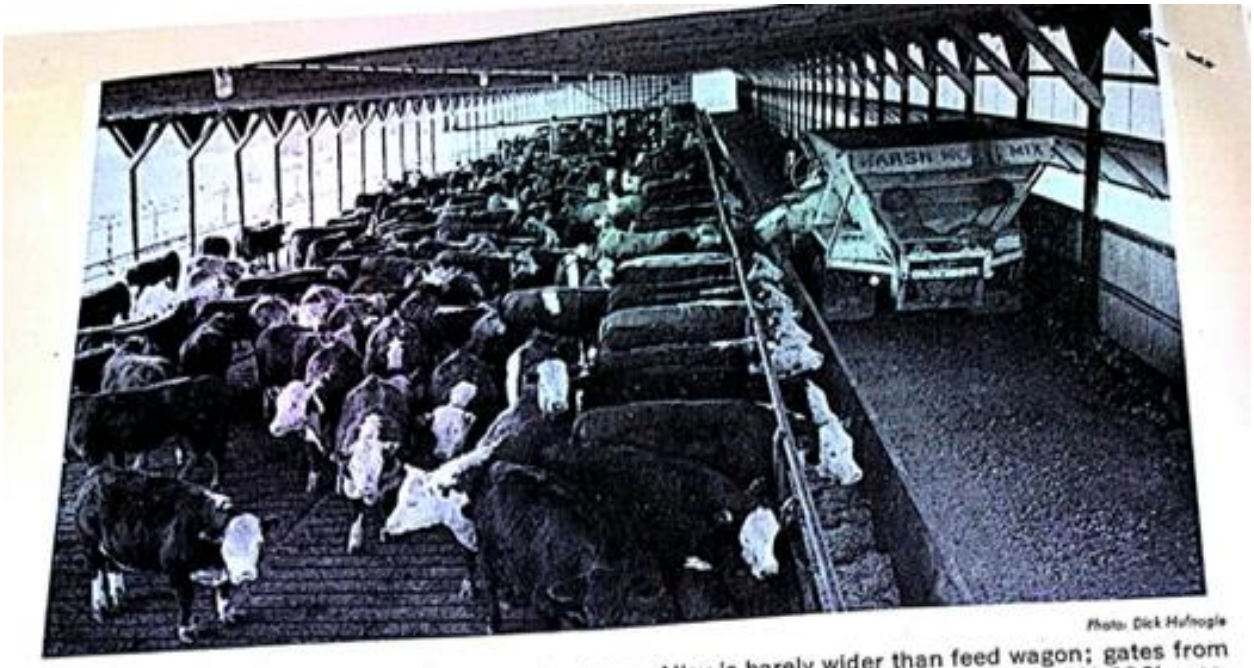

Image 4: Timmerman and Sons' enclosed feeding barn, found in: Warren Kester, "This big Corn Belt custom feedlot tries confinement," *Farm Journal/Beef Extra* (September 1971), 10 in 1713, Box 245, NCA.

Timmerman and Sons' enclosed structure had a capacity of 540 animals over just a quarter of an acre.[373] That is a concentration of less than 20 square feet per animal—an area no larger than a twin mattress for each 1000 lb creature. Greater density had enabled not just efficient and relatively automated waste management, but enclosure improved weight gain and feeding efficiency as well. Labor costs were reduced by 70%. While the feeders charged their open-lot customers 6 cents per head per day, they charged 10 cents per head per day for the bovines in confinement.[374] Paradoxically, one of the Timmerman brothers claimed, "we've had fewer sick cattle too."[375] This may have been due to a greater use of antibiotics for fear of the

[373] Ibid., 12.
[374] Ibid.
[375] Ibid.

susceptibility that comes from increased confinement. This is one way in which antibiotics and confinement formed a vicious self-reinforcing cycle.

Agricultural technology companies began designing and promoting entire "beef confinement systems."[376] They furnished the building blueprints, as well as equipment, for "controlled environment confinement"—similar to those already popular in the hog industry for over a decade, because of its early adoption of antibiotics. A roof exhaust system fitted with thermostats and a slatted-floor shallow-pit waste management system were the highlights of one such confinement design by W. Northco of Minnesota. Their pens of 960 sq. ft. each were designed for 50 cattle at a time. In justification of this high density their brochure explained:

> This gives a net of 19 square feet per animal and although this doesn't sound like a lot of square footage for an animal of that size, you will find that by crowding them to this point, the slats, and the animals, will stay much cleaner.[377]

This statement captures exactly how waste management was touted as the reason for such high degrees of concentration. In each instance discussed above, animal welfare never even made it into the discussion of efficient and "pollution-free" feedlot design solutions. Greater confinement was cast as the solution to feedlot pollution.

Manure as Feed

Cattle manure had several uses to farmers. Cow dung had been used not just as fertilizer but as fuel in many parts of the world for centuries. The latter remained an option for cattlemen such as Hackett who were using manure to generate combustible methane. But in the early 1970s, with gigantic feedlots collecting tremendous amounts of manure every single day, much

[376] W. Northco Farm Automation Systems, "Northco Beef Confinement System," *Tech N Equip Bulletin* (A. R. Wood Manufacturing Company, 1972) in 1713, Box 245, NCA.
[377] Ibid., 2.

in excess of the nutritional demands of the nearby soil, feeders began to search for more alternatives. They began experimenting with manure as feed—refeeding manure to the very animal that excreted it as well as to other species including fish.[378]

Iowa Beef Processors (IBP), leading meat packers who had a stake in the feeding business, were some of the earliest to experiment with oxidized animal waste as cattle feed. Gerald Frankl, vice-president of farms and feeding operations at IBP, led the effort to harvest the effluent from manure oxidation ditches and feed it to feedlot animals in coordination with Iowa State animal scientists, and with the cooperation of the United States Department of Agriculture and the Food and Drug Administration.[379] Frankl claimed that the effluent from oxidation ditches was teeming with aerobic bacteria which have a high protein content. The effluent was also rich in calcium, potassium, and several amino acids—the nutrients used in cattle supplements.[380] Their plan was to supplement the grain diet of bovine animals with this protein rich effluent.

In the first trial, effluent was removed from an oxidation ditch and poured onto each load of feed given to the twenty "test cattle". Over the course of the experiment, the ratio of effluent was slowly increased to make up around 35 percent of the entire ration. A control group of twenty cattle were given the regular ration. After feeding them for 110 days, the two groups of animals were slaughtered and checked by USDA veterinarians and meat inspectors. Frankl reported that the effluent fed cattle were "healthy, graded well, had no internal lesions, no condemned livers—and turned out "beautiful" carcasses in the cooler."[381] IBP concluded that

[378] W. E. Splinter, "Current Waste Management Research Program," University of Nebraska Lincoln (1970) in 1713, Box 238, NCA.
[379] Staff, "Oxidation Ditch is Cattle Feed Source: IBP's Frankl Has Found Effluent Contains High Level of Protein," *Beef* (October, 1971), 24 in 1713, Box 245, NCA.
[380] Despite the nutritional benefits of cow dung, cattle are not known to be coprophagic.
[381] Staff, "Oxidation Ditch is Cattle Feed Source: IBP's Frankl Has Found Effluent Contains High Level of Protein," *Beef* (October, 1971), 24 in 1713, Box 245, NCA.

feedlot performance was about the same for the two groups, if not slightly in favor of the effluent fed animals. The effluent fed cattle were also found to be eating significantly more than the control group. Notably, this method meant that feeders could reduce feed supplement costs and save "at least 5 cents per head per day."[382]

Interestingly, Frankl was averse to calling this system "re-cycling." He insisted that the effluent coming out of the ditch was a "completely different material than the animal waste that went into the ditch."[383] He called it "biologically processed."[384] Despite this assertion, Frankl "laughingly" promised his crew, who were using a rope and pail to transfer the effluent from the ditch and onto the feeding troughs, that he would automate the system before full scale testing was underway. Call it what he may, but the crew's disgust and unwillingness to handle the effluent signaled that the "biologically processed" manure remained unpleasant to the senses—perhaps even more so than the original product.

The USDA's Agricultural Research Service published its own research on the refeeding of manure in 1972. They proposed that "refeeding manure might be developed as a way to reduce [feedlot] pollution."[385] They had created a two-step laboratory fractionation process to convert the feedlot waste into usable products. A USDA press release compared the processed waste to "soybean meal in protein content and amino acid balance."[386] The most practical form of cattle manure refeeding that emerged over the 1970s, however, was as "wastelage," or silage consisting of cattle manure and either straw, hay or some other roughage.[387]

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[382] Ibid.
[383] Ibid.
[384] Ibid.
[385] USDA, "Feedlot Waste Converted to Usable Products," *USDA News* 2751-72 (August 28, 1972), 2 in 1713, Box 245, NCA.
[386] Ibid.
[387] Manure refeeding remains prevalent in the twenty-first century, despite cattle not being predisposed to coprophagia—or the consumption of feces—common in other species. It is now poultry waste, however, that is

As feeders, feedlot engineers, and USDA scientists invented new techniques to reduce and reuse feedlot waste, legislators sought to push federal regulations on feedlots around the nation. This is because feedlot pollution drew the ire of numerous interest groups, including public health and sanitation officials, environmentalists, fishing interests, downstream municipalities, and rural citizens. But in their attempts to stem the flow of feedlot pollutants into America's waterways, no one questioned the methods proposed to do so. Animal welfare was not considered in the congressional proceedings nor in the EPA's discussion of implementation. The remainder of this chapter discusses the legislation and implementation of the Clean Water Act of 1972.

Clean Water Act

The pollution of American waterways burst into the public eye in 1969 when a section of the Cuyahoga river in Cleveland caught fire. That fall *Time* magazine published images of the river in flames. Following the lead of Cleveland's first African American Mayor, Carl Stokes, Americans around the nation began to clamor for environmental regulation. In January 1970, Congress created the Environmental Protection Agency, and a few months later, Americans organized the country's first Earth Day. Within a couple of years, Congress had passed the Clean Water Act (The Federal Water Pollution Control Act Amendments of 1972) over President Nixon's veto. It was the first piece of federal legislation in the 20th century to regulate the discharge of agricultural waste into public waters.

usually fed to bovines as a protein supplement. See: Z. O. Müller, *Feed From Animal Wastes: State of Knowledge* (Rome: Food and Agriculture Organization, UN, 1980), Obtained from: http://www.fao.org/3/x6518e/X6518E00.htm#TOC Obtained on: May 27, 2020.

The United States Senate Committee on Public Works had been holding hearings on water pollution from different sources and industries over the course of more than a year leading up to the Clean Water Act (CWA). The Subcommittee on Air and Water Pollution met in Kansas on April 2nd, 1971, to gain "its first comprehensive review of the problem of agricultural pollution."[388] In the almost fifty witnesses and statements heard that day the word "feedlot" appeared more than a thousand times. Whereas "fertilizer" was mentioned in about five-hundred instances, and "chemicals" and "pesticides" brought up even less. Congressmen on the committee were thus urged by scientists, public health officials, and non-profit organizations, in testimony after testimony to address the problems of feedlot runoff over and above other issues of agricultural pollution.

Cattlemen, such as Alan King, President of the Missouri Cattlemen's Association, however, warned in his testimony that, "the consumers in this country will eventually pay for increased production costs caused by pollution control regulations."[389] Kansas feeder, George Chandler, whose feedlot received the National Award for Commercial Feeder of the Year on the merit of their pollution mitigation system, testified that waste management cost them $2 per animal; with a turnover of 75,000 bovines a year that amounted to an overhead of $150,000 a year.[390] He felt that despite the large costs involved, the feedlot was profitable. "I don't think we could be in business if we didn't control the waste," Chandler stated. His was a large feedlot and he thought it was impossible to, "operate that size operation and dump that much waste indiscriminately."[391]

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[388] U.S. Congress, Senate, Committee on Public Works, Water Pollution Control Legislation: Agricultural Runoff, Hearings before the Subcommittee on Air and Water Pollution, 92nd Cong., 1st sess., 1971, 2515.
[389] Ibid., 2584.
[390] Ibid., 2593.
[391] Ibid., 2596.

Representing many smaller cattle feeders, President of the Kansas Farm Bureau, R. E. Frisbie, actively downplayed the feedlot pollution concern. He quoted a researcher at Kansas State who estimated that waste from, "a 10,000 head feedlot has an annual population equivalent of 1,000 people."[392] This figure, however, assumed proper management of feedlot wastes—the very purpose of federal regulation. Further, he thought that the federal water quality standards were so unreasonable that even "before man dominated the area known as Kansas…the present water quality standards were exceeded."[393] Frisbie believed that "it would be poor policy to establish pollution control standards on a uniform basis in Kansas and would certainly be poor policy to establish uniform standards across our nation."[394] Even though most farmers were arrayed against the emerging environmental bureaucracy, many at the hearing nevertheless acknowledged the feedlot waste problem and sought federal funding toward "the development of totally new technology" for affordable management of animal waste and also "projects designed to eliminate animal waste escaping from the farm of origin."[395]

County Health Officer, Patrick Bosley of Minnesota, again drew Congress' attention to feedlot pollution in a compelling testimony in front of the House Committee on Public Works in September of 1971.[396] Unlike the Senate, the House of Representatives had not had much testimony around feedlot pollution until then. But Bosley, with the use of gripping images and lucid language, was able to effectively persuade the committee on the magnitude of agricultural waste from concentrated animal feeding operations. The chairman of the committee remarked,

[392] Ibid., 2603.
[393] Ibid.
[394] Ibid.
[395] Ibid., 2573.
[396] U.S. Congress, House of Representatives, Committee on Public Works, Water Pollution Control Legislation—1971 (Proposed Amendments to Existing Legislation), Hearings before the Committee on Public Works, 92nd Cong., 1st sess., 1971, 2112.

"let me congratulate you on one of the finest presentations I have ever heard before this committee. This is the first time I have had any explanation of this enormous problem."[397]

Bosley's Lyon county, Minnesota, had four times more cattle than humans in the mid-1960s and the nearby Redwood River had at least six times the BOD of safe drinking water. Bosley reported that:

> Many feedlot owners in Southwestern Minnesota have dug direct connections to rivers, allowed their cattle to go directly into public lakes, fed their animals on frozen lake surfaces in winter, and left dead calves and cows on riverbanks and at the bottom of lakes, and otherwise violated laws and common decency in the disposal of animal wastes.[398]

Bosley had witnessed first-hand the befouling of local waters from feedlot waste. He was convinced that feedlot owners "deliberately" let their waste wash into local waters through ditches and inclines built into the lot by design.[399] This he highlighted for the Congressmen by sharing image after provocative image of different feedlots, their layout, including runoff ditches, culverts, and channels carrying accumulated manure to adjacent lakes, streams, and waterways. Therefore, he asked Congress not only to apply "the most stringent feedlot regulations possible before it is too late" but to draw their sights on "tackling the real problem—enforcement."[400] But enforcement was not in Congress' purview, it was in the EPA's.

When the CWA was finally passed in October 1972, it aimed for the total elimination of "point source" pollution into the nation's waters by 1985. Significantly, the legislation defined a point source as:

> any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock,

[397] Ibid., 2189.
[398] Ibid., 2113.
[399] Ibid., 2116.
[400] Ibid., 2115.

> *concentrated animal feeding operation*, or vessel or other floating craft, from which pollutants are or may be discharged.[401]

By specifying "concentrated animal feeding operations" under the definition of point sources regulated by the CWA, Congress highlighted the urgency and magnitude of the feedlot pollution problem. Feedlots were the only operation to thus be singled out.[402]

The CWA's central mechanism for pollution control was the National Pollution Discharge Elimination System (NPDES) under which point source polluters had to obtain a permit from the EPA (or a state agency that had been delegated permit program authority by the EPA). Discharge of pollutants without an NPDES permit became illegal and violators could be fined up to $50,000 per day and receive up to two years of imprisonment. Congress had left it up to the EPA to issue specific guidelines and standards regarding who exactly needed to apply for NPDES permits and how. The first of these proposed guidelines "seemingly called for every farmer in the country to apply for a NPDES permit" and drew severe criticism from agricultural interest groups.[403]

Earl Butz, Secretary of Agriculture, wrote the EPA administrator, William Ruckelshaus, expressing his deep concern at the proposed rules. Butz worried that the NPDES system could involve "every farm operator and livestock producer in the nation, regardless of size."[404] Size was what Butz thought should determine permit requirements. He expressed his desire that only "large animal production units" should need to apply for NPDES permits.[405] His office had

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[401] Italics for emphasis mine; Federal Water Pollution Control Act, Section 502. EPA. Obtained from: https://www.epa.gov/cwa-404/clean-water-act-section-502-general-definitions Obtained on: May 26, 2020.
[402] In 1987, however, Congress exempted "agricultural stormwater discharges" from the definition of point sources, signaling important limitations to the scope of the Clean Water Act as it affected feedlot manure disposal methods such as the application of manure on nearby fields.
[403] Paula M. Recker, "Animal Feeding Factories and the Environment: A Summary of Feedlot Pollution, Federal Controls, and Oklahoma Law," *SMU Law Review* Vol. 30 (3) (1976), 578.
[404] Earl L. Butz to William D. Ruckelshaus (January 10, 1973) in 1713, Box 238, NCA.
[405] Ibid.

prepared a thorough response to the EPA's proposed rulemaking. In it the USDA urged the EPA to define CAFOs as a "feedlot, feed yard, or confined feeding facility having more than 300 animal units at one time."[406] Three hundred animal units were defined as the equivalent of 300 slaughter steers or heifers, 200 dairy cows, 1200 butcher hogs, 2300 sheep, 10,000 feeder pigs and turkeys each, 32,000 laying hens, or 35,000 broilers. Operations with fewer than 300 animal units, the USDA recommended, should not be considered CAFOs.

The USDA's threat that "applications from 1,914,945 livestock producers… would result in utter chaos and extreme financial waste," struck a chord with the EPA.[407] The latter definitely lacked the USDA's administrative capacity and the reach of its extension network. In the face of the seemingly insurmountable challenge of regulating several hundred thousand feedlots around the nation, the EPA's final NPDES permit regulations were revised significantly to meet and indeed exceed (in leniency) the USDA's suggestions. Only feedlots that met certain criteria now qualified as CAFOs subject to NPDES permits. First, feedlots with more than 1000 "animal units" (defined very closely per the USDA's recommendations mentioned above) were automatically classified as CAFOs. Second, feedlots that confined more than 300 animal units and also discharged pollutants into public waters were subject to the CAFO regulations. Third, CAFOs could be required to obtain NPDES permits on a case-by-case basis if found to be significant polluters despite not meeting the above criteria.[408] CAFOs that successfully acquired

[406] Ibid, attachment: "USDA Response to the Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES), Proposed Forms and Guidelines for Acquisition of Information from Owners and Operators of Point Sources, As Published Under Proposed Rule Making in the Federal Register, Vol. 37, 234—Tuesday, December 5, 1972."
[407] Ibid.
[408] Jeff L. Todd, "Environmental Law: The Clean Water Act—Understanding When a Concentrated Animal Feeding Operation Should Obtain an NPDES Permit," *Oklahoma Law Review*, Vol. 49 (1996), 481-509.

NPDES permits would be able to avoid liability if they discharged during a "chronic or catastrophic storm."[409]

Environmental groups criticized the EPA for their leniency in defining CAFOs, claiming that feedlots with fewer than a thousand animal units were also a considerable threat to the nation's waters. The Natural Resources Defense Council (NRDC) advocated for the USDA suggestion of defining CAFOs as operations with three hundred animal units or more. An NRDC attorney felt that every such operation should have to obtain a permit that specifies for the feeder, "something concrete to construct and operate" instead of "some unspecified general effluent goal."[410] Further, the NRDC claimed that "the EPA numbers are a rallying point for industry opposition."[411] For instance, in the face of the EPA's limiting definition of CAFOs, certain states like Indiana were struggling to define more stringent water pollution regulations that applied to smaller feedlots. "The feedlot industry is going to be… using that EPA number [1000 animal units] as an argument," to oppose state level regulation of smaller feedlots.[412]

Further, the EPA rulings granted large feedlots a crucial exemption. Feedlots that *only* discharged runoff "in the event of a 25-year 24-hour storm," i.e. during a catastrophic storm for that region per the National Weather Service, would not be considered CAFOs in violation of the CWA. So regardless of whether or not a feedlot met the previously mentioned size and location criteria, its potential to discharge wastes in anything less than a 25-year 24-hour storm determined whether it needed an NPDES permit.[413] In effect, a large feedlot, with more than

[409] Ibid., 491.
[410] U.S. Congress, House of Representatives, Committee on Government Operations, Control of Pollution From Animal Feedlots, Hearings before the Subcommittee of the Committee on Government Operations, 93rd Cong., 1st sess., 1973, 146.
[411] Ibid.
[412] Ibid.
[413] Jeff L. Todd, "Environmental Law: The Clean Water Act—Understanding When a Concentrated Animal Feeding Operation Should Obtain an NPDES Permit," *Oklahoma Law Review*, Vol. 49 (1996), 487.

1000 animal units, that did not discharge waste in anything less than a rare "catastrophic" weather event or worse, would not qualify as a CAFO or a point source that could be regulated under the CWA. This meant, that a feedlot, with or without an adequate waste management system, only became a CAFO under the CWA retroactively, after having polluted the nation's waters in anything less severe than a 25-year 24-hour storm.

By defining CAFOs in this particular way, the EPA had provided a way for feedlots to go unregulated until caught polluting. Accordingly, most feeders did not apply for permits and instead chose to build ponds and lagoons adequate to contain runoff from a 25-year 24-hour storm and thus considered themselves exempt from the CWA and the NPDES permits it entailed. Consequently, in the first two decades after the CWA was passed, less than 2000 permits had been issued to feedlots nationwide, while the total number of feedlots in America exceeded 100,000, with close to 10,000 of them feeding over a thousand animal units at a time.[414]

The 25-year 24-hour storm exception was additionally problematic because, feedlot runoff could easily exceed that level during sustained spells of rainfall over a period of more than 24 hours. Exactly that happened in a famous 1987 case, where a Texas feeder of over 20,000 bovines, Alta Verde, was brought to court by two private citizens, one of them a rancher, for discharging pollutants into a creek after a series of heavy rains between April and July overwhelmed their holding ponds.[415] Alta Verde had decided to cut a spillway from one of their ponds to discharge effluents into a nearby tributary. Alta Verde was working on the assumption that because they had a waste management capacity to handle a 25-year 24-hour storm, they were exempt from CAFO status under the CWA. But the moment Alta Verde discharged waste

[414] Ibid., 482.
[415] Jeff L. Todd, "Environmental Law: The Clean Water Act—Understanding When a Concentrated Animal Feeding Operation Should Obtain an NPDES Permit," *Oklahoma Law Review*, Vol. 49 (1996), 490.

in a non-25-year 24-hour storm event their assumption was invalidated, and they became a CAFO by definition and therefore subject to the CWA. Had Alta Verde obtained an NPDES permit, the CAFO would have been exempt from "chronic or catastrophic rainfall events" not limited to a 25-year 24-hour storm.[416] In essence this case, proved that feeders who met CAFO size definitions but did not have an NPDES permits could face litigation and fines if they discharged waste in anything other than a 25-year 24-hour storm event. But despite the threat of litigation, the definition of a CAFO that was subject to the CWA remained retroactive; CAFOs were thus, innocent until caught polluting.[417] In other words, the CWA subjected only actual discharges to regulation, not potential discharges.

Structural Changes in the 1970s

It is not unsurprising that many feeders chose to avoid expensive compliance with the NPDES system in the political economy of the 1970s. Following the Soviet grain sale of 1972, government grain stocks had been "virtually liquidated."[418] World crop shortages had created an increased export demand for American crops and even as corn production soared, so did demand, and grain prices rose. Increased grain prices pushed cattle feeders into a terrible cost-price squeeze. Over 10% of cattle feeders exited the industry across the nation and many of those that remained operated at less than 50% capacity. The number of small feedlots, with less than 1000

[416] Ibid., 491.
[417] The EPA tried to reform its NPDES permit requirements to subject large numbers of previously unregulated CAFOs to monitoring, reporting, and inspections in its 2003 rulemaking, but was thwarted by the U.S. Court of Appeals for the Second Circuit, in the 2005 case, *Waterkeeper Alliance Inc. v. EPA*. The court concluded that the EPA "did not have the authority under the Clean Water Act to require CAFOs that were not discharging pollutants into federally regulated waters to apply for permits." See: Government Accountability Office, *Concentrated Animal Feeding Operations,* GAO-08-944 (Washington D.C.: September 2008), 7.
[418] Douglas Bowers, Wayne D. Rasmussen, and Gladys L. Baker, "History of Agricultural Price Support and Adjustment Programs, 1933-1984," *Agricultural Information Bulletin* No. AIB-485 (Dec. 1984), 29. Obtained From: https://www.ers.usda.gov/publications/pub-details/?pubid=41994 Obtained on: July 16, 2020.

cattle, fell by more than half in the coming decade, while larger feedlots flourished (see Image 5).[419] Ironically, the very feedlots that had the most pollution potential, i.e. the largest operations, were the most likely to weather the storm of the early 1970s.

Table 7—Number of cattle feedlots by capacity and percentage change, 1962-89

State	Feedlot capacity							
	Under 1,000 head				1,000 head and over			
	1962[1]	1970	1980	1989	1962	1970	1980	1989
	Number of lots							
Thirteen States:								
Texas	1,600	1,300	931	639	203	227	166	161
Kansas	14,947	8,868	3,252	1,626	53	132	248	274
Oklahoma	2,159	753	280	[2] 223	29	47	35	27
Colorado	1,200	654	200	130	80	184	200	165
Nebraska	23,991	18,400	12,525	8,320	312	514	375	480
Idaho	870	546	286	45	60	89	64	58
Washington	585	262	106	[2] 49	39	30	19	16
South Dakota	10,780	9,049	5,951	4,142	20	51	49	58
Minnesota	23,979	18,162	10,681	5,945	21	38	69	55
Arizona	95	8	4	[2] 7	94	53	29	8
Iowa	49,964	41,829	29,532	16,250	36	171	468	250
California	305	153	17	9	300	272	84	46
Illinois	31,976	23,952	12,410	7,850	24	48	90	50
Total	162,451	119,436	76,175	45,235	1,271	1,856	1,896	1,648

Image 5: Change in the number of feedlots in large cattle feeding states between 1962 and 1989. Image Source: Kenneth R. Krause, *Cattle Feeding, 1962-89: Location and Feedlot Size*, Economic Research Service, USDA, Agricultural Economic Report No. 642 (Washington D.C.: 1991).

Responding to the grain shortage crisis, the Agriculture and Consumer Protection Act of 1973, for the first time since the end of WWII, no longer sought to control overproduction. Earl Butz, Secretary of Agriculture under President Nixon, became famous for encouraging farmers to plant crops from "fence row to fence row." The concept of parity was removed from price

[419] Kenneth R. Krause, *Cattle Feeding, 1962-89: Location and Feedlot Size*, Economic Research Service, USDA, Agricultural Economic Report No. 642 (Washington D.C.: 1991).

supports and replaced by "target prices", which tended to be lower. [420] When market prices fell below target levels, deficiency payments would be made to farmers to compensate for the difference between market prices and target prices. CCC loans continued to use the concept of parity, but loan rates were set below market prices (as well as target prices) in order not to result in excessive reliance on government storage.

Overall, the 1970s, witnessed a major move away from the supply management of agricultural commodities. This is exactly what cattlemen had long wanted, only it came during a time of high input prices and increasing expenses related to waste management. High corn prices made it so that "no deficiency payments were made to corn producers under the 1973 Act."[421] The USDA also altered its set-aside program, reducing compliance requirements for acreage reduction from 25% to 10%.[422] The USDA removed all planting restrictions for 1974. In other words, grain producers were incentivized to produce as much as possible, without any production controls. Next year, President Gerald Ford vetoed a farm bill that would have raised target prices and loan rates for grain, serving the ailing livestock industry which was only slowly recovering from a difficult start to the decade.

The transformed political economy of corn exemplified in the Agriculture and Consumer Protection Act of 1973 also reflected the cumulative changes in the structure of agribusiness in the post war era. Many large grain processing and merchandising firms such as Cargill and ConAgra had expanded into livestock feed manufacturing. After all, in 1973, livestock and

[420] Douglas Bowers, Wayne D. Rasmussen, and Gladys L. Baker, "History of Agricultural Price Support and Adjustment Programs, 1933-1984," *Agricultural Information Bulletin* No. AIB-485 (Dec. 1984), 30. Obtained From: https://www.ers.usda.gov/publications/pub-details/?pubid=41994 Obtained on: July 16, 2020.
[421] Stephanie Mercier, "Corn: Background for 1990 Farm Legislation," Staff Report No. 89-47, Commodity Economics Division, Economic Research Service (Washington D.C.: USDA, Sept. 1989), 31.
[422] Harold Lee, "The Citizen and the USDA: The Case of Roswell Garst," *Agricultural History* Vol. 64, No. 2 (Spring 1990), 269.

poultry feeding accounted for almost 60% of corn production in the U.S., a number that rose steadily in the following two decades. Because feeders were the largest domestic consumers of corn, Cargill and ConAgra depended on the demand that they generated. These large corn processors did not benefit from high corn prices but from the increased demand. Their interests would not be served if the cattle industry returned to grazing practices in lieu of high grain prices.

With a significant chunk of the grain sector either integrated or contracting for livestock interests, it is not surprising that the primary function of 1970s corn policies was to achieve a favorable livestock-corn ratio for animal feeding—something that the Farm Bureau's corn belt membership also desired. As for corn farmers, with the withdrawal of supply management, larger farms could increase production to make up for lost government payments, while smaller farms suffered. Thus, while the CWA contributed to concentration in the feeding industry during the 1970s, the farm bill of 1973 led to concentration in the grain business.

Conclusion

Even though most cattle feedlots were still open to the elements in the 1970s, more and more turned to covered and enclosed lots over the following decades. The reasoning of one Ohio State University professor illustrated why: it was because of environmental regulations that, "a lot of the livestock industry is ultimately going to have to go to enclosed systems."[423] This is because agricultural engineers conceived of complete confinement as the only solution to feedlot pollution. Enclosed or not, as this chapter has argued, feedlots witnessed greater concentration of

[423] Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (Boston: Houghton Mifflin Harcourt, 2013), 151.

animal numbers in smaller spaces in search of efficient waste management systems. The search for a "sanitary" feedlot has, therefore, came at the cost of the deteriorating quality of animal lives, ultimately with little pollution abatement to show for it.[424]

The administrative challenges faced by the EPA and the economic context of the early 70s made the EPA and the Clean Water Act that much less effective at regulating feedlot waste in the United States. Whether from runoff, lagoon spills, or the excessive application of manure onto agricultural fields, feedlot pollution remained an urgent environmental concern for decades to come. Disparate fields and professions brought their attention to the problem of feedlot waste. As in the hearings surrounding the CWA, engineers, public health workers, water and sanitation experts, environmentalists and their litigators all weighed in on feedlot pollution concerns and shaped the feedlot enterprise, much to the consternation of a cattle industry—one that was becoming increasingly wary of public opinion turning against beef—the subject of the epilogue.

[424] The NOAA reported the largest dead zone in the Gulf of Mexico on record, in 2017: https://www.noaa.gov/media-release/gulf-of-mexico-dead-zone-is-largest-ever-measured

The Emerging Critiques of Animal Rights & Climate Change

Rachel Carson, renowned author of *Silent Spring*, which was a rallying point for environmentalists from the 1960s onward, lent her influence to another growing international movement: animal rights. She wrote the foreword to Ruth Harrison's pioneering critique of factory farming, *Animal Machines*, in 1964, which led to the legislation of significant animal welfare regulations in Britain later that decade. In the United States, Frances Moore Lapp's 1971 best-seller *Diet for a Small Planet* popularized vegetarianism while revealing the inefficiencies in the feedlot method of grain-fed meat production—especially egregious in the face of widespread famine and a world hunger crisis. Her work inspired a storm of criticism directed at the cattle feeding industry during the 1970s, highlighted in popular publications such as *Readers Digest* and *Cosmopolitan*. Further, Peter Singer's publication of *Animal Liberation* in the mid-70s exposed the abysmal living conditions of feedlot animals and, in doing so, launched the modern animal rights movement in the United States.

When the nascent animal rights movement began to challenge the methods and legitimacy of industrial animal agriculture, it was animal scientists like Temple Grandin who came to the industry's rescue. Grandin embodied the confluence of animal science and feedlot capitalism that had emerged over the second half of the twentieth century. Grandin was a trained researcher who not only spoke the language of agribusiness, she owned and operated a business designing equipment for the industry. She convinced feedlot managers that animal welfare paid. Her explicit attention not only to animal behavior but also to the bottom line, catapulted her into the spotlight and made her the industry's favorite animal welfare advocate.

By the end of 70s, the use of the growth stimulating hormone DES, in animal feeds, was banned after investigators discovered its carcinogenic properties. Within a few years, scientists

also discovered increasing instances of antibiotic resistance and began pointing to their indiscriminate use in animal agriculture as a likely reason. Simultaneously, the medical profession arrived at a consensus on the positive link between cholesterol and heart disease—again implicating red meats such as beef as primary culprits. In this climate, beef consumption began to decline in the United States, increasingly replaced by chicken, which was seen as a healthier alternative.

In the midst of declining beef consumption climate scientists began connecting rising methane emissions to ruminant animals. Rumen in bovine stomachs produced methane as a byproduct, which was released to the atmosphere through cattle burps. This knowledge, combined with the fact of rapidly increasing cattle numbers over the course of the second half of the twentieth century, brought to light the most serious existential challenge to the cattle industry yet: the role of bovines in climate change. Animal scientists at land-grant universities again came to the defense of cattlemen but were unable to undermine the growing body of international research that indicated that cattle were one of the largest sources of global warming emissions in the agricultural sector, and that animal agriculture alone accounted for more emissions than all transportation, globally.

Animal Rights and Vegetarianism

The nineteenth century *animal welfare* movement had focused on reducing abuse and cruelty toward domesticated animals, as well as alleviating animal suffering in the course of transportation, without questioning the use of animals for human purposes. For instance, Henry Bergh founder of the American Society for the Prevention of Cruelty to Animals in 1866, successfully pursued legislation in New York to limit the time cattle could be left on rail cars.

Efforts by SPCAs, humane societies, and the anti-vivisection movement led to the passage of anti-cruelty statutes in every state by 1907.[425] The Humane Slaughter Act of 1958, written and pushed by Senator Hubert Humphrey, was among the few advances at the federal level made prior to the emergence of the animal rights movement in the 1970s. The act required packers selling meat to the government to either anesthetize or stun animals through mechanical or electrical means prior to slaughter (excepting Kosher operations).

The *animal rights* movement, however, offered a critique that was radically different from the *animal welfare* advocates of the past—arguing for an end to animal experimentation and slaughter altogether. This critique emerged in the1960s context of an explosion in the number of concentrated animal feeding operations and the growth of animal experimentation funded by the cold war military-industrial-complex. The issue of animal experimentation emerged as the early focus of the animal rights movement in the United States, with SPCA and Humane Society led exposés of animal dealers that supplied laboratories, often with stolen animals, revealing the filthy conditions in which the animals were kept. Public outcry led to the passage of the Laboratory Animal Welfare Act in 1966. Amendments to the Act in the 1970s required the administering of pain-relieving drugs to live animals being experimented upon, unless that would interfere with the experiment.

A new critique of animal agriculture took shape during the world hunger crisis.[426] In the two decades between 1960 and 1980 there were repeated famines around the world, responsible

[425] Lawrence Finsen and Susan Finsen, *The Animal Rights Movement in America: From Compassion to Respect* (New York: Twayne Publishers, 1994), 52.

[426] The remainder of this section is drawn from a paper I wrote with Leah Silverman: "Threat of the Vegetarian Dogma: National Cattlemen's Association, Vegetarianism, and World Hunger, 1959-1989," *LibraETD* (2019). Source: https://doi.org/10.18130/v3-twpz-9290

for the death of over 25 million people.[427] The crisis commenced with the two-year long Great Leap Forward Famine in China, which began in 1959 and was dubbed the "single biggest famine event in history in terms of absolute number of deaths" with a death toll estimated at 24 million.[428] The late 1960s saw a major famine in Biafra, Nigeria with an estimated 750,000 deaths. That was followed by famines in Bangladesh (1974) and Cambodia (1979), with 1 million and 1.6 million deaths, respectively.[429] There were smaller scale famines as well, and all of these together, put a spotlight on the unequal distribution of grains throughout the world—most of which were being fed to animals being mass produced to sate the hunger of wealthier nations.

In the midst of these global famines, meat consumption in America diverged drastically from the global average. In 1966, people in the United States consumed an average of 66 grams of animal protein per day (71% of their daily protein intake).[430] This was far greater than the average of 20 grams of animal protein that the rest of the world consumed on a daily basis.[431] So even as an increasing amount of grain was being fed to domestic animals in the United States, grain scarcity bedeviled much of the much of the rest of the world. Researchers had also realized that meat production was a highly inefficient process of calorie conversion. Animal scientists calculated that cattle feedlot production was the least efficient in converting plant protein to animal protein, of the entire livestock sector.[432] For instance, one acre of land could fulfill one

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[427] Hasell, Joe, and Roser, Max. "Famines." Our World in Data [database online]. 2017 [cited April 2019]. Available from https://ourworldindata.org/famines.
[428] IBID.
[429] IBID.
[430] Damon V. Catron and Milton R. McRoberts. "Animal Proteins in the Diets of the World's People," RS21-7-12, Box 47, Folder 1 (October 10,1966), pg. 2, National Cattlemen's Association Records, American Heritage Center, University of Wyoming
[431] IBID.
[432] Damon V. Catron, "Impact of Nutrition and Food Science on Animal Agriculture," *Soybean Digest* Vol. 27, No. 12 (September 1967), 72.

person's protein requirement for only 77 days if the land were used for beef production, compared to 236 days if the land were used for milk production; 773 days if the land were used for corn cropping, and 2,224 days if the land grew soybean protein.[433] Animal scientists were called upon to make beef production more efficient.

Damon Catron and Milton McRoberts, two prominent animal scientists with strong industry connections, released a report suggesting that the meat industry must take action in response to growing global protein disparities. They urged the animal feeding industry to adopt confined housing and automated feeding technology in place of increasingly expensive land and labor inputs. These researchers urged U.S. scientists and institutions to transfer the technology of efficient feedlot production to other nations.[434] Their critical lens was directed outward: researchers placed the burden of famine on countries experiencing extreme hunger, suggesting that they must reform their ways of producing food to match the productivity standards of the United States. In the researchers' opinion, industrialized animal agriculture based on large-scale grain-feeding remained the clearest solution for world hunger.

Building on Frances Moore Lappé's 1971 bestseller, *Diet for a Small Planet*—which would go on to sell over three million copies—in 1975, CBS released a 60 Minutes Episode titled "Let 'Em Eat Grass" that urged viewers to adopt a plant-centered diet in the face of world hunger.[435] Gordon Van Vleck, ANCA President at the time, responded to this publication with polite rage, explaining that feed grains and food grains were "not synonymous" and that reducing use of feed grains and the consequent reliance on animal proteins, would have no effect on the

[433] Catron, Damon V., and Milton R. McRoberts. "Animal Proteins in the Diets of the World's People," RS21-7-12, Box 47, Folder 1 (October 10,1966), pg. 8, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[434] IBID.
[435] Van Vleck, Gordon. "Letter from NCA President to Mike Wallace at CBS News," 1713, Box 42, (February 19, 1975), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.

world hunger crisis.[436] Van Vleck explained that animal feed, which was inedible to humans, was also getting more expensive forcing the feeders to operate at low capacities.[437] Van Vleck purposefully neglected to mention what he meant by feed grains. Corn, grain sorghum, barley and oats were the most common feed grains in the United States. The kind of corn grown for cattle was different from sweet corn, but was not inedible—it was used to make cornmeal and corn chips. Grain sorghum was rarely consumed by persons in the United States, but eaten around the world, as were barley and oats. The ANCA president represented himself and his industry as a fellow victim in the time of the food crisis, struggling under high grain prices while receiving unwarranted blame for a problem that they felt they had no part in.

In the Spring of 1975, *Reader's Digest* bombarded Americans with a plethora of reasons to give up meat. Articles titled "Do We Eat Too Much Meat" and "Why the Food Crisis?" were explicit about each meat-eater's direct impact on world hunger.[438] In the former, author Daniel Grotta-Kurska quoted the *New York Times* in stating that, "if Americans were to reduce their meat consumption by only ten percent for one year, it would free for human consumption at least 12 million tons of grain."[439] This amount was projected to feed "60 million grain eaters for a year" and would be able to mitigate developing famines in India and Bangladesh.[440] In this article, *Reader's Digest* asked its readers to take small steps, implying that if each American consumer changed only slightly, the problem of world hunger would subside. A section labeled "A Trace of Guilt" suggested that if readers did not take small steps toward a more plant-based

[436] IBID.
[437] IBID.
[438] Van Vleck, Gordon. "Correspondences Between NCA President and Laura Belle Owens with Magazine Articles Included," 1713, Box 42, (May 28, 1975), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[439] Grotta-Kurska, Daniel. "Do We Eat Too Much Meat?" *Reader's Digest,* 1713, Box 42, (1975), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[440] IBID.

diet, they should feel a sense of shame for failing to do their duty to the hungry millions around the world.[441]

In "Why the Food Crisis?" author Jean Mayer detailed "how we came to the brink of catastrophe" as the world's food reserves approached depletion.[442] Mayer blatantly argued that the "conversion of feed into animal food for humans is far from efficient," with only five to seven percent of calories fed to steers making it into the mouths of American consumers.[443] In concluding his argument for personal accountability in food consumption, Mayer delineated two "dangerous attitudes" towards the world hunger crisis that had formed amongst Americans: "One advocates 'triage,'" Mayer wrote, "the abandonment of some poor countries—and millions of lives—to their fate."[444] This attitude had been earlier reflected in McRoberts and Catron's ideas about technology transfer. Mayer continued, "the other, more generous but not farsighted [attitude] advocates aid with no strings attached."[445] Mayer found such thinking only produced shaky, unreliable results. He stood against consumer tendencies of perceived helplessness in the face of crisis, ending his piece with the words, "both of these attitudes imply that we cannot control events and work to improve the fate of mankind. Both are unworthy of us."[446] Whereas Grotta-Kurska had preyed on guilt, Mayer demanded action—a remedy not only for the crisis at hand, but also for the question "can I make a difference?" In the publication of these calls to action, *Reader's Digest* created for its readers an image of a moral consumer that could be as

[441] IBID.
[442] Mayer, Jean. "Why the Food Crisis?" *Reader's Digest,* 1713, Box 42, (May 1975), pg. 73, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[443] Mayer, Jean. "Why the Food Crisis?" *Reader's Digest* ,1713, Box 42, (May 1975), pg. 74, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[444] Mayer, Jean. "Why the Food Crisis?" *Reader's Digest* ,1713, Box 42, (May 1975), pg. 77, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[445] IBID.
[446] IBID.

easily tarnished as fulfilled. The magazine did not advocate ruthlessly for complete vegetarianism, but it married morality to consumer diet.

The American National Cattlemen's Association (ANCA) believed it could wriggle free from these charges through the distribution of research and information supporting the beef industry. Quickly following the *Reader's Digest* publications, ANCA President Gordon Van Vleck wrote to the concerned Laura Belle Owens, Tehama County Cattlemen and Cow Belles representative, explaining the ANCA's approach to remedying the negative publicity that the magazine had created. Van Vleck stated that the ANCA had "been in touch with the publication… sent them considerable information, and… urged their consideration of an article presenting more correct facts and different views."[447] To the ANCA, 'better' facts and more favorable publications were the key to the industry's response. This tactic exposed the ANCA's readiness to polish its public appearance, but complete unwillingness to adapt its agricultural practices.

In 1975, Peter Singer's publication of the highly influential book, *Animal Liberation*, initiated an intellectual dialogue that made its way into universities and serious academic philosophical discussions in the US and abroad. He argued that animals' interests shared equal consideration because they were capable of experiencing pain. Singer furthered the language of *speciesism*, which argued that it is wrong to fail to consider the interest of animals simply by virtue of the fact that they are from a different species, likening speciesism to the injustices of racism and sexism. Activist Henry Spira, inspired by taking a class with Singer, led protests against the Museum of Natural History in New York City, where NIH-funded researchers had been conducting experiments on cats to discover the effect of blinding, deafening, and removing

[447] Van Vleck, Gordon. "Letter from NCA President to Mike Wallace at CBS News," 1713, Box 42, (February 19, 1975), pg. 1, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.

parts of the brain, on feline sexual behavior. After 18 months of protests by the activists the laboratory was dismantled. Similar highly public protests and campaigns, by PETA activists as well as the more radical Animal Liberation Front, took place at labs in Maryland and Pennsylvania during the 1980s—lending momentum and thousands of followers to a growing nationwide movement.

By 1977, vegetarian critiques of the beef industry were in full force in publications such as *Cosmopolitan Magazine*. An article titled "Meat & Vegetarian Concept," including claims like "meat squanders the world's protein sources," alongside many health benefits of vegetarianism, gripped and angered the ANCA.[448] Tom McDermott, ANCA Communications Specialist, wrote to *Cosmopolitan* aggressively stating that "it seems especially unfortunate that a magazine read by so many young women is so ill-informed about nutrition."[449] Along with refuting the health and environmental benefits of a vegetarian lifestyle, McDermott proposed that meat eating did the exact opposite of what *Cosmopolitan* claimed: that it provided a high-quality protein source from land not suitable for crop production. He stated that only 15% of U.S. land was suitable for raising grain, while almost triple that much land could be used as ranges and pastures where ruminant animals could graze.[450] It is ironic that in that decade, more American bovines spent their days in feedlots being fed high grain concentrates than ever before.

ANCA worry escalated in April of 1977 when a presidential dinner commemorating the year's Food Day was made entirely vegetarian. Tom Monier, the National Livestock Feeder

[448]McDermott, Tom. "Letter from NCA Communications Specialist to NCA Director of Communications on Cosmopolitan Magazine Article Response," 1713, Box 430, (May 23, 1977), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[449] IBID.
[450] McDermott, Tom. "Letter from NCA Communications Specialist to NCA Director of Communications on Cosmopolitan Magazine Article Response," 1713, Box 430, (May 23, 1977), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.

Association's president at the time, wrote directly to President Jimmy Carter, pleading for the addition of meat to the menu. Failing to serve meat would at the least "lead to a discriminatory endorsement of food-faddism and certainly a sanction of a meatless diet," and at worst be taken as a corroboration of "the unrighteous propaganda programs against meat and meat products."[451] Monier implicated the government in any potential backfires that the President's menu may have on the industry. He added a reminder that the meat industry was the largest segment of U.S. agriculture and food production, and that any suffering imparted on the industry at the hands of a presidential recommendation would have ricochet effects throughout the economy.

The battle between vegetarian advocates and members of the ANCA continued even after the World Food Crisis began to ebb away. In the May of 1980, *Cosmopolitan Magazine* again used its power as a cultural influencer to promote a vegetarian lifestyle. Writer Gary Selden wrote an article titled "The Virtues of Vegetarianism" that appealed primarily to ethical consumerism, and only secondarily to the health benefits of a vegetarian diet.[452] By this time, about seven million Americans were vegetarian and the movement was characterized as one of young, racially-mixed middle-class people that was centered around college campuses.[453] In the article, Selden highlighted key vegetarian celebrity figures like actress Cloris Leachman and actor Denis Weaver. Weaver's attitude was that, "vegetarianism is not a fad. People come to it sensibly and they're saying, 'no matter what the majority says, this is my body and I'm going to take care of it and make it last.'"[454]

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[451] Monier, Tom. "Letter from NLFA President to United States President Jimmy Carter on Dinner Menu," 1713, Box 443, (April 19, 1977), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[452] Selden, Gary. "The Virtues of Vegetarianism," *Cosmopolitan Magazine*, 1713, Box 11, (May, 1980), p.136, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[453] IBID.
[454] IBID.

The attack on the meat industry was now more direct, personal, and divorced from the context of the world hunger crisis. The contextually driven act of foregoing meat in the face of famines around the world had now become a lifestyle choice endorsed by popular media outlets. Besides touting the health benefits of a vegetarian diet, Selden's article argued for vegetarianism on a moral ground that would outlive any food crisis. Selden further enforced his points by quoting Leachman, who stated that the American public had been "brainwashed with four-food group propaganda… which teaches people the wrong way to eat" and that she could enjoy an "abundance of vitality without ever eating meat again."[455] Further, the *Cosmopolitan* article invoked the importance of animal liberation, as promoted by major figures ranging from "Pythagoras and the Buddha to Tolstoy and Gandhi" before attempting to address the questions around meat productions inefficiency and waste.[456]

This transformation in rhetoric shows the vegetarian movement coming of age, having moved beyond its appeals to the world hunger crisis, garnered support from celebrities, and secured air-time in mainstream media. In doing so, it represented a more intense threat to the meat industry than its previous avatar as a temporary remedy to the World Food Crisis. Yet, Selden lamented that beef remained, "the most prestigious meat," even though, "in a very real way, a steak on [the reader's] plate means seven empty bowls in Bangladesh."[457] Despite past spats with the ANCA president, *Cosmopolitan* did not hold back in its scrutiny of the cattle industry, suggesting that its readership probably approved of its message. Over the course of the world hunger crisis, the vegetarian movement moved from a timely prescription to a more robust ethical critique of meat on pages consumed by millions of young Americans.

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[455] IBID.
[456] IBID.
[457] Selden, Gary. "The Virtues of Vegetarianism," *Cosmopolitan Magazine*, 1713, Box 11, (May, 1980), p.136, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.

With this rise in the vegetarian movement's intensity and popularity came an equally intense pushback from the ANCA. Anti-beef propaganda signified a growing threat with the power to turn millions of Americans away from the beef industry. The article, "The Virtues of Vegetarianism," made its way up the organizational ladder at the ANCA, past the ranks of communication specialist to President Merlyn Carlson, who refuted seven individual points made in the article, all whilst circumventing the ethical question: "is meat moral?"[458] Responses were sharp nonetheless: "Sally Fields and Burt Reynolds eat meat," wrote Carlson. Americans only consume "about 25 grams of [meat] protein per day—less than half the recommended daily allowance for men (56 grams) and well below the 46 grams recommended for women."[459] This was a shocking misrepresentation of facts at moment when Americans ate more meat than any other nation on the planet. And on issues deemed untouchable, "no comment."[460] The severity of the threat of ethical consumerism was easiest to see in Carlson's concluding statement: "If I were interested in taking a "cheap shot" at Mr. Selden's article (similar to the many 'cheap shots' he has taken at my industry), I would point out that he failed to mention the most celebrated vegetarian of all time in his article. Adolf Hitler."[461] Selden's argument was deemed senseless, irrational, and disrespectful. His moral claims were bypassed, pushed aside, and labeled "cheap shots." The ANCA's responses displayed a deliberate avoidance, a non-consideration, of ethical consumerism, and a profound discomfort at the thought of consumers foregoing beef products. Underlying the aggravated response of the ANCA was an unwillingness to evolve, a sense of

[458] Carlson, Merlyn. "Letter from NCA President to Editor of Cosmopolitan Magazine," 1713, Box 11, (June 3, 1980), National Cattlemen's Association Records, American Heritage Center, University of Wyoming.
[459] IBID.
[460] IBID.
[461] IBID.

helplessness. There was no working together: the beef industry and its dissenters were another "us" and "them" in a Cold War world.

In November of 1979, *Time Magazine* author John Leo wrote, the "[vegetarian] dogma is spreading rapidly. Most college campuses now have vegetarian sections, and on many campuses the faithful are herding to form vegetarian clubs."[462] It was the world hunger crisis that gave rise to a wave of ethical consumerism. Exposés of the inefficient system of grain-based feedlot production revealed the roots of global food injustice. Though the moral quandary of eating meat was initially brought to light in the face of widespread famine, the rhetoric of the vegetarian movement grew beyond a reaction to famine alone. Eventually, the anti-beef campaign developed a systematic, rather than contextual, critique of meat. Arguments evolved to ask and answer more fundamental questions—to spur radical, long-lasting change for domesticated animals.

Temple Grandin

It was in this context of animal rights activism that Temple Grandin became involved in the cattle industry. Her interest in the experiences of animals began, when she was 17, at a summer job handling cattle at an Arizona feedlot. She then went on to get a master's at Arizona State University in 1972. Three years later she started her own design firm, Grandin Livestock Handling Systems. Eventually, she got her PhD at the University of Illinois, where she wrote a dissertation on the effects of environment on an animal's behavior and central nervous system.

[462] Leo, John. "How to Beat the Beef Against Meat," *TIME Magazine*, 1713, Box 11, (November 5, 1979), p.112, National Cattlemen's Association Records, American Heritage Center, University of Wyoming.

As a professor at Colorado State University, Grandin made a name for herself designing equipment to expedite the safe movement and handling of livestock. She was acutely aware, at a time of increasing concern over animal welfare in the 1970s and 80s, that understanding animal behavior was basic not only to the design of animal handling facilities and the daily tasks of animal management, but also to head off criticism by animal rights advocates.

Animal scientists at land grant universities in the mid-twentieth century focused their research mainly on questions of nutrition and feed efficiency, as many considered animal behavior and psychology pseudo-science.[463] Extension agents encouraged farmers to kill off ill-behaved animals. In the mid-1950s, during drought years, University of Nebraska's extension service advised farmers to cull animals that had an unruly disposition. "One nervous, unruly animal will make the whole herd harder to handle and is a constant source of danger."[464] Animals that were "easily disturbed" required added management and often lost more weight from handling-induced stress. In other words, animals with an unfavorable temperament were expensive and potential liabilities that should be killed outright. "When a balky Brahman steers decides to lie down in a narrow leadup alley your operation stops till he gets up."[465] Such animals, joined the cull list alongside animals that were old, unproductive, injured or unhealthful.

Animal behavior, thus, had considerable impact on feedlot operations, and ultimately feedlot profitability. And so it was in search of feedlot efficiency and greater standardization that early studies of animal behavior were conducted by agricultural scientists at land-grant universities. For instance, in 1953, University of Illinois' scientists conducted an experiment

[463] B. F. Skinner, one of the early pioneers in the study of animal behavior who was known for his work on operant conditioning and learned behaviors in the 1930s and 40s, was trained in experimental psychology, not animal science.
[464] W. V. Lambert, "Why Cull Your Herd Now?" Extension Service—University of Nebraska (December 1956) in Box 50, RG 11-10-03 University of Nebraska Lincoln Archives.
[465] Key Pepper, "She Kills Cows with Kindness," *Phoenix Gazette* (March 16, 1977).

over 156 days, to study how access to a dirt lot impacted the feeding efficiency of confined bovines. Their concern was that animals in paved feedlots, without access to soil, would not stay on a diet of "full feed". Ultimately, the desire of bovine creates to eat dirt in confinement thwarted the scientists' comprehension. Matsushima later reflected, "we have never been able to make a feedlot ration sufficiently complete so that we can keep cattle from eating dirt or licking the soil."[466]

In 1967, John K. Matsushima conducted an experiment reminiscent of the time-and-motion studies of Frederick Winslow Taylor in order to figure out why some feedlot animals ate more than others? If he cracked this puzzle, breeding and environmental factors could be controlled in such a way as to maximize weight gain in feedlots. Miniature radio transmitters were attached to the heads of a group of CSU's experimental feedlot animals and each animal was assigned its own feed bunk. These bunks had a lid that would open or close whenever the animal approached it. The opening and closing of the bin lids, like the mechanism that controls automatic garage doors, would set of timing and measuring devices that would record when each steer "felt the urge to eat," how long he was at it, and how much he consumed.[467] "What we're trying to do, is achieve uniformity," confirmed Matsushima.[468] But uniformity of behavior remained elusive.

Grandin's work on animal behavior was definitely more animal-centric, but nonetheless influenced by the time she spent, outside the laboratory, in her clients' feedlots where she witnessed first-hand the abuse of animals. She argued that 15% of U.S. feedlots and ranches were allowing gross abuse of animals to occur on a regular basis. "I have seen the headgate of a

[466] John K. Matsushima and W.D. Farr, *A Journey Back: A History of Cattle Feeding in Colorado & the United States* (Colorado Springs: Cattlemen's Communications, 1995), 109.
[467] Jack Guinn, "Genius of the Feedlots," *Empire Magazine, The Denver Post* (August 13, 1967).
[468] Ibid.

chute slammed on a calf's head repeatedly and a cowboy try to poke an animal's eye out with his finger."[469] In the face of widespread animal abuse and vocal critiques by animal rights activists, Grandin painted a stark picture for the livestock industry:

> Pressure from animal welfare groups is going to increase. The industry has two choices: One, get our house in order… or two, get new government regulations shoved down our throats… If we do not respond to animal welfare pressure we will get stifling regulations piled on top of us which will increase our costs.[470]

She was a regular presenter not only at academic animal science and agricultural engineering conferences, but was a highly sought-after speaker at national and international industry events. At one such conference she urged the beef industry to identify and correct the problem of abusive livestock handling "so that feedlots and ranches that are doing a good job are not penalized for the abuses of others."[471]

To be clear, there was a difference between preventing animal abuse and promoting animal welfare. Grandin taught animal handlers to "exert dominance over an animal."[472] Not by "beating an animal into submission," but by "using the animal's natural behavior."[473] For instance, once Grandin herself was bitten by a dominant pig. "By shoving [that] pig against the fence with a board pushed against its neck," Grandin simulated other pigs' attempts at gaining dominance by pushing each other against the neck and biting.[474] By asserting her dominance

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[469] Temple Grandin, "Handling Feedlot Cattle," *Beef Cattle Science Handbook Volume 19*, ed. Frank H. Baker (Westview Press, 1983), 1171.
[470] Temple Grandin, "Animal Abuse: Industry's Shame," *Meat & Poultry* (September, 1987) in Box 1, MS 344, Iowa State University Archives.
[471] Temple Grandin, "Handling Feedlot Cattle," *Beef Cattle Science Handbook Volume 19*, ed. Frank H. Baker (Westview Press, 1983), 1173.
[472] Temple Grandin, "Behavior Principles of Livestock Handling," *Beef Cattle Behavior, Handling, and Facilities Design*, Course AN 378, p. 2, in Box 1, MS 344, Iowa State University Archives.
[473] Ibid., 5.
[474] Ibid.

over the dominant pig, she was able to "achieve dominance" over the entire group. She thought, the odor of the dominant pig on the handler, may have helped.[475]

Grandin taught that a cow could remember a painful or frightening experience for many months. Bovines that had received electric shocks would have elevated heart rates when they approached the place where the shock had occurred. Nonetheless, she maintained that "electric prods… are good tools when used properly."[476] Proper use constituted sparing use, for sure, but "an exceedingly stubborn animal in a line of cattle in a single file chute can often be successfully moved by prodding the animal immediately behind it."[477] For the most part, however, tapping the fence with the prod would often do the trick, she taught.

In feedlot processing facilities of her own design she made sure that the cattle did not have to pass the processing area on their way to the loading chute. She explained, "cattle remember painful experiences… and will sometimes refuse to walk toward the processing area."[478] Animals that had received gentle handling were easier to handle in the future. Grandin's restraining devices therefore, emphasized safety and painlessness, to make it easier to lead animals voluntarily into them. Many animals could remember the person that handled them roughly and experience stress whenever they approached.[479] Therefore, Grandin highlighted that livestock should be handled gently at all stages of their life from birth, pasture, feedlot to slaughterhouse.

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[475] Ibid.
[476] Temple Grandin, "Handling and Processing of Feedlot Cattle," *The Feedlot* ed. G. B. Thompson and Clayton C. O'Mary (Philadelphia: Lea & Febiger, 1983), 219.
[477] Ibid.
[478] Ibid., 221.
[479] Temple Grandin, "Behavior Principles of Livestock Handling," *Beef Cattle Behavior, Handling, and Facilities Design*, Course AN 378, p. 6, in Box 1, MS 344, Iowa State University Archives

Most livestock are also herd animals and Grandin reiterated that isolation was a "strong stressor". She urged animal handlers to introduce other animals into pens with agitated ones. Because most herds have a lead animal, Grandin urged handlers to "allow livestock to follow the leader" and not rush them.[480] If animals bunched up, handlers were to concentrate on moving the leader of the herd. Animal scientists found that certain animals could be trained to lead others through a handling facility. Grandin also emphasized the importance of visual stressors by saying: "The wildest cow will remain calm in a darkened artificial insemination box which completely blocks vision."[481] These conclusions were all derivative of Grandin's first-hand experience outside research laboratories, in packing plants and feedlots.

Grandin's most significant achievement was to convince the industry that animal welfare paid. She became the livestock industry's favorite animal rights activist.[482] Grandin wrote, "reducing stress during handling will improve productivity and prevent physiological changes that… lower productivity."[483] Some of her examples of lower productivity included reduced rumen function and poor conception rates. She highlighted experiments that demonstrated, for instance, that continuous exposure to noise over 100 decibels reduces daily weight gain in sheep. Similarly, bovines also have a greater hearing sensitivity to high frequency sounds than humans. Grandin thus taught that unexpected and loud noises could be highly stressful to livestock. She advised animal handlers and feedlot managers to identify and reduce stressful experiences for animals in their care. "Gentle means money," she emphasized.[484]

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[480] Ibid., 4.
[481] Ibid., 2.
[482] Dan Green, "Animal Rights—and Wrongs," *The Salers Stockman* (February, 1988), 5.
[483] Temple Grandin, "Behavior Principles of Livestock Handling," *Beef Cattle Behavior, Handling, and Facilities Design*, Course AN 378, p. 1, in Box 1, MS 344, Iowa State University Archives
[484] Temple Grandin, "Gentle Means Money," *Beef* (Fall 1988), 14.

Grandin presented her techniques and findings in a way that helped cattlemen and others in the livestock industry see savings from the adoption of safer animal handling methods and equipment. Moyer Packing Company of Pennsylvania, for instance, recommended Grandin for 1984's Outstanding Extension Industry Specialist Award, because of her help with "several cost-effective ideas… and safety practices."[485] She had designed and installed serpentine cattle flows that led bovine creatures from the Moyer stockyards to a cattle restrainer where each animal was shot before slaughter in the Moyer plant. Grandin's cattle restrainer brought a dramatic decrease in accidents, while the serpentine chutes kept the animals calm. Utica Veals, a kosher packing plant in upstate New York, listed multiple instances of employees being injured by calves kicking them on the hands or knees while they tried to restrain them using shackles. Grandin's new restrainer at Utica Veals had eliminated such injuries from nervous animals altogether.[486] Another commendation said, "Temple took the black magic out of animal handling and developed it into an important aspect of livestock management and packing plant economics."[487]

[485] Glenn C. Moyer to Midwest ASAS (November 2, 1983) in Box 1, MS 344, Iowa State University Archives.
[486] Victor Broccoli to Temple Grandin (March 10, 1988) in Box 1, MS 344, Iowa State University Archives.
[487] Raoul J. Baxter to Dr. Curstis, University of Illinois (November 21, 1983) in Box 1, MS 344, Iowa State University Archives

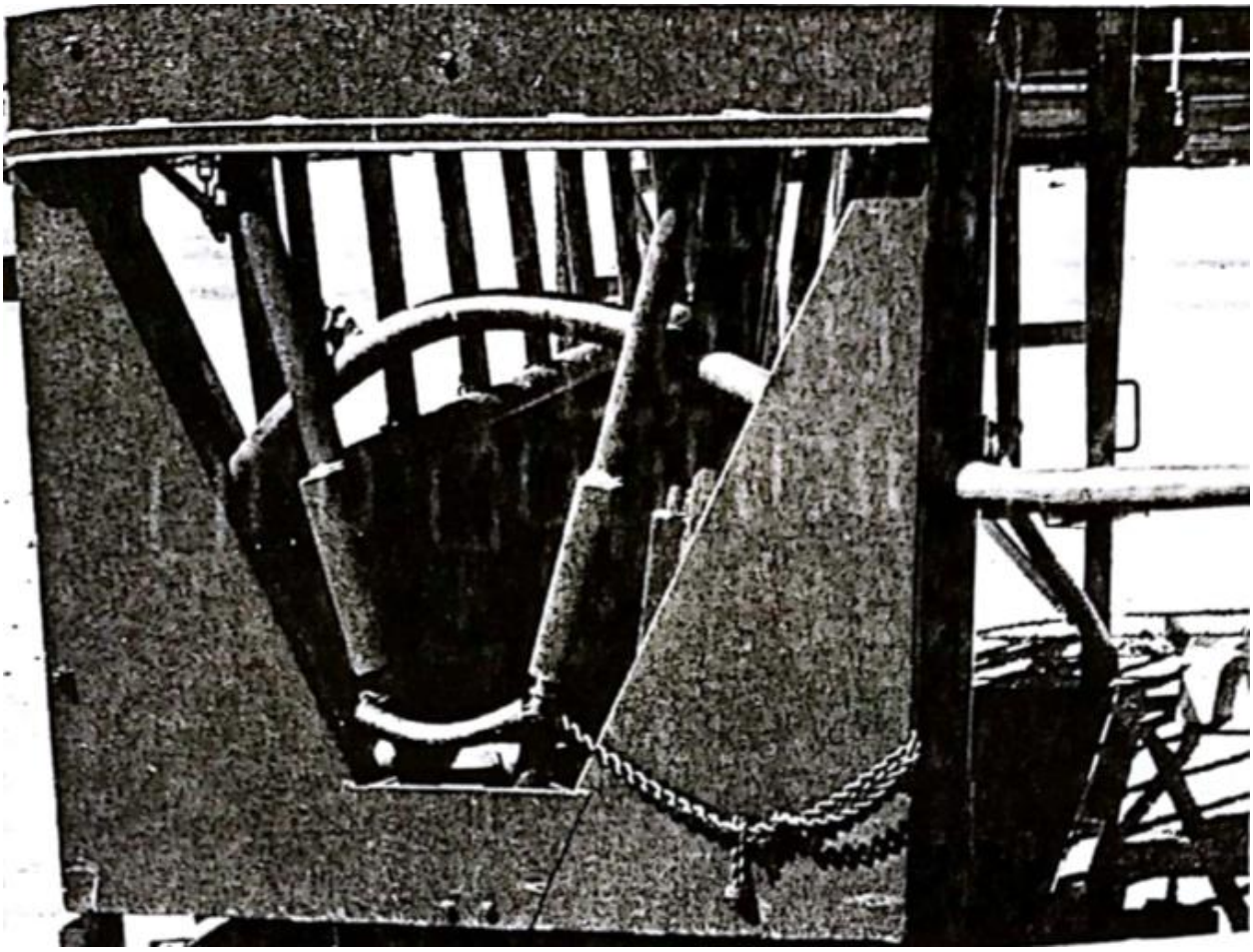

Image 5: A V-shaped manual squeeze-chute recommended by Temple Grandin for use in feedlot hospitals; from Temple Grandin, "Handling and Processing of Feedlot Cattle," *The Feedlot* ed. G. B. Thompson and Clayton C. O'Mary (Philadelphia: Lea & Febiger, 1983), 230.

Grandin also worked with feedlots, where her company designed and constructed "everything from the corral door and cow feeder to specialized posts and latches," such as, at the Red River Feed Yard in Stanfield, Arizona.[488] "Cattle feeders lose thousands of dollars when poor handling practices are allowed in their operations," she wrote in a 1983 collected volume titled, *The Feedlot.*[489] One of her specialties was the proper design and operation of squeeze

[488] Marilyn Angell, "Duo Champions Humane Care in Arizona Livestock Industry," *Scottsdale (Ariz.) Daily Progress* (Oct. 16, 1980), 12.
[489] Temple Grandin, "Handling and Processing of Feedlot Cattle," *The Feedlot* ed. G. B. Thompson and Clayton C. O'Mary (Philadelphia: Lea & Febiger, 1983), 213-234.

chutes in which animals were held for vaccination, ear-tagging, hormone-implanting, pesticide spraying, tail-clipping, castration and other medical examinations and treatments. Mishandling animals in such sensitive situations, Grandin warned, "may cause them to lose 1 to 3 days of weight gain," during the crucial early days at the feedlot.[490] To avoid mishandling Grandin designed a V-shaped chute that reduced pressure on the animal's bodies and other devices, including animal-centered gates, fences, pens, flooring, drainage and dipping vats.

Grandin found that because most livestock animals had wide-angled vision they were sensitive to any movement within a circular "flight zone". "When a person enters an animal's flight zone it will move away."[491] Enter it too deeply, and the animal will bolt. The cattle may even "turn back and run over [the handler]."[492] Cattle and pigs have a visual field of more than 300 degrees. Thus, she recommended handlers stay outside of the animal's flight zone when possible and approach the animal from behind when they want it to move forward. For these reasons she designed chutes with 5 feet high, solid walls that prevented outside distractions from agitating or frightening the animals. The chutes were serpentine, or curved (see Image 6), in order to prevent the animals from seeing where they were going until they were almost there, also taking advantage of cattle's tendency to circle around their handler.[493] A circular crowd pen and a curved chute were shown to reduce the time it took to move cattle by more than 50%. Cows also have color vision, and therefore Grandin's chutes were painted uniformly of one color.

[490] Ibid., 213.
[491] Temple Grandin, "Behavior Principles of Livestock Handling," *Beef Cattle Behavior, Handling, and Facilities Design*, Course AN 378, p. 3, in Box 1, MS 344, Iowa State University Archives.
[492] Ibid.
[493] Ibid., 8.

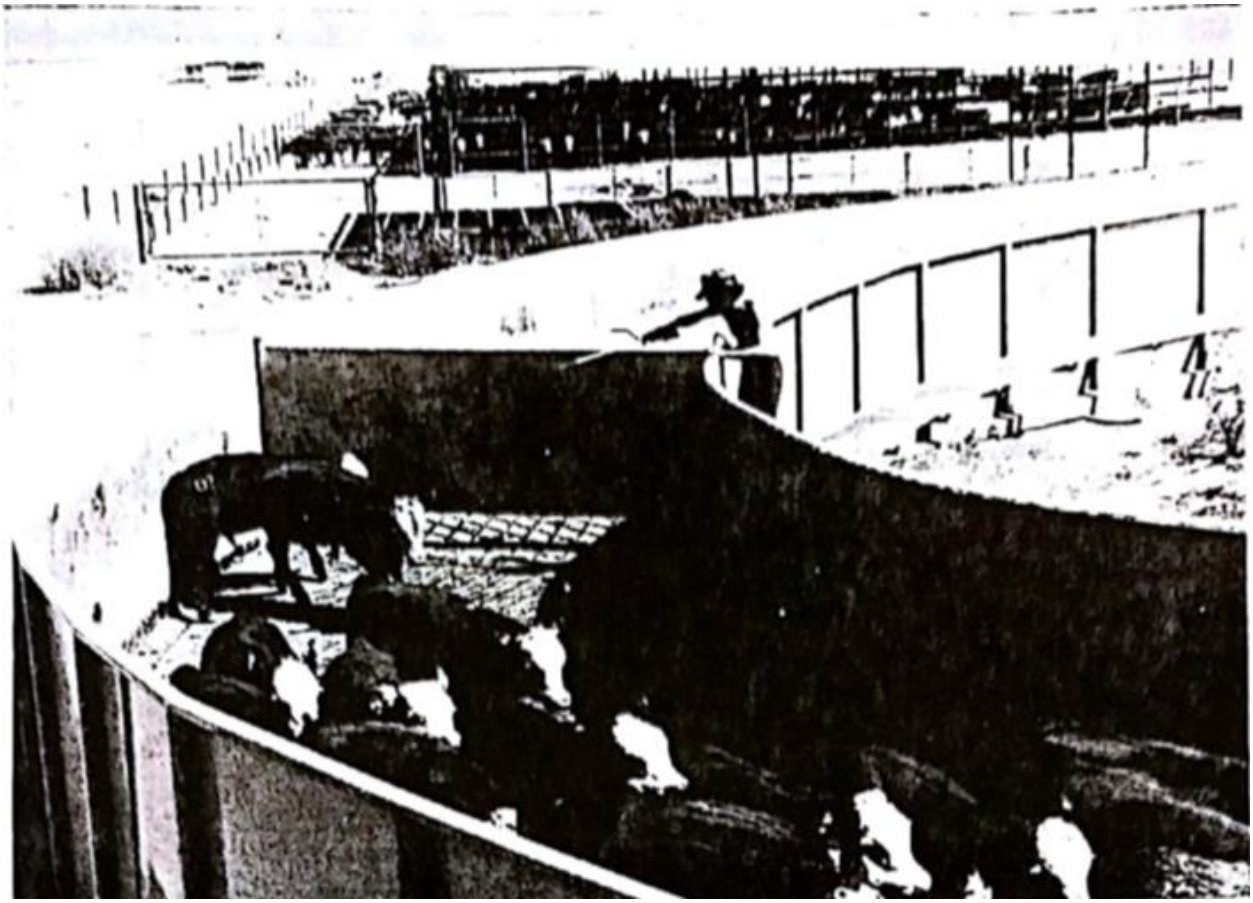

Image 6: A curved chute of Grandin's design from Temple Grandin, "Handling and Processing of Feedlot Cattle," *The Feedlot* ed. G. B. Thompson and Clayton C. O'Mary (Philadelphia: Lea & Febiger, 1983), 222.

Innovations such as these made their way to feedlots around the country, including Monfort of Colorado, because Grandin had convinced the industry that animal welfare paid. Her approach was different and remarkable in a world of animal scientists and feedlot capitalists who were hesitant to engage with animal activists or even in the study of animal behavior. She used her own sensitivity to sound and touch as a guide to the experience of animals in artificial surroundings. "She'll actually crawl through a chute system to see what the animal sees. Once she immersed herself in a dip-vat for cattle."[494] She was acutely aware, that understanding

[494] Nina Rubel, "Temple Grandin: Meat Industry Maverick," *National Campus Digest* (University of Illinois, Fall/Spring 1985-1986), 11.

animal behavior was basic not only to the design of animal handling facilities but the daily tasks of animal management. Grandin's entire career was thus built on domesticated creatures' abilities to respond to their environments, and even their willingness to fight back. Grandin forcefully argued that by understanding animal agency and responding accordingly—especially in the face of an active animal rights critique of factory farming—feedlot operators could protect and enhance their investments and generate more value in their capitalist enterprise. She won many accolades for her work, becoming a leader in an otherwise male-centric industry, despite her challenges with autism.

Every attempt of the feedlot industry to standardize bovine creatures has met with one impassable hurdle: these animals are, to use Tom Regan's phrase, "subjects of a life."[495] Recent scientific research has shown in dozens and dozens of animal species, including cattle, not only the ability to feel pain, but to have an active social and emotional life, as well as sophisticated levels of physical and social cognition.[496] The industry's own records and spokesmen have admitted as much in their periodicals and research literature. Over the years, animal scientists and feedlot managers have made it their goal to reduce the undesirable behavior in feedlot animals. Their very efforts to stamp out differences of "temperament" amongst individual animals through breeding and management, and figure out their gustatory preferences between one type of feed and another, is a testament to the subjective choices and traits of these creatures.

[495] Tom Regan, *The Case for Animal Rights* (Berkeley: The University of California Press, 1983).
[496] C. Nawroth, J. Langbein, M. Coulon, V. Gabor, S. Oesterwind, J. Benz-Schwarzburg, & E.von Borell, "Farm Animal Cognition-Linking Behavior, Welfare and Ethics" *Frontiers in Veterinary Science*, 6, 24 (2019). doi:10.3389/fvets.2019.00024; Jennifer Vonk, "Advances in Animal Cognition," *Behavioral Sciences* 6 (4) (Dec. 2016). doi: 10.3390/bs6040027; Peter Wohlleben, *The Inner Life of Animals: Love, Grief, and Compassion Surprising Observations of a Hidden World* (Vancouver: Greystone Books, 2016);

Triple Threat: Hormones, Antibiotics, and Heart Disease

Animal rights were not the only threat that the cattle industry had to contend with in the 70s and 80s. The consumer movement, often associated with Ralph Nader, who in 1965, authored a critique of the auto industry titled, *Unsafe at Any Speed*, had matured. "Nader's raiders" secured the passage of a slew of consumer protection and safety legislation, including the National Traffic and Motor Vehicle Safety Act, the Consumer Products Safety Act, and the Occupational Safety and Health Act, which established OSHA in 1970. The meat industry, which had been the subject of early twentieth century exposés, such as Upton Sinclair's classic, *The Jungle*, and regulation such as the Pure Food and Drug Act as well as the Meat Inspection Act of 1906, was not exempt from the ire of the consumer movement. In 1967, Congress passed the Wholesome Meat Act to address unsanitary conditions in the meat and dairy industries, prohibiting the sale of uninspected meat in intra-state and inter-state commerce.

But nothing had threatened cattle feeders more than the 1970s campaign against DES. Since its discovery in 1938, DES had drawn repeated concern as a potential carcinogen. However, the U.S. Food and Drug Administration had approved it time and again for the lack of conclusive evidence tying DES to cancer in humans. In the decades since, it had been prescribed to millions of women as a treatment for the symptoms of menopause, and eventually to pregnant women in order to reduce the risk of miscarriage. But in 1971, Boston researchers found extremely rare cancers in young women whose mothers had taken DES during their pregnancies. The ensuing "DES Daughters" issue became a battle cry for more research and eventually drove

concerned citizens, scientists, and congressional representatives to force a ban on most uses of DES, including its use as a feed additive, by 1979.[497]

Wise Burroughs, the animal scientist to successfully apply DES to the bovine diet in the 1950s, took a stance akin to most of the cattle feeders whose operations the ban impacted. Burroughs blamed "radicals and extremists" for inciting undue public outrage. By 1980 he maintained, "I would do everything tomorrow that I've done before, and feel good about it…[my] conscience is perfectly clear." In his opinion, DES was banned because scientific reasoning took a backseat to politics and public opinion. Most interestingly, like so many industry apologists, Burroughs chose to weigh the DES issue in terms of "risks and rewards."[498] And he seemed to suggest that the benefits to consumers and the cattle industry outweighed the risks to human health. Indeed, the benefits to Burroughs and Iowa State University were not insubstantial. DES patent rights had earned him $343,000, and Iowa State $2,750,000 by 1973.[499]

The 1970s also witnessed a rise in concerns about the dangers of a meat-rich diet, especially red meats like beef. Beef was known to have a high content of fatty acids and cholesterol, both of which were under scientific scrutiny as potentially detrimental to human health. By the early 1980s, the National Heart, Lung, and Blood Institute, published the results of a large randomized, double-blind clinical trial, that showed that lowering blood cholesterol led to a reduction in heart disease, concluding a decades long debate about the role of cholesterol as a

[497] Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010); Alan Marcus, *Cancer from Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: Johns Hopkins University Press, 1994).
[498] Jim Head, "'I would do it again' says DES 'inventor'" Wallace's Farmer (June 28, 1980).
[499] Staff Writer, "Burroughs Assails Ban on all DES" Des Moines Register (April 27, 1973).

risk factor in cardiovascular disease.[500] Much like its response to the world hunger crisis, the cattle industry relied on strategies of denial and obfuscation in response to the accusation that eating lots of beef led to heart disease and (later) also diabetes. But ultimately, it could not stem the slow decline of per capita beef consumption in the United States.

Further, antibiotic resistance was on the rise and feedlot production was deemed part of the problem. In 1969, the British government, followed by other European nations, banned the use of therapeutically relevant antibiotics, such as penicillin and tetracyclines, for agricultural growth promotion. But in the United States, scientific uncertainty was leveraged by the meat industry to override concerns of antibiotic resistance. By the 1990s more than half of the entire U.S. production of antibiotics was dedicated to livestock production. But the doses common in animal feed made it easier for bacteria to develop resistance to the drugs. Making things worse, these bacteria were able to transfer their resistance to other bacteria and made it much harder to treat the diseases caused by such microbes. While a direct link between human disease and antibiotic use in animals was difficult to establish, critics since the 1960s lobbied to end the practice in the United States.[501] A 1992 report titled, *Emerging Infections: Microbial Threats to Health in the United States*, authored by a Nobel Prize Winner, served as a "crucial inflection point" in the campaign against antibiotic resistance.[502] More recently, the U.S. Centers for Disease Control and Prevention's report on *Antibiotic Resistance Threats in the United States, 2013*, stated that "more than two million people are sickened every year with antibiotic-resistant

[500] Jeanne Garbarino, "Cholesterol and Controversy: Past, Present, and Future," *Scientific American* (Nov 15, 2011). Source: https://blogs.scientificamerican.com/guest-blog/cholesterol-confusion-and-why-we-should-rethink-our-approach-to-statin-therapy/ Accessed on: Mar. 29, 2021.
[501] William Boyd, "Making Meat: Science, Technology, and American Poultry Production," *Technology & Culture* Vol. 42 (4) (Oct. 2001): 648-652.
[502] S. H. Podolsky, "The evolving response to antibiotic resistance (1945–2018)". *Palgrave Communications*, 4, 124 (2018). https://doi.org/10.1057/s41599-018-0181-x

infections, with at least 23,000 dying as a result." Thus, it recommended that "the use of antibiotics for promoting growth [in animals]…be phased out."[503]

Cows and Climate Change

The connection between cows and climate change has been a long time in the making. Scientists had become increasingly concerned with anthropogenic climate change and global warming ever since the publication of the Keeling Curve in 1960—showing rising carbon dioxide levels in the earth's atmosphere. Charles Keeling, a researcher at the University of California San Diego's Scripps Institution of Oceanography, after whom the curve was named, began regular measurements of CO_2 from Hawaii in 1958. The results of his research suggested a "worldwide rise in CO_2 from year to year."[504] Following this lead, researchers focused most of their attention on the greenhouse warming potential of CO_2 from the burning of fossil fuels, over the next two decades.

By 1980, however, Veerabhadran Ramanathan, also of the Scripps Institute, found that trace gases such as methane were extremely potent greenhouse gases as well, with a warming potential an order of magnitude greater than CO_2, on a molecule by molecule basis.[505] His team concluded that, "trace gases other than CO_2 are shown to be potentially as important as CO_2 for long term climate trends."[506] These trace gases included methane as well as chlorofluorocarbons and tropospheric ozone. But where was all the methane in the atmosphere coming from? While

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[503] Centers for Disease Control and Prevention, *Antibiotic Resistance Threats in the United States, 2013,* U.S. Department of Health and Human Services (2013). Accessed on: Jan. 12, 2019. Retrieved from: https://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf

[504] Charles D. Keeling, "The concentration and isotopic abundances of carbon dioxide in the atmosphere" *Tellus* **12** (2) (1960): 200–203. doi:10.3402/tellusa.v12i2.9366.

[505] V. Ramanathan, "Climatic Effects of Anthropogenic Trace Gases" In *Interactions of Energy and Climate*, edited by W. Bach, et al., (1980) pp. 269-280;

[506] V. Ramanathan, et al., "Trace Gas Trends and Their Potential Role in Climate Change," J*ournal of Geophysical Research,* 90 (D3) (1985): 5547-5566. doi:10.1029/JD090iD03p05547.

methane was released from natural sources such as swamps and bogs, as well as human activities such as rice farming and oil and gas production, scientists were increasingly connecting animal agriculture to methane emissions. Not only did animal manure release methane, but the rumen (one of the cows four stomachs) itself produced methane, which was released into the atmosphere when ruminant animals such as cows and sheep burped.[507]

Then, in 1986, the climate scientist and Nobel laureate, Paul Crutzen, published a journal article that put the burden of increasing methane emissions on the cattle industry in unequivocal terms. Crutzen explained that 15-25% of total methane emissions were of animal origin.[508] "Of this, cattle contribute about 74%."[509] He estimated that methane production from domestic animals in 1890 was about 17 Tg and that this source had "increased by a factor of 4.4" over the course of a century.[510] Crutzen and others, thus confirmed that growing livestock numbers, especially the bovine population, was the single largest factor behind the rise of methane emissions.[511] But what lay behind this growth in the cattle population in the twentieth century?

[507] Blaxter, K. L. and Clapperton, J. L., "Prediction of the Amount of Methane Produced by Ruminants", *British Journal of Nutrition*, 19, (1965): 511–522; Czerkawski, A. W., "Methane Production in Ruminants and Its Significance", World Rev. Nutr. Dietetics 11 (1969), 240–282; R. M. Murray, A. M. Bryant and R. A. Leng, "Methane production in the rumen and lower gut of sheep given lucerne chaff: effect of level of intake" *British Journal of Nutrition*, Volume 39, Issue 2 March 1978 , pp. 337-345; D.T. Hill, "Methane productivity of the major animal types," *Transactions of the ASAE* 27 (2) (1984): pp. 530-540.

[508] According to UN report, "Livestock's Long Shadow," more than 1/3rd of all methane emissions come from the livestock industry, making it the single largest source.

[509] Paul J. Crutzen, Ingo Aselmann, Wolfgang Seiler, "Methane production by domestic animals, wild ruminants, other herbivorous fauna, and humans," *Tellus*, Volume 38B, Issue 3-4 (July-September 1986), 271-284.

[510] Ibid.

[511] Lerner, J., E. Matthews, and I. Fung, "Methane emission from animals: a global high-resolution database," Global Biogeochemical Cycles 2 (1988): 139-156.

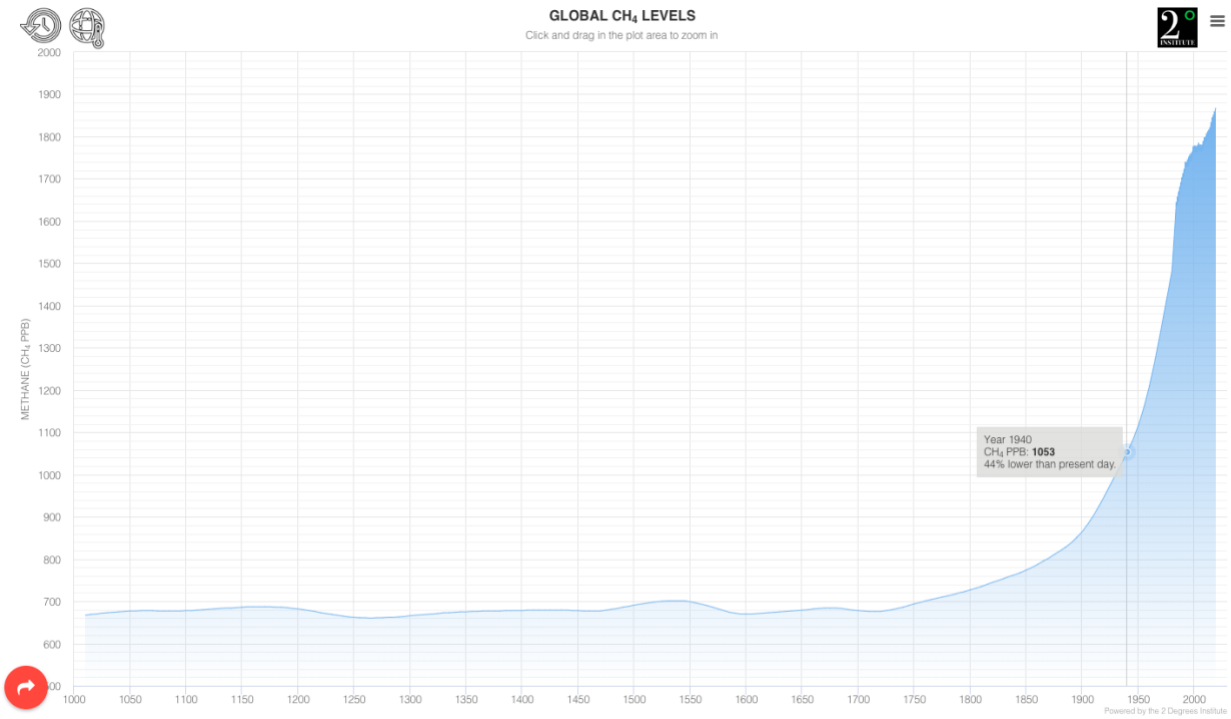

Image 1: The above graph charts the rise in methane levels in the atmosphere over time using data from Antarctica ice-cores and a global network of air sampling sites. Methane concentration was 44% lower in 1940 than it is today. Source: https://www.methanelevels.org/

At the American Geophysical Union's annual conference in 1991, Sherry Rowland—another Nobel Laureate of ozone hole fame—tied rising methane emissions to the boom in cattle numbers around the world in the post-World War II period.[512] By the cattle industry's own admission, this explosion in the bovine population was most certainly the result of intensive grain feeding practices at feedlots—introduced first in the United States and then spread across six continents. Some journalists reported that there were over 40 times as many bovines in the world in 1989, as there had been in 1900.[513] And of the over 1.5 billion cattle in the world by 2015, only Brazil, India, and China had more than the United States.[514]

[512] Richard A. Kerr, "Cows and Climate," *Science*, New Series, Vol. 252, No. 5012 (Jun. 14, 1991), pp. 1496-1497
[513] D'vora Ben Shaul, "Of Cows and Ozone," *Jerusalem Post* (Jerusalem: 11 June 1989), 4.
[514] Rob Cook, "World Cattle Inventory: Ranking of Countries (FAO)," *Drovers* (Aug 2, 2015).

The U.S. bovine population had oscillated around 60 million for the half century between 1890 and 1940 (see Image 2).[515] By 1920, the beef interests had started noting that "grass is the limiting factor in beef production."[516] And by the 1940s cattlemen were genuinely worried about their ability to produce enough beef to feed a rapidly growing human population. They began looking to grain feeding as the way beyond the limitations of available pasture. With the introduction of grain feeding in commercial feedlots around the United States cattle production began to skyrocket by the 1950s. Between 1935 and 1963, the number of cattle on feed in the United States had more than tripled.[517] In 1975, there were more than twice as many bovine animals in the United States as there had been in 1940.

[515] Geoff Cunfer suggests that American grasslands had reached their carrying capacity by 1945.
[516] C. W. McCampbell, "Grass and Beef Production," *Breeder's Gazette* (Chicago: June 3, 1920), 1540.
[517] Jimmy M. Skaggs, *Prime Cut: Livestock Raising and Meatpacking in the United States 1607-1983* (College Station: Texas A&M University Press, 1986), 179.

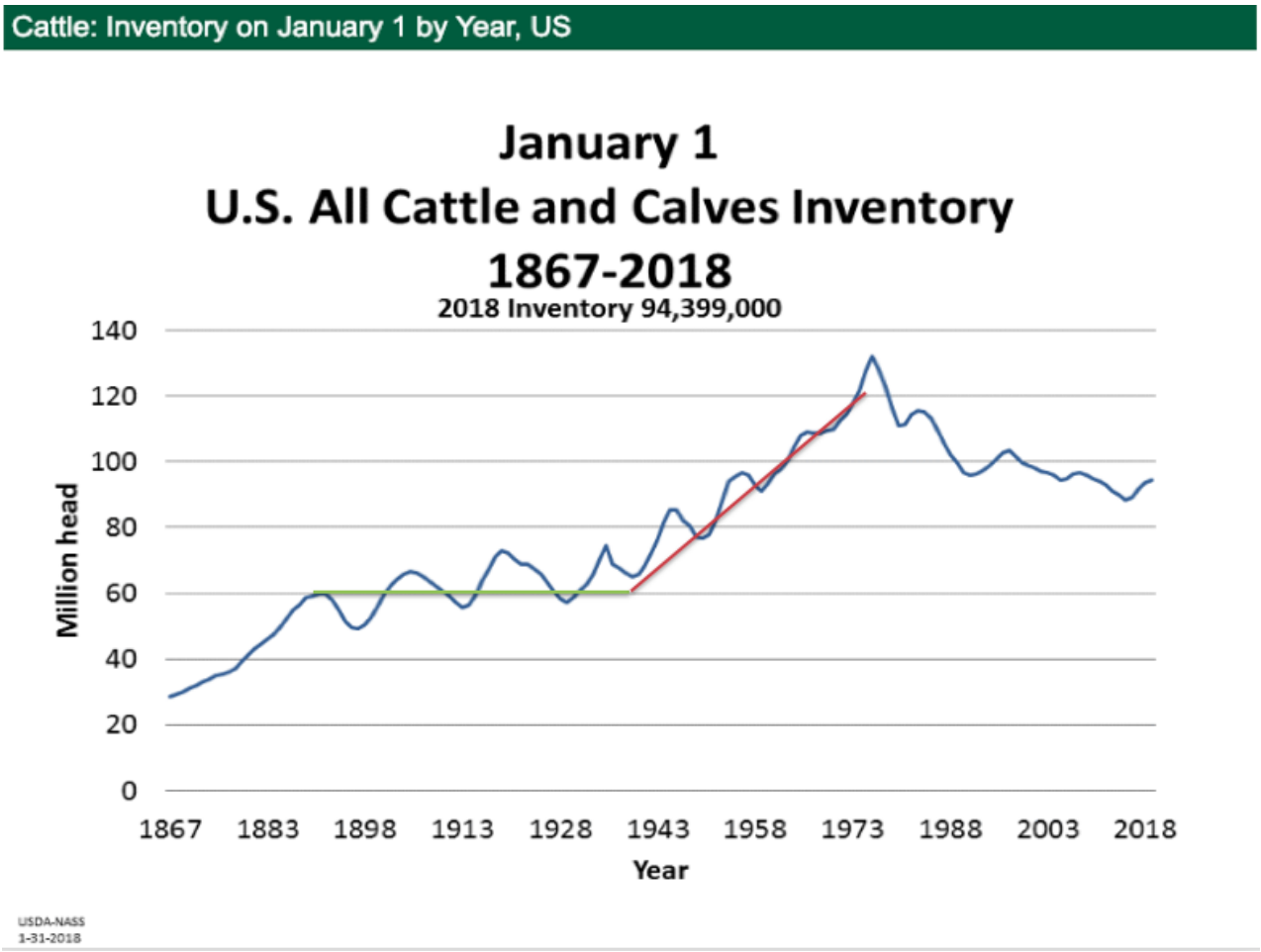

Image 2: Green line shows the average cattle population, 62,582,294 cattle (including calves), between 1890 and 1940. Red line shows dramatic growth between 1940 and 1975, when the cattle population peaked at 140,201,000 bovines. Source: USDA National Agricultural Statistics Service (https://www.nass.usda.gov/Charts_and_Maps/Cattle/inv.php)

During this bovine population explosion, Warren Monfort, remarked that "just to raise the calves we buy every year [to feed] requires an area the size of Delaware."[518] Grazing acres in the United States, had, since the 1930s, been slowly giving way to urban housing, public works, and military projects. This was despite the addition of 80 million acres of federal lands to grazing districts under the Taylor Grazing Act of 1934. As the total grassland area shrank, and land

[518] Quoted in Maureen Ogle, *In Meat We Trust: An Unexpected History of Carnivore America* (Boston: Houghton Mifflin Harcourt, 2013), 130.

prices rose, confinement feeding not only became more lucrative, it remained the only path for the growth of the cattle industry. "More of the growing period will have to be in feedlots," argued Monfort.[519] Instead of spending two to three years on the range before being shipped to feeders and packers, American bovines were increasingly shipped to feedlots at the age of one, and there lived out the rest of their days—four to eight months—eating grain. In this way more calves could have access to grass over shorter durations of time, and eventually transition to a diet that was not tied to the availability of pasture.

In 1975, a time when the U.S. cattle population had never been higher, Gorden Van Vleck, wrote, "there are real limits on grazing capacity."[520] Without any feedlot feeding he explained, "total beef supplies would become much more limited" due to "reduced cattle numbers." In other words, the total pasture-land of the United States could only support a limited population of cattle, and without concentrated grain-feeding the number of bovines in the country would not have been able to grow to its current heights. Other industry reports claimed that it was "mechanization, better nutrition [re: grain feeding] and disease control," only possible in concentrated feeding operations, that were "responsible for producing larger numbers of cattle."[521] New research in 2018 estimated, "that the current pastureland grass resource can support only 27% of the current beef supply" and that grass-fed beef accounts for less than 1% of U.S. supply.[522]

In this way, the burden of increasing bovine numbers, and thus greater methane emissions, was placed on feedlots—in the very words of leading cattlemen. This led to an effort

[519] Ibib., 132.
[520] Gordon Van Vleck to Mike Wallace (February 19, 1975) in Box 42, 1713, National Cattlemen's Beef Association Collection at the American Heritage Center (NCA from here on).
[521] "Research Project: Management and Control of Beef Feedlot Waste," (July 1969) in 1713, Box 238, NCA.
[522] Matthew Hayek and Rachael Garrett, "Nationwide shift to grass-fed beef requires larger cattle population," *Environmental Research Letters* 13 (2018)

to measure individual bovine emissions. A researcher at the National Center for Atmospheric Research, Patrick Zimmerman built a "bovine burpalyzer" to measure the methane generated in a ruminant stomach. "Cows are among the most prodigious belchers in the animal kingdom, burping about once every 40 seconds," explained an article in *Popular Science* reporting on Zimmerman's research.[523] He devised a way to insert a constant flow of tracer gas into a cow's stomach, and then measure the dilution of the tracer gas in the animal's breath. The EPA granted $500,000 to researchers at Utah State University in order to expand on Zimmerman's experiments.[524] Zimmerman built a career and company on supplying emissions monitoring devices, engineered for animals, all across the globe.

Animal scientists at other land grant colleges, like Colorado State University, began estimating methane emissions from individual animals and its relationship with their diet. Donald E. Johnson, at CSU, wrote, "Accurate methane estimates are particularly sensitive to cattle and buffalo census numbers and estimated diet consumption."[525] He calculated that ruminant livestock could produce 250 to 500 liters of methane per day. This, he wrote, put "the contribution by cattle to global warming [over] in the next 50 to 100 yr, to be a little less than 2%." Such studies by animal scientists were sympathetic toward the cattle industry and attempted to downplay the implication that Crutzen had published a decade earlier.[526] Crucially, in reaching their estimates of methane emissions, many land-grant scientists ignored the methane and carbon dioxide emissions from the decomposition of cattle manure, from the production of feed crops fed to the animals, and from the manufacture of fertilizers that were applied to those

[523] Staff, "Bovine Burpalyzer," *Popular Science* Vol. 245, Iss. 4, (New York: Oct. 1994), 24.
[524] Ibid.
[525] Donald E. Johnson and Gerald M. Ward, "Estimates of animal methane emissions," Environmental Monitoring and Assessment, Volume 42, Issue 1–2, (September 1996) pp 133–141.
[526] Johnson K. A., Johnson D. E., "Methane emissions from cattle," Journal of Animal Science, 73 (8) (Aug 1995): 2483-92.

crop fields—not to mention transportation costs at each link of the beef production process and the acres of forests cleared every year for pasture.

But in 2014, the United Nations Food and Agricultural Organization made a shocking announcement: the total greenhouse gas emissions coming from animal agriculture exceeded the carbon footprint of all of the world's automobiles.[527] Such research corroborated other international scientific reports, such as the UN's 2006 report titled, *Livestock's Long Shadow*, which confirmed the outsized footprint of animal agriculture, and the growth in animal numbers made possible by feedlots. The report confirmed that 30% of the ice-free terrestrial surface of earth was devoted to animal agriculture (including feed crop production), and that 1/3rd of the global cereal harvest was fed to livestock. The animal industry was responsible for 9% of all CO_2 emissions and 1/3rd of all Methane emissions.[528] In places like Brazil, ranching was a major driver of deforestation, and elsewhere, overgrazing was turning 1/5th of all pastures and ranges into desert. Closer to home, 21,000 sq. kms. in the Gulf of Mexico had turned into an ocean "dead zone" from the concentration of animal waste—most of which was coming from feedlots around the American West. Just a year after the Green New Deal unveiled its plan to reduce beef-related emissions in the U.S., atmospheric Methane emissions reached "highest levels on record" and researchers claimed: "emissions from cattle and other ruminants are almost as large as those from the fossil fuel industry."[529]

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[527] Food and Agriculture Organization (FAO), "Tackling Climate Change Through Livestock," FAO (Oct., 2014) Retrieved from: http://www.fao.org/ag/againfo/resources/en/publications/tackling_climate_change/index.htm Accessed on: Feb. 7th, 2017.

[528] Methane accounts for 10% of greenhouse gas emissions in America: U.S. Environmental Protection Agency, "U.S. Methane Emissions 1990-2020: Inventories, Projections, and Opportunities for Reductions" EPA 430-R-99-013, Office of Air and Radiation (Sept. 1999), ES-1.

[529] Doyle Rice, "Cow burps and fossil fuels: Methane emissions soar to record high globally," *USA Today* (Jul. 15, 2020)

Epilogue

At the foothills of the Rocky Mountains, in the year 1970, the small town of Greeley received more than 20,000 tourists from over 40 different countries.[530] Visitors from six continents were thronging to this agricultural county to see what one European summed up as "the eighth wonder of the world."[531] Complete with a tourist information center, an observation tower, tour guides, maps, and pamphlets, spread over a few hundred acres in Northern Colorado, was a city of a 100,000 cows.[532] On top of the observation tower, tourists were struck by the magnitude of animal life in front of them—and the stench! "It's the smell of money," no doubt some were told, all 38 million dollars worth of "beef-on-the-hoof."[533] If that many bovines were ever placed in single file, nose to tail, the line would stretch over 300 miles. Unsurprisingly, one Montana stockman commented, "that is a lot of bull."[534] This—the largest feedlot in the world—now served as the background for models, actors, cameramen, and advertising agencies seeking to evoke the new American West: no longer an image of the open range and the cattle drive, but a radically transformed vision of factory farming wrought by Monfort of Colorado, a shining exemplar of American agribusiness.

This dissertation has sought to demonstrate how, in the mid-twentieth century, large scale feedlots came about as a result of a combination of political, economic, and techno-scientific forces. Individuals, such as Louis D. Hall and John K. Matsushima, were as much responsible for this technological marvel—indeed "wonder"—as institutions such as the USDA and the land-

[530] Jim Briggs, "So This Is Greeley," *Greeley Daily Tribune* (Greeley, CO: 01 February, 1971), 4.
[531] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO, pp. 104.
[532] Monfort's Greeley feedlot reached its 100,000 capacity in 1968.
[533] That would be the total value at sale of 100,000 steers fattened to 1200 pounds at 32 cents a pound.
[534] William F. Hartman, draft of Warren Monfort's Biography, Family Document Files, FF 16.5, Greeley Museum, CO,, 105-106.

grant network of experiment stations. Federal beef grading, introduced in the 1920s, laid the groundwork for the grain-over-grass logic that would be a crucial catalyst for the transition from grass to grain feeding in the cattle industry. Following on its heels, supply management in American agriculture ensured an abundant supply of cheap grains, without which grain-feeding would have remained a dream of breeder's like Alvin H. Sanders. Hormones, antibiotics, and corn flaking technology, developed in most cases by publicly funded scientists and engineers in the 1950s and 60s, allowed feeders to put more weight onto cattle, in shorter periods of time, than ever before, drawing thousands into the industry. Cattle feeding had become big business.

The 1960s and 70s were also a time when Americans increasingly questioned the virtues of technological modernity in the face of environmental degradation and the horrors and setbacks of the Vietnam War.[535] In this context, the feedlot was seen as a factory and not exempt from critique. The expansion of the cattle feeding industry had visible and visceral downstream effects on rivers and lakes. Forced by neighbors, environmentalists, and public health officials—and very bodies of the bovines that they sought to dominate—feedlots had to adapt to environmental legislation of the 1970s and undertake expensive waste management. The cost-price squeeze of

[535] A critique of technological modernity is apparent in important works of the era such as: Jacques Ellul's *Technological Society*, published in English in 1964, which drew attention to the threat of technology to human autonomy. Four years later, Rene Dubos' Pulitzer Prize winning *So Human an Animal* urged to "make technology once more the servant of man." John Kenneth Galbraith's *The New Industrial State*, like Ellul, invoked images of men becoming the servants of technology, warning of an oppressive "technostructure" in a new industrial age. Lewis Mumford drew attention to the power-complex of science, technology, and politics, and questioned the totalitarian, technocratic directions in which this "megamachine" was headed. Alvin Toffler's *Future Shock*, was published in 1970 and went on to become a bestseller. Toffler was critical of technology and traced many of society's ills to the rapid pace of technological change. This so-called "anti-technology" vision remained vibrant through the seventies with the release of influential books such as E.F. Schumacher's *Small is Beautiful* that championed small-scale and locally suited technological systems as opposed to the large-scale technology transfer being advocated by most economists and technologists around the world. Dystopian visions of technological oppression and disaster, seemed, at decade's end, to become a reality with the partial meltdown of a nuclear reactor at the Three Mile Island power plant, only to be followed in the next decade by the Bhopal-Union Carbide catastrophe, the Challenger spaceship explosion, and the Chernobyl nuclear meltdown in the 1980s. See: Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge: MIT Press, 1977), 14; Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962); Lewis Mumford, *The Myth of the Machine: Technics and Human Development* (1967); Lewis Mumford, *The Myth of the Machine:The Pentagon of Power* (1970); Alvin Toffler, *Future Shock* (1970); E.F. Schumacher, *Small is Beautiful* (1973).

the 70s combined with the increased expense of regulatory compliance, compelled feeders to either "get big or get out". Feeders that weathered the storm were slow to notice another small but growing threat to the feedlot enterprise: the rise of the animal rights movement and a multipronged critique of factory farms. This critique took on a new urgency in the final decade of the twentieth century with the rise of global warming activism and the discovery of the link between cows and climate change.

But even as feedlot production came under intense scrutiny within the United States, animal scientists like John K. Matsushima began to export the techniques of industrial animal agriculture around the world. Matsushima was internationally sought after for his expertise in beef cattle research and consulting. From the 1960s onward he was involved in agricultural programs in twenty-five different countries. He helped introduce feedlots in Canada, Kenya, and China. But it was in Japan that he had the most impact. There, like elsewhere, he was invited to consult not just by government institutions but primarily by corporations and trade groups.

Exporting Cattle Feeding Around the World

Matsushima's first trip to Japan in 1973 was on behalf of the Meat Export Federation, a trade association that represents the beef industry with the stated goal of "putting U.S. Meat on the World's Table." And Matshushima's second trip there in 1978 was arranged by the Mitsubishi Group—one of the largest corporations in Japan—to explore the potential of a chemical nitrogen compound that Matsushima was testing at CSU. But his longest and most impactful Japanese connection was with the Kiyota Sangyo Company—one of the largest meat distributors in Southern Japan.

In the Fall of 1980, the CEO of Kiyota Sangyo flew out to CSU to meet with Matsushima in person. Japan's beef import quota from the U.S. had been raised by the Strauss-Ushiba

Understanding of 1978, allowing for a gradual increase in the import quota for grain fed beef by 1983.[536] This reflected greater demand for grain-fed cattle in Japan. Sensing the possibility for feedlot production of such intensely grain-fed animals in Japan itself, Mr. Tanetsugu Kiyota discussed the possibility with Matsushima. They toured the animal science and nutrition facilities at CSU along with a handful of other Japanese businessmen. Their discussion must have made an impression on Kiyota because within a month of his visit, Matsushima received an invitation to make his third visit to Japan.

With less than 2% of the country's land-mass qualifying as pasture, Japan was ripe for the intensive grain feeding program in which Matsushima was an expert. From 1981 to 1988, Matsushima visited the Kiyota Beef headquarters in Oita, Japan for six months every year. Kiyota wanted to expand his small feedlot experiment into a three-thousand-head facility. To do this, Matsushima was given every convenience he needed for his long stays: a brand new house, a young maid, a chauffeur driven Mercedes Benz, business class airfare for work and pleasure, and several thousand Yen a month. Matsushima described his time in Oita as "luxurious".[537] Over the course of their commercial relationship, Mr. Kiyota's second son was admitted to CSU to pursue a bachelor's degree in animal science. He later went on to head up the Tokyo distribution center for Kiyota Sangyo. So from Kiyota's perspective, Matsushima was worth every expense. Most importantly, by the end of Matsushima's involvement with Kiyota Sangyo in 1988, the feedlot in Oita prefecture, near Mt. Kuju, could handle four thousand bovines at a time.[538]

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[536] John Dyck, "U.S.-Japan Agreements on Beef Imports: A Case Study of Successful Bilateral Negotiations" in *Regional Trade Agreements and U.S. Agriculture*, ed. Mary E. Burfisher and Elizabeth A. Jones, (Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 771: 1998) pp 99-107. Retrieved from: https://www.ers.usda.gov/mediaImport/927959/aer771_002.pdf

[537] John K. Matsushima, *Broad Horizon: I Fear No Boundaries* (CreateSpace: 2011), 109.

[538] Ibid., 102-109.

Like the Monfort's, Kiyota Sangyo was a vertically integrated operation including a feedlot, a packing plant, distribution centers, and even a restaurant not far from the feedlot. Under Matsushima's guidance the feedlot expanded from just six to forty-eight covered sheds located on a terraced hillside. Like Greeley, trucks were used to drive through the sheds and deliver the feed into the bins, but these trucks were smaller and the feed they carried was hand mixed. The feed, of course, consisted of Matsushima's specialty: flaked corn.

There were important differences between Monfort's Greeley feedlot and the Kiyota feedlot. Unlike in the U.S., rice straw was the major source of roughage in Japanese feedlots, owing to rice being Japan's major surplus crop. Whereas water pollution laws would not have allowed feedlots to be built on a hillside in the United States, fresh mountain water was a distinct advantage for the Kiyota feedlot which was built into the side of a mountain. The Kiyota feedlot also had concrete shed floors which made manure collection easier—a significant ancillary source of profit for the feedlot. Finally, and to Matsushima's amazement, Japanese cattle were not dehorned, instead a nose ring was used to make handling easier.

Matsushima made significant contributions to the Kiyota feedlot. In his years of consulting for Kiyota Sangyo, Matsushima conducted 14 different trials to determine the feed efficiency of various cattle breeds along factors of sex, age, and feed combinations. He designed a new cattle-weighing facility to more carefully document the gains made by the intensively fed animals. He sourced feedlot cattle from the United States, Australia, as well as locally in Japan. Even small details like the hand-mixing of rice straw and concentrate directly in the feed bunk, were within Matsushima's purview. Matsushima even assisted the Kiyota Beef operations with overall cost management.

Overall, his experience in Japan conveyed the unprecedented level of engagement that Matsushima had with feedlot capitalists around the world. Matsushima was far from an aloof scientist engaged in theoretical advances that happened to benefit agribusiness. Much like Burroughs, Matsushima was engaged in serious and ongoing collaboration with feedlot capitalists in search of feed efficiency and a bolstered bottom line—as much a business consultant as an animal scientist.

Monfort and the End of Supply Management

The Monforts—an icon of industrial animal agriculture—had managed the risks and uncertainty of the 70s and 80s through constant growth and diversification. In search of capital, Monfort became a publicly traded company, soon to join the Fortune 500, that owned and operated two gigantic feedlots and a packing plant, together employing over 1800 people by 1974.[539] The half a million steers and heifers, at the Greeley lot and a new five-million-dollar feedlot in Gilcrest, CO, together, now consumed 25 million bushels of corn a year. The scale of the operation was reflected in the scale of its revenues. In 1982, Monfort reported one billion dollars in sales. Monfort's success was noticed at the highest levels of government.

The entrée served at Reagan's "President's Dinner" on May 21, 1986, was beef tenderloin from Monfort of Colorado. Kenneth Monfort was grateful for Reagan's farm policies which had saved him from the agricultural depression of the early 80s. The Food Security Act of 1985 had lowered target prices for corn, incentivizing production—a favorable combination for grain feeding. That year, Ken Monfort urged his feed crop growers to use government feed grain

[539] Monfort acquired another packing plant from Swift & Co. in Grand Island, Nebraska by the end of the decade.

programs to help tide them over.[540] Overall, the 1980s saw commodity program payments skyrocket as production levels reached historic highs. Corn prices didn't return to their 1983 high for over a decade, while the cattle to corn ratio remained favorable until 1994. Corn farmers who had received only around $90 million in government subsidy payments in 1975, and $917 million in 1982, were paid a whopping $7,737 million in 1987.[541]

In 1987, Kenneth Monfort, now in his father's shoes, decided to sell Monfort of Colorado to ConAgra. With 10% ownership, the Monforts had the largest share in ConAgra.[542] Joining with a business that had other livestock interests allowed Monfort to continue feeding cattle even when beef prices were low and feed prices were high. The price-cost squeeze was of 1979-1980, when the packing plant workers had gone on strike, and the company almost went bankrupt, combined with the emerging threats to the American beef industry, were all too fresh in Monfort's mind. Like before, growth and diversification went hand in hand. This time horizontal integration served to balance Monfort's risks. ConAgra already had hog operations from its earlier acquisition of Armour and Company, as well as its grain business which traced its roots back to 1919. With Monfort, ConAgra was now the second-largest meat processing firm in the U.S. (soon to be the largest) and fourth-largest in the world. The Monfort family retained executive positions in ConAgra until 1998.

In the context of skyrocketing government expenditure yet stable prices, in 1996 President Bill Clinton signed the FAIR Act, fundamentally altering supply management policy as it had existed since the New Deal. Under the FAIR Act farmers received fixed payments that

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[540] Carol Andreas, *Meatpackers and Beef Barons: Company Town in a Global Economy* (University Press of Colorado, 1994), 46.
[541] Douglas Bowers, Wayne D. Rasmussen, and Gladys L. Baker, "History of Agricultural Price Support and Adjustment Programs, 1933-1984," *Agricultural Information Bulletin* No. AIB-485 (Dec. 1984), 37. Obtained From: https://www.ers.usda.gov/publications/pub-details/?pubid=41994 Obtained on: July 16, 2020.
[542] Ibid., 43.

decreased gradually between 1996 and 2002. These payments were no longer tied to commodity prices or production controls and were therefore "decoupled". The Fair Act "ended production controls completely."[543] Even though falling prices soon convinced Congress to raise subsidies again in 1998, government payments remained largely decoupled from production levels through to the 2018 farm bill. This was the realization of the retrenchment in supply management that had begun in the 1950s, and the fulfillment of the demands of American agribusiness, especially its corn and meat sector.

Growth and scale remain the modus operandi at the Monfort feedlots which, in 2018, became a part of Five Rivers, the world's largest cattle feeding company, with a total feeding capacity of almost *one million* bovine creatures over several feedlots.[544] This dissertation has exemplified that as long as agricultural policies incentivize grain farmers to produce as much feed as possible, input prices for the feeding industry remain relatively low. In this way, American cattle feeding stays profitable while American bovines continue to be fed cheap grain, unconstrained by the limits of a grass-based-diet.

By describing the growth and development of a modern industrial feedlot in the context of changing agricultural policies, this dissertation has argued that feedlots weren't simply a product of increased consumer demand, technological ingenuity, or agricultural entrepreneurship, but were the making of creatures, capital, and the state. It shows how actors as varied as presidents, cattlemen and four-legged mammals, together shaped one of the most important changes in the history of animal agriculture. In tracing the changing contours of feed

[543] Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009), 162.
[544] The Monfort cattle feeding business changed hands several times in between, at different periods owned by Smithfield Foods, and JBS, the world's largest processor of meat.

policy in the US, this work shows the complex and non-linear ways in which commodity policies shape the food we eat, the water we drink, and the air we breathe.

Alternative Futures

The impasse between cattlemen and industry critics is showing signs of strain. Impossible Foods, a California based company founded in 2011, created a realistic substitute for ground beef that has cattlemen stumped.[545] Founder Patrick Brown predicts: "plant-based products are going to completely replace the animal-based products in the food world within the next 15 years... That's our mission."[546] In the April of 2019, in collaboration with Impossible foods, the popular fast-food chain Burger King released the Impossible Whopper. Sizing up the competition, a senior meat industry lobbyist "admitted the surprisingly realistic taste of modern fake meats [is] a 'wake-up call' to livestock farmers."[547] Further, Director of Public Affairs at the Missouri Farm Bureau, Eric Bohl said, "if farmers and ranchers think we can mock and dismiss these products as a passing fad, we're kidding ourselves."[548]

Meat packers have responded to the rise of realistic faux meats by launching their own. Global food corporations have begun to shift into the plant-based protein market spurred by pressure from companies such as Impossible Foods and Beyond Beef. The world's largest meat company, JBS launched its own meatless protein in June 2020. Other meatpackers including

[545] This epilogue builds off of research I co-authored with Leah Silverman at the University of Virginia via a Double Hoo grant.
[546] Staff, "Our Meatless Future: How the 2.7T Global Meat Market Gets Disrupted," *CBInsights* (July 15, 2020) Obtained from: https://www.cbinsights.com/research/future-of-meat-industrial-farming/ Obtained on: Aug. 31, 2020.
[547] Milman, Oliver, "Burger King's plant-based Whopper gets glowing review – from a meat lobbyist," *The Guardian* (April 8, 2019).
[548] Ibid.

Tyson, Smithfield, Hormel, and Cargill are offering their own lines of plant-based alternatives.[549] I spoke to an industry consultant in 2019, who admitted that some consulting companies are advising their "protein" clients to divest from beef. Yet, cattlemen remain optimistic about demand as the growing international middle class, in places like China, acquires a taste for American beef.

If alternative meats continue to capture growing markets and beef consumption really begins to decline, the global bovine population may, after a century of tremendous growth, finally decline. The U.S. bovine population began its decline in the 1980s, but the beef supply continued to grow as more meat was produced by fewer animals. As this trend extends to the rest of the world, cattle numbers may decline marginally, even if the faux meat revolution splutters. But it is unlikely that cows will disappear altogether. Chances are that, without systemic change, those animals that remain will continue to feed on grains laced with hormones and antibiotics in concentrated animal feeding operations. This dissertation has shown that feedlot capitalism depends on feed subsidies, publicly funded science, and a grain-over-grass logic embedded in beef grading regulations. Without changing these underlying forces that shape the feeding enterprise, the ways in which animals are raised for food will remain much the same—if not intensify even further.

[549] Staff, "Our Meatless Future: How the 2.7T Global Meat Market Gets Disrupted," *CBInsights* (July 15, 2020) Obtained from: https://www.cbinsights.com/research/future-of-meat-industrial-farming/ Obtained on: Aug. 31, 2020.

"After the last word is said about the ranchman and the railroad, about the callous drover, the butcher whose hands must drip with blood, the packer who grows rich out of his traffic,—we must come face to face with ourselves. But for us there would be no demand and no supply."

—Francis Rowley, *The Humane Idea* (1912), 59.