Pure and Modern Milk

An Environmental History since 1900

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Introduction

On November 20, 1967, Philadelphia resident Edna Irwin wrote to the President's Special Assistant on Consumer Affairs, Betty Furness, with a question inspired by the label on her milk carton. "Would you please tell me what the word 'manufactured' means in the processing of milk? If milk is a product of cows, how can humans manufacture it?"[1] Irwin's questions cut to the heart of a paradox that this book explores. From the turn of the twentieth century, milk and dairy foods have simultaneously been presented to consumers as pure products of nature *and* as products remade by human intervention and modern technologies. To make milk readily available as a staple food, dairy farm families, health officials, and food manufacturers have simultaneously stoked human desires for an all-natural product and intervened to ensure milk's safety and profitability.

Glance at the cartons in the dairy aisle of the nearest supermarket and you will encounter the same phenomenon that perplexed Edna Irwin. On the milk label peddled by Stonyfield Farms, three cows graze on a verdant pasture, backed by a deciduous forest and an undulating hillside. On another, a cow's wide-eyed face, graced with a wreath of meadow flowers, beckons the thirsty drinker. Store-brand dairies festoon their milk bottles with images of red and green barns at sunrise to proclaim the product's wholesomeness.[2] However, the same labels in the dairy case that flaunt meadow flowers and red barns betray a different history, one of human manipulation of milk between farm and supermarket. Words on the carton indicate that milk is "Grade A," "pasteurized," "homogenized," and "vitamin fortified." Multicolored plastic caps help purchasers distinguish between whole, 2 percent, 1 percent, and skim milk, while the nutritional fact panel calculates the meaning of such designations in fat grams and calorie content. The cartons carry expiration dates and advise consumers to keep the product refrigerated. These adjectives and numbers convey a different reality than images of happy cows: harnessing cows' lactation cycles and preparing milk for sale require an extraordinary amount of human intervention. On behalf of pure and plentiful milk, Americans have become as reliant on inspectors to monitor cows for diseases and suppliers to keep milk cool as on idyllic agricultural landscapes.

Though often conceived of as a pure product of nature, milk's nature must be perfected for it to become a healthful human food.

While many Americans buy milk without giving it a second thought, an increasing number approach the act of purchasing food with trepidation. As they assess package labels, consumers consult their taste buds and pocketbooks and consider their nutritional requirements and moral commitments. Despite straightforward recommendations from nutritionists, advertisers, and food reformers, decisions about what to eat are rarely simple. What one eats has become a battleground for environmental politics and the fight against childhood obesity. Perplexed shoppers wonder whether the nutritional or ecological benefits of organic milk justify its premium price. They deliberate whether milk from a local dairy will be fresher or spoil more quickly than ultra-pasteurized milk shipped from a greater distance. They puzzle over how a product sold to add creaminess to coffee can be billed as "fat free." The paradoxes facing consumers in the dairy aisle point to the broader complexities of seeking health and maintaining a sustainable relationship with nature in modern America.

Milk is not the only food long lauded for its natural origins. Nor is it the only food that reaches the marketplace in an altogether different state from that in which it originated.[3] But no other food has so stolidly symbolized natural purity, while simultaneously undergoing dramatic transformations to its material form. How and why has milk been conceptualized as wholly natural, even as it has been churned into manufactured foods like butter and ice cream, and incorporated into products as artificial as Cheez Whiz and wood glue? What ideas and values drove the modification of milk so that it became a staple food for Americans? How have consumers' changing expectations for milk affected the dairy farmers, cows, and rural landscapes central to milk production? This book explores these questions, connecting the development of dairy farming and changing practices of buying milk products from the turn of the twentieth century to the present. It traces the biological and economic processes through which milk has been produced and consumed, and it chronicles the meanings people made from those processes through the stories of four different dairy products: fluid milk, butter, ice cream, and the leftover waste of dairy processing (whey, skim milk, and milk proteins).

Two forces were especially important in making milk, paradoxically, a modified "natural" food: the food's role in the diet of children and its capacity to be transformed into a broad array of consumer products. Milk's status as a staple food for American children stimulated advertisers to stress its "natural" origins and also to modify its biological form. At the turn of the twentieth century, when infant formulas were commonly designated as "artificial" foods, calling cows' milk "natural" helped assuage parents' concerns about the shift from breast- to bottle-feeding. At the same time, the material properties of cows' milk and the biology of cows' bodies defied its safety and availability for infant feeding. One challenge was the seasonality of milk production. Most cows calved in the spring and thus produced more milk in the spring and summer months than in the fall and winter. Cows needed adequate feed to keep lactating, and as pastures dried up in the fall, their milk production dropped off. Another feature of milk that posed a challenge to its use was its propensity to spoil. If left unrefrigerated, milk sours within forty-eight hours of leaving the cow. Getting fresh milk to faraway residents, then, required sophisticated systems of cooling and quick transportation, in an age before electric refrigerators and automobiles. A final challenge to the use of milk as a food for the masses was that the fluid could serve as a medium of deadly communicable diseases, including typhoid, scarlet fever, and bovine tuberculosis. Children's vulnerability to milk-borne diseases drove efforts to reform the substance of milk, remake cows' bodies, and restructure the landscapes from which it came.

If milk's physical properties posed challenges, they also promised possibilities. Transforming milk into other products allowed farm families and manufacturers to transcend some of the natural obstacles that limited the sale of fluid milk, such as spoilage or seasonality. Few foods were so innately well suited to morph into other products as was milk. After being drawn from the cow, milk could be whipped into ice cream, churned into butter, coagulated into cheese, incorporated into candies and breads, or fed to livestock and reach the market as meat. In time, chemists found ways to alter milk even more dramatically, powdering it for long storage, weaving its proteins into cloth fibers, and channeling its sugars into the manufacture of penicillin. Just as milk drinkers needed inspectors and milk companies to guard milk's safety, so too did farm families come to rely upon these manufacturers to transform the raw materials of their farm into salable goods.

Even before milk left the countryside, farm people manipulated its nature, altering cows' bodies and the farm landscape to maximize its production. By bringing greater regularity to cows' feeding and breeding schedules, for instance, farm families could boost cows' capacity for lactation. Supplementing bovine diets with silage or fodder crops helped sustain milk production through the fall and winter months. Mating cows with promising udders to potent bulls increased the likelihood of young calves that would produce record quantities of milk. By modernizing their farms, farm people aimed not just for profits, but also to replace some of the most toilsome farm tasks and to bring order to the unpredictable vagaries of nature, like drought, disease, and insect infestation. In the postwar era, they turned to antibiotics to treat infectious diseases in cows' udders and sprayed pesticides to keep biting flies from irritating their animals. As farm people tweaked the processes of bovine reproduction and lactation, a biological process devised to provide sustenance for young calves simultaneously became

bound to a cultural process designed to supply human markets and improve rural comforts.

This book is not the first to discuss the transformation of milk and dairy foods in the twentieth century.[4] What this book contends, however, is that the twentieth-century transformation of milk required not simply changes to the food itself, but also to the farms from which milk came. Growing out of works in environmental history, this book links consumption and production, helping to explain how changing consumer practices and retail techniques changed rural nature.[5] It examines the passage of new public health laws to improve urban milk safety and also traces the implications of these laws for the human and animal inhabitants of the farm. It details the development of new dairying technologies on farm practices, and the challenges such technologies posed to health officials charged with maintaining a safe and plentiful food supply.

Environmental historians have done much to elucidate the relationship between production and consumption. But too often efforts by environmentalists and environmental historians to reconnect consumers to the places from which their food came position the farm as a counterpoint to a rapidly industrializing urban America. Such histories and appeals, like the imagery on dairy labels, encourage consumers to associate milk with a timeless idyllic countryside.[6] This romanticization of rural nature makes it easy to overlook that rural places experienced processes of industrialization in tandem with urban ones in the twentieth century. Modernizing milk was not simply a process that took place once the white beverage reached the city; rural and urban people alike transformed it.

When historians narrate the ways that farm people specialized and adopted capital-intensive methods to increase production, many depict these processes of industrialization as the driver of environmental ills or as a force that erodes authentic rural communities.[7] Such accounts make it difficult to explain why farm people willingly embraced industrialized agriculture. Declensionist narratives tend to portray agricultural modernization as a force that corrupts natural purity, but in some cases, changing nature to be more artificial helped make milk *more* safe and pure. Farm people often had compelling reasons to modernize their operations in ways that dramatically altered nature. By breeding cows artificially, for instance, farm families reduced the real risk of being gored by a bull. Farm people did not uncritically champion all industrial solutions; many sought to adopt new technologies on their own terms. Paying attention to the ways in which they evaluated and understood rural industrialization as it unfolded provides a clearer picture of the human interests served by the manipulation of natural organisms in working landscapes.

To explain why and how dairy farm families understood and reacted to the processes of rural industrialization and assessed its consequences, this book incorporates evidence from farm diaries and records housed in state archives in each of the country's well-established dairy regions: the upper Midwest, New York and New England, and California. But because dairy farms dotted the landscape throughout the nation, and because the problems facing farmers differed by locality, the book also draws on sources gleaned at state archives outside these regions, such as Virginia and Montana, and from interviews of dairy farm families profiled by the Southern Agriculture Oral History Project. Seen together, the archival records illuminate farm practices on a wide variety of operations from small-scale cream producers to large-scale specialized dairies.

Despite the ubiquity of dairy farmers and the admirable efforts of archivists to preserve their records, many state archives hold only a handful of farm diaries that discuss dairy production. Even states with rich agricultural collections tend to focus on the most well-heeled or politically active farm people. I aimed to draw out the experiences of other kinds of farmers into the story with other sources, but the perspectives of specialized and successful farmers appear more prominently than those who struggled. To round out the economic, technological, and environmental trends in the industry, I have consulted the records of milk and agricultural regulators, agriculture experiment station reports, industry records—such as the records of the Badger Cooperative Creamery Company and national trade magazines, *Hoard's Dairyman* and *Creamery and Milk Plant Monthly.*

One of this book's aims is to catalogue the environmental history of rural industrialization. A second is to explain the ways that milk, dairy foods, and the cows and farm landscape from which they came involved a delicate interweaving of human technologies with elements of the nonhuman environment. That Rita Irwin had difficulty understanding whether milk was the product of cows or of humans was for good reason: milk and the cows that produced it were a hybrid of nature and culture. They were products of economic and technological innovations, cultural attitudes, human and animal labor, and environmental forces and structures—soil, plants, water, sunshine, and air.

In this, milk, the cow, and the dairy farm were not unique. Over the past forty years, environmental historians have explicated the processes by which spaces have been marked by human intervention and yet maintain natural qualities.[8] Richard White's *Organic Machine* captures this idea powerfully, revealing how even as people modified the Columbia River to fish and to generate electric power, the river's flow and salmon's migratory journeys remained formidable forces.[9] Other historians challenge perceptions of the city as apart from nature, demonstrating the centrality of natural resource flows to their development and cataloguing the geomorphological transformations of the very ground and water on which urban environments stand.[10] Some historians have even taken environmental history indoors, to examine the natural histories of the factory floor

and office space.[11] Together, these works make visible and render significant human-environment interactions not simply in seemingly pristine wild places, but in all spaces in which people live, work, and play. Further, many of these works challenge interpretive frameworks once popular in histories of the environment and technology, depicting technological transformation neither as a fall from wilderness nor as a symbol of humanity's mastery over nature.

More recently, historians have begun to look closely at the blended histories of nature and technology in rural and agricultural spaces.[12] The most provocative contribution of these studies is the idea that nature is not wholly apart from technology, but that nature itself constituted technology, particularly as humans manipulated the bodies of animals and plants. Thus, historian Edmund Russell has urged historians to recast Leo Marx's idea of the "machine" intruding upon "the garden" and instead to explain how the garden (nature) formed the machine (technology).[13] This book takes up Russell's call, paying attention to the ways that the farm landscape, cows' bodies, and dairy foods were standardized and modified by human action, and yet their natural attributes remained critical to dairy production. Whether through the stories of bacterial cultures used to flavor butter, the cement milk tank whose cooling waters were pumped up by a windmill, or the sturdy, barrel-bodied cow being led to a breeding stall, readers will encounter a host of examples of the ways that the material environment acted and, combined with human intentions, produced forms difficult to classify as either creatures of nature or artifacts of culture.

Furthermore, this book explores the ways Americans conceptualized the relationship between nature and technology by calling attention to the central word used to describe milk: purity. No concept was more important in capturing the mix of biological and human processes necessary to make milk a safe and viable human food than this one. Americans' ideals about milk purity shifted over time, in tandem with their changing ideas about nature and modernity. Over the twentieth century, Americans identified a different role for nature in purifying milk. At the turn of the century, what imperiled milk's purity was its nature. Its perishability made it difficult to transport. Its tendency to spoil and carry bacteria threatened those who drank it with digestive and communicable diseases. As pasteurization and refrigeration minimized these risks, the perceived threats to milk shifted from elements of nature, such as bacteria, flies, and spoilage to human technologies, such as pesticide residues and radioactive particles. Nature, once conceived of as the primary threat to milk's purity, was envisioned by postwar Americans as the food's primary source of purity. Ironically, as Americans revised what constituted "pure" milk, the very technologies that once promised to protect milk from the hazards of nature, such as antibiotics or pesticides, became threats to milk's purity themselves.

Americans' turn to nature as the source for milk's purity was itself a modern phenomenon. Only when consumers came to believe that the food on which their lives depended was somehow unnatural and alienating could Americans seek to get back to nature through their diets. The kind of milk Americans put on their tables reflected their cultural expectations for purity and convenience as much as their physical needs for sustenance.

Finally, this book investigates the ways in which changing consumer practices and consumer culture transformed the physical spaces of dairy farms and perceptions about them. Although the field of environmental history has traditionally done more to elucidate how the activities of economic producers (like farmers, anglers, or miners) remake the landscape than those of consumers, in recent years, environmental historians have begun to think more about the effects of consumer behavior on the environment.[14] These creative studies have charted the changing economic and cultural processes through which plants and animals became desired commodities, and documented the ways that the food industry and advertisers transformed consumers' views of nature.[15]

Although concerns about "the consumer" came to have increasing influence in twentieth-century politics, and the collective actions of consumers fundamentally altered the physical environment, the actions of individual consumers can be difficult to track.[16] To get at how and why consumers purchased dairy foods and the meanings they made from those transactions, I have relied upon the papers of consumer organizations, government bodies, surveys of consumer behavior conducted by dairy organizations, cost-of-living surveys, and women's magazines and advertisements. It is easier to read from these documents what health officials and dairy manufacturers believed consumers needed and desired than how consumers expressed these needs and desires themselves. My aim in this book, then, is less to uncover the motivations of individual purchasers of milk, butter, ice cream, or cheese than it is to explain physical settings, economic structures, and political mechanisms through which those purchases took place and became meaningful. As historian Ruth Oldenziel explains, industry, state agencies, trade unions, and other groups mediated the ways that consumers exerted power in the marketplace.[17]

New practices of food retail and distribution altered the way that dairy consumers and producers made decisions. Over the course of the twentieth century, strategies of mass retailing, state policies, and expert recommendations came to play a greater role in shaping actions on the dairy farm and in the grocery aisle alike. The development of chain stores, and later supermarket retailers, altered the very form by which foods like butter and ice cream reached consumers and encouraged the development of quality standards on the farm. State agencies defined milk purity and legitimized some dietary practices in ways that privileged some foods and farming practices and denounced others. Farm people and

consumers often reacted to these processes. Farmers who relied heavily on butter sales protested when government nutritionists presented margarine as a nutritious food. Consumers argued for more detailed labels on ice cream and other manufactured dairy foods. That the president had a Special Assistant on Consumer Affairs to whom Edna Irwin could address her puzzlement over milk is indicative of these broader changes.

The structures and institutions of consumer society did not simply alter how Americans understood food; they also reframed how consumers came to know nature. As women shifted from breast to bottle, the act of ingesting milk remained an embodied experience. People tasted the cool, creamy fluid on their tongues and sniffed off-flavors in a bottle that had soured. But with the development of mass consumer society and scientific theories about milk's role in disease transmission, consumers began to consider elements difficult to ascertain from merely seeing, tasting, or smelling, such as bacterial counts, vitamin content, or parts per million of pesticide residues, as they assessed milk's healthfulness. After World War II, when concerns about milk safety began to focus on the bioaccumulation of pesticide residues and strontium-90, farm families altered cows' diets and crop-raising practices to minimize cows' exposure. Employees of state and municipal health departments and federal agencies like the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA) took on an ever-more important role in reassuring milk drinkers of the product's freshness and safety. Herein lay the impetus for supermarket milk cartons laden with nutritional facts and words like "Grade A pasteurized" inscribed on their labels.[18]

Over the course of the twentieth century, consumers revised their vision of the appropriate way to achieve milk purity. In the Progressive Era, consumers insisted on the establishment of local, state, and federal standards for food purity. Purchasers of dairy foods became ever-more reliant on the state as arbiter of food's wholesomeness during the interwar period, pushing state agencies to guard the safety of manufactured dairy foods as well as fluid milk. By the 1920s and 1930s, consumers assessed the labels, looking favorably on phrases like "USDA approved." After World War II, consumers increasingly relied on federal standards crafted in Congress and upheld by the FDA, to ensure milk's purity as it crossed state lines. Since the 1970s, consumers' trust in the state as an arbiter of food safety has declined. Still seeing themselves as part of a "consumer movement," many milk and dairy purchasers in recent times reject state inspection and seek to monitor food safety themselves. Consumers' push for transparent measures of food's contents and for a role in defining food safety constituted an important way of adjusting to the products of modern agriculture.

To make milk pure and modern required changes to the urban milk supply and dairying landscape. It involved the actions of public health officers and delivery truck drivers, farm families and food chemists, lawmakers and consumer activists, pediatricians and parents, bacterial cultures and dairy cows. To understand milk's twentieth-century transformation requires traversing the commodity chain, seeing the relationships between changes in consumer choices and farm practice. What emerges from such a history is not a simple story about milk, but a history of the evolution of consumer society, the development of governance over food and agriculture, the role of industrial technologies in organizing modern life, and the ways in which these processes engendered new ways of understanding nature.

Concern about food purity is not merely a historical phenomenon. Despite efforts by farm families, food processors, and state regulators to protect food safety, impurities continue to plague the nation's food supply—from spinach laced with *E. coli* to eggs contaminated with salmonella. Worried by disease outbreaks and increasingly distant from the farm, many Americans have, in recent years, taken renewed interest in learning more about the food system on which their lives depend. Their curiosity has turned books like Michael Pollan's *Omnivore's Dilemma* and Barbara Kingsolver's *Animal, Vegetable, Miracle* into best-selling tomes.[19]

Contemporary food writers such as Pollan and Kingsolver tend to characterize the food system as one of multiple paths: one of modern industrial agribusiness and another in which farming takes place "close to nature." The history of milk, though, reveals that the values and practices guiding industrial agribusiness and small-scale farming have not always been separate and distinct. Whether they fertilize fields with manure or synthetic fertilizers, farm families feel the forces of nature acutely when droughts or insect pests threatened to wipe out a hay crop. When raw milk devotees travel hundreds of miles seeking an unpasteurized product, their quest is just as embedded in the technological system and complex calculus of consumer demand that brings pasteurized milk to the nearby supermarket.

It is tempting to believe that nature can be controlled and equally alluring to be inspired to go back to nature. Milk's history reminds us that neither alternative is truly possible. Even at the moments when technology seems to guarantee new breakthroughs in managing and predicting processes of life on the farm, nature offers such challenges as storms, aborted cattle, and antibiotic-resistant bacteria. Similarly, even milk produced by pasture-grazed cattle, free of chemical inputs, carries residues from human activities. The pursuit of purity requires striking a balance between harnessing the raw materials of nature and allowing biological processes to thrive. To take milk's history seriously is to understand the compromises, complexity, and challenges involved in our dependence on other organisms for our very sustenance.

The state's extended power over milk safety was never complete, however, for its authority and legitimacy as a protector of purity was tested on many fronts. Scientific uncertainties about fallout or pesticides made farm families and consumers alike question federal milk standards. When new techniques, like antibiotics, proved ineffectual against bacterial hazards, it undermined trust in scientific solutions. Thus, if the general pattern by 1970 was to uphold federal standards of purity and encourage the development of a national milk supply, misgivings about this federally driven system remained. Standards of milk purity may have been codified in federal law, but the question of what constitutes pure milk remained an open question. In the ensuing years, as the trends of concentration and consolidation in the dairy industry continued, these doubts would lead some Americans to envision a dairying economy that provided a greater role to consumers and farm families in defining and producing pure milk.

Epilogue

Since the 1970s, efforts to modernize the dairy farm with technological innovations have proceeded at a rapid pace. Dairy farmers manipulate the bodies of dairy cows and the farm landscape in evermore complex ways. To increase milk yields, some farm people supplement time-tested milk-boosting techniques, such as breeding or feeding for high yields with injections of recombinant bovine growth hormone (rBGH). Other technologies present possibilities unforeseen just decades earlier. For instance, by the 1990s, dairy farmers could not only obtain semen from the world's best bulls to inseminate their cows, but could also pay for sex-selected semen, so that each breeding would yield milk-giving cows and not bull calves that contribute less to the farm income. The technology seeks to eliminate even further the inefficiencies of reproduction that have for so long defied human understanding and slowed dairy farmers' efforts to increase the quantity of milk produced. Such developments extend the long-term efforts to make the nature of the farm more predictable and efficient and to eliminate waste.

As farm families embrace technological efficiencies, consumers' pursuit of the natural has intensified. Although by the 1980s, American consumers were accustomed to eating a host of foods bearing long ingredient labels, milk maintained its status in the popular imagination as a quintessentially "natural" food. In pursuit of purity, some seek milk free of rBGH. Others buy organic milk, believing it to be more healthful and natural than that produced with pesticide-laden feed. A few prefer to purchase raw milk, viewing the unpasteurized food as one stripped of the trappings of modern society. Contemporary concerns about milk quality, like technological developments, are part of a longer history. Suspicion about rBGH in milk, for instance, mirrors concerns of the immediate postwar period, when activists raised the alarm about antibiotics, fallout, and other milk contaminants.

Newfound interest in milk's purity is not simply a reaction to new technologies. It derives just as profoundly from economic and political developments of the post-1970 period. The pursuit of pure milk since the 1970s has taken

place in a particular social and economic context, one in which citizens are ambivalent and anxious about a changing rural economy and in which individual consumers—rather than government agencies—are increasingly viewed as the preferred agents of social change. Hence, ideas of milk purity became articulated through an appeal to "the family farm" as much as pastoral nature. Further, the quest for milk purity since the 1980s has been waged through campaigns for product labeling and consumer autonomy, instead of demands for greater government regulation. Placing contemporary interests in organic and raw milk within their own moment, as well as in dialogue with the long twentieth century, foregrounds how the politics of consumer society intersect with the landscape of the dairy farm in distinctive ways.

Technological developments of the late twentieth century bear some responsibility for the dairy case laden with cartons of milk bearing the labels "organic" or "rBGH-free." In the 1980s, researchers developed a way to artificially manufacture bovine somatotropin (BST), a growth hormone that occurs naturally in a cow's pituitary gland. Once scientists identified the gene that coded for the hormone's production, they isolated and incorporated it into bacteria to be reproduced. Then, they injected the synthetically produced hormone into cows' bodies, lengthening cows' lactation periods and increasing the amount of milk the cows yielded.[1] Trials of manufactured BST, also known as rBGH, began in the late 1970s, and U.S. officials approved it for retail sale in 1993. The use of a hormone to stimulate milk production was not a new development. Naturally occurring BST (also known as bovine growth hormone) had long performed this function. What was new to the 1980s was that genetically modified bacteria, outside of cows' bodies, manufactured the hormone.

Promoters of rBGH reiterated rhetorical claims made for many farm technologies that preceded it. They promised the hormone would increase cows' milk-producing capacity without demanding additional labor or feed.[2] While prior technologies to boost milk production altered cows' bodies, bovine biology limited the pace of change. Selective breeding, for instance, could only take place within the framework of cows' gestational cycles. Changing the mix of grains and grasses in the feed trough could boost milk production, but cows' appetites and capacity for digestion restricted some foods from being appropriate cattle feeds. The use of a genetically modified species to generate additional BST, however, seemingly allowed humans to surpass these limitations. With every injection, the human influence on cows' bodies deepened.

If the language used to promote rBGH had antecedents, so did the objections raised against it. Like pesticide or strontium-90 residues, rBGH challenged the perception of milk as a quintessential "natural" food. Consumers who conceived of milk as a product generated by cows' bodies objected to milk that originated partly from a human-instigated chemical injection.[3] Further, those opposed to the hormone claimed it harmed cows' health by elevating levels of mastitis in treated cows. Thus, they argued, rBST intensified antibiotic residue problems, since dairy farmers used more antibiotics to treat mastitis.[4] These claims resonated with animal rights activists and those who identified technologies, rather than disease organisms, as the greatest risks to milk's purity.[5]

Although the debate surrounding rBGH echoed earlier discussions of the appropriate relationship between humans and the environment, the political and economic context of its introduction shaped the content and form of the debate over its use. rBGH arose amid a struggling dairy economy and fears about the disappearing dairy farms. When scientists introduced rBGH, the dairy economy was on the skids, despite the increased productivity of cows. As selective breeding and new feeding regimens boosted milk yields, surplus milk drove prices down, and bills for expensive farm improvements mounted. By 1986, the nation's milk surplus was so massive that the federal government, under the Dairy Termination Program, paid $1.8 billion to dairy farmers who agreed to slaughter their cows and stay out of dairying for five years. Reducing the cow population and thereby milk production, legislators hoped, would lower the costs the federal government paid to maintain dairy price supports.[6] Hence, many farm people greeted news of rBGH not as a technological marvel, but as an absurdity, for dairy farmers were suffering from economic problems resulting from too much milk, not too little.[7]

Rural audiences were not the only ones concerned about the economic strains felt by dairy farmers, for a changing farm economy affected the character of the landscape on the edge of America's cities and weakened the economic sustainability of small towns. In the northeast and mid-Atlantic, suburban roads, houses, and retail establishments swallowed up farmland. Defense installations converted land from agricultural to industrial uses in the West and the South. Dairy farmers were more sensitive to suburban development than any other farm group, because commercial dairying required large, long-term investments for specialized buildings and equipment. As suburbs sprawled, dairying families hesitated to spend money on farm improvements because they believed they might not be able to use them in the future. Farm families on the fringes of the city also feared paying higher taxes to fund suburban roads, schools, and utilities. Hence, metropolitan counties witnessed a steady decline in the number of dairy cows in the 1960s and early 1970s.[8]

Even in states like Vermont, where few counties could be classified as metropolitan, the imprint of the city shaped land use development. Vermont's dairy farms had long been reliant on the city; out-of-state residents, particularly Bostonians and New Yorkers, drink most of the state's milk and have since the early twentieth century. But in the 1960s and 1970s, urbanites and suburbanites

increasingly came to Vermont to ski and visit its pastoral landscapes. When these tourists built second homes, Vermont dairy farmers experienced some of the same economic pressures as those on the fringes of American cities.[9] Like nineteenth-century processes of industrialization, processes of suburbanization and urban escape changed country and city alike.

On dairy farms that remained in operation, suburbanization encouraged new land use patterns. Since farm families paid higher land taxes with development, they shifted away from using land extensively for pastures and woodlots and intensified production on cropland. USDA researchers concluded that between 1974 and 1982, pastureland declined by 25 percent on farms in metropolitan counties.[10] Ironically, suburbanites and tourists endangered the very landscapes they idealized—rural pasturelands surrounded by wooded hillsides—by seeking out these landscapes as sites of residence and vacation homes.

In the 1960s, historian Adam Rome argues, the loss of open space inspired urbanites concerned about diminished recreational opportunities and poor flood controls to call for land conservation.[11] By the 1970s and 1980s, though, the effects of the loss of open space on rural residents became of vital interest. In the 1970s, state and local governments introduced differential tax assessment rates for agricultural lands to stem the economic pressures on farmers. Others initiated state land use plans to protect rural lands from development. By the late 1970s and early 1980s, these efforts proved ineffective at maintaining farmland in regions most affected by sprawl and stirred considerable political opposition.[12] Although political efforts to protect farmland from suburban pressures foundered, they reinvigorated appeals to the "family farm" in political rhetoric and forged alliances between farmers and environmentalists. Both these developments would be important in the fight waged against rBGH.

A second factor that made the rBGH opponents' appeals to the family farm resonant for popular audiences at the time of rBGH's adoption was the 1980s farm crisis. In that decade, many farmers suffered from an intense credit crunch. Encouraged to invest in new agricultural technologies to take advantage of international grain markets in the 1970s, farm families found themselves deeply in debt in the 1980s. Although dairy farmers were partially insulated from the farm crisis because milk and dairy foods were not part of the export boom, they did experience a sharp downturn in land values and dairy price supports. Pointing to main streets of small towns tattered by the 1980s farm crisis, farm groups warned of continued decline as rBGH accelerated the pace at which farmers left the business.[13]

Activists' concerns intensified when economists calculated that roughly one-third of the nation's dairy farms were ill-prepared to weather the likely economic effects of rBGH adoption. Economists predicted that highly leveraged medium-sized farms, those most affected by the credit crunch in the 1980s, would suffer most from rBGH, for as declining milk prices drove down land prices, mid-sized farmers would not be able to utilize land as an asset to obtain short-term loans.[14] Groups that drove efforts to restrict the use of rBGH, like Wisconsin's Family Farm Defense Fund, began as organizations to protest the economic conditions facing farmers in the 1980s and viewed the new technology as one that would perpetuate the economic problems of that decade. The fears expressed by these activists fueled successful efforts to pass moratoriums on the use of rBGH in Wisconsin and Minnesota in 1990.[15]

Within this context, opponents to the artificial hormone framed their opposition as a defense of the family farm, as much as a protest about milk's purity. According to political scientist Patricia Strach, the phrase "family farm" only emerged in the immediate post–World War II period to describe the effects of rapid technological modernization on family-sized farms and to distinguish individual farms from collectivized farms in communist states.[16] Opponents to rBGH turned to the phrase, arguing that a stance *against* rBGH was a position *for* the future of the family farm. Importantly, opponents of rBGH used this rhetoric on product labels as much as in the halls of Congress. Ben & Jerry's ice cream, for instance, proclaimed their exclusion of rBGH in milk by emblazoning their packages with the phrase "Save Family Farms." In the wake of failed legislative attempts to preserve agricultural lands and a political climate of neoliberalism, they viewed consumer action, rather than a robust legislative agenda, as the best way to curb the use of the new technology. These contextual factors made the debate over rBGH distinctive from prior discussions about technological innovation.

Placing the family farm at the center of the debate on rBGH was an effective strategy devised by the technology's opponents. The phrase simultaneously addressed rural residents' concerns about the economic viability of farming and tapped into long-standing suburban and urban concerns about the loss of open space in rural areas. But the rhetorical emphasis cast the farm as a site resistant to technological change and reinforced the idea that rural spaces are counterpoint to industrial ones. In fact, by the time of rBGH's introduction, the working landscapes characterized as repositories of traditional values and unchanged nature by the phrase "family farm" had long been hybrids of nature and technology radically transformed by the processes of industrialization in the twentieth century. Since the 1910s and 1920s, small and mid-sized farmers cultivated a precise mix of protein-rich pasture grasses, like alfalfa, to improve cows' efficiency and built silos to encourage steady year-round lactation. After the 1950s, they ridded their barns of pigs, chickens, or goats, orienting labor and investment toward specialized equipment for dairy production. Postwar agriculturalists also moved the locus of expertise for breeding from the bull pen to the farm office, where they pored over breeding records and placed semen

orders from artificial insemination firms. In other words, the decision of whether to utilize rBGH did not constitute the most critical moment for distinguishing between industrial, capital-intensive farming and traditional means of raising dairy animals; the technology merely extended and amplified the orientation toward capital-intensive production whose origins lay decades earlier.

What instigated the public debate about rBGH, then, was less the technology itself than the questions it provoked among farm people and public audiences. In the wake of economic dislocation, farm people began to question the capital-intensive, mass-market orientation of agriculture and the burdensome debt loads that accompanied it. Faced with a homogeneous landscape of strip malls and parking lots, suburbanites thought more deeply about the implications of their consumer-driven lifestyle on the countryside and the people who lived there. The debate over rBGH revisited earlier concerns about milk's purity stemming from technological hazards but articulated concerns that the 1980s and 1990s brought to the fore.

The second element that marked the movement against rBGH as a phenomenon of its time was that activists put great emphasis on individual consumers as the agents of social and economic change. Although opponents of rBST worked to slow the technology's progress through government channels, they simultaneously mounted a campaign to make consumers the ultimate decisionmakers in the fate of the new technology. The growing political climate of neoliberalism in the 1980s and 1990s made calls for expanded regulatory authority politically untenable and encouraged opponents of rBGH to showcase consumers, rather than regulators, as agents of change. If consumers could be persuaded to refuse to drink milk from cows treated with the hormone, its critics reasoned, state approval or sanction of the use of rBST would have little effect.

Thus, the central issue became whether milk from cows that were not treated with the artificial hormone could be labeled rBGH-free. Since milk from treated cows bore no obvious visual distinctions from that of nontreated animals, and few consumers knew the immediate origins of their milk, only a label could help consumers to distinguish the practices used in its production. By the end of the twentieth century, food labels served both as a canvas for manufacturers to make claims about their product and also reflected consumer groups' demands for reliable information to inform purchasing decisions—through truth-in-advertising laws, requirements for weights and measures, and ingredient lists. Even consumer-driven activism was in some ways dependent on the state because food regulators decided the pitched battles over the permissible language of food labels.[17]

Monsanto, the leading manufacturer of rBGH, firmly opposed any efforts to label milk that would allow consumers to differentiate between milk derived from treated or nontreated cows. The corporation contended that because milk from treated cows bore no significant nutritional or material distinctions, labeling of milk as free of the technologically derived hormone was false and misleading. Monsanto contended that affixing labels indicating that milk came from treated animals was tantamount to attaching a warning to a product proven safe, while labels indicating a product was rBST-free falsely implied a level of superior wholesomeness.[18]

Opponents of rBGH, however, steadfastly supported efforts to label milk, insisting that consumers had a right to know the contents of their food and the conditions in which their food was raised. The use of a label to tell consumers more about the conditions under which a good was produced was not a new strategy. In the nineteenth century, abolitionists used the "free produce" label to sell goods untainted by slave labor, and Progressive Era consumer activists acted in solidarity with unionized workers through their "white label" campaign.[19] Nor were labels emphasizing product origins new to the dairy industry; after all, Land O'Lakes creameries built a national market in the 1920s by trumpeting the origins of its sweet cream butter on the label. In a political context that placed great value on the individual rights of consumers, rBGH critics articulated their position on labeling as one of protecting consumers' freedom in the marketplace.

In February 1994, however, the FDA rejected a mandatory requirement that all milk from rBGH-injected cows be labeled. The agency allowed voluntary labeling to identify milk from nontreated cows as free of rBST, so long as the label put the claim in context, with a phrase such as "No significant difference has been shown between milk derived from rBST-treated and non-rBST-treated cows." Companies who sought to label milk as rBGH-free had to certify and document that their suppliers were indeed eschewing use of the supplemental hormone. In short, the FDA guidelines put the burden of proof on farmers and dairy manufacturers seeking to keep milk free of rBST, rather than on those using the hormone.[20] While the FDA recommendations lacked the force of law, Monsanto's lawyers sought to ensure that the guidelines were strictly interpreted, suing any dairy companies whose labels it believed deviated from the FDA's guidelines.[21]

In the decades following FDA approval in 1993 and the labeling decision of 1994, the hormone neither ushered in the greatest hopes of its proponents nor the greatest fears of its critics. rBST did not increase milk yields as dramatically as its promoters had projected. To produce the levels of milk its promoters had promised, farm people had to manage and monitor the diet and health of cows receiving rBST injections with intense scrutiny, a labor-demanding prospect that was hard to achieve in practice. Further, farm adoption rates were not as widespread as some economists had suggested; even farmers who embraced rBGH often used it selectively on just some of the cows in their herds.[22] In 2002,

a USDA survey reported that 22 percent of the nation's dairy cows were treated with artificial growth hormone. By 2007, that number fell to 17 percent.[23]

In the end, the key decisionmakers regarding the use of rBGH were not consumers who refused or embraced milk produced with rBGH, or the individual farm people who enthusiastically adopted or rejected the technology. Rather, the middle sectors of the dairy industry—particularly milk-processing plants, retailers, and regulators—played the largest role in encouraging or curtailing its use. In a dairy industry dominated by large milk processors and supermarket distributors, when a processor refuses to accept milk from cows treated with rBGH, it has important implications on the decisions of its farm suppliers. Farmers who fail to oblige with the milk processor's dictate will have trouble marketing their milk.[24] Many chain retailers and dairy companies decided not to accept milk from rBGH-treated cows, because they feared that even if only a few consumers rejected milk from treated cows, it would drive down profits. By 2008, Walmart, Kroger, and Publix sought out milk without artificial BST, and the major milk bottler Dean Foods shifted away from purchasing milk from farmers who adopted the product.[25]

From the perspective of rBST-backers, the decision by milk processors to reject milk from cows injected with rBST is objectionable, because it disallows dairy farmers themselves to choose whether to use an approved technology. Yet milk companies' influence over farmers' decisions about farm technology is not new. Creamery and milk company fieldmen urged farmers to grow alfalfa, build silos, or buy bulk tank coolers in previous decades. By the late twentieth century, though, the market for milk was so centralized and concentrated that dairy farmers lacked alternative markets if they chose not to follow processors' suggestions. This absence of alternatives made the influence of processors and distributors on farm people's behavior profound.

Although the introduction of rBST was not as revolutionary as originally anticipated, it did set into motion new thinking and action on the farm and in the marketplace. rBST inspired some farmers to adopt technologies to maximize the supplemental hormone's effects, such as state-of-the-art feeding equipment to individualize cows' rations and ease the burdens of management. The artificial hormone motivated other farmers to imagine low-capital alternatives to the technological treadmill rBGH encouraged. For some consumers, rBGH rekindled suspicions about the role of technology on foods like milk, encouraging a new quest for an "all-natural" alternative.

One result of the debate over rBGH was to stimulate interest in organic milk. The use of the term "organic" to describe an agricultural method and kind of food originated in the early 1940s, through the works of Albert Howard and J. I. Rodale. At a time when conventional agriculture emphasized capital-intensive technological improvements to minimize human labor, organic agriculturalists advocated labor-intensive methods that eschewed technology. Advocates of organic farming espoused building the soil with compost, controlling insects with natural predators, and killing weeds with mechanical means, instead of relying on chemical fertilizers, insecticides, and herbicides. Further, rather than sell through centralized food distributors, many organic agriculturalists marketed goods directly to consumers. Proponents of organic agriculture thus cast themselves as an alternative and counterpoint to conventional agriculture's emphasis on chemicals, capital-intensive practices, and centralized markets. By the late 1960s and 1970s, many counterculture activists filled their plates with organic food as a way to make the personal political; disillusioned with the public face of political activism, culinary choices became part of a journey of self-renewal.[26]

While the roots of the organic food movement were established decades earlier, organic milk's popularity boomed in the 1990s as the debate over rBGH unfolded. The growing interest in organic milk transpired at the very moment that the organic label became institutionalized. In 1990, the USDA established national standards to govern organically produced commodities. Implemented in 2002, the standards codified the definition of the term "organic" and required products sold or labeled organic to comply with these rules. Organic dairies, for instance, must eschew rBGH, antibiotics, and feed grown with pesticides for at least three years to meet certification standards. Skeptics of biotechnology turned to the organic label for greater assurances of consistency and food quality than in the rBGH-free label, which varied state to state, based on the outcome of state regulations and legal challenges. Constituting only .3 percent of the nation's milk market in 1999, by 2007 organic milk and cream made up 6 percent of national sales.[27] Federal organic certification standards reinforced a vision of milk's purity that credited technological contaminants as the primary threats to milk safety, because they targeted antibiotics, hormones, and pesticides as substances to be eliminated or avoided.

Organic milk also drew the interest of dairy farm families. In the 1990s, going organic offered a way for mid-sized dairy farmers to opt out of technologically intensive dairy production. Premiums paid for organic milk looked especially promising to prospective producers. In some cases organic milk commanded a price twice that of conventional milk. Most organic producers used lower-cost alternatives to capital-intensive animal-tending regimes, relying on rotational grazing, for instance, instead of mechanized feeding equipment.[28] Still, converting to organic production was not a decision to be taken lightly, because a farm must be managed organically for three years before it is certified and can garner higher organic prices. Organic producers incurred added costs, such as purchasing pesticide-free feed, and their cows produce less milk per cow than those conventional dairies. Despite these high conversion costs, between 2002 and 2007, the number of organic dairy farms rose nearly 80 percent.[29]

In some respects, the extraordinary growth in the popularity of organic milk demonstrated the abiding appeal of all-natural milk among consumers, and a more general acceptance of organic principles among farmers. But organic milk's tremendous growth also owed much to a significant departure from the guiding philosophies of the organic movement. In the 1970s, one of the most revolutionary elements of organic farm proponents was that its provisioners distributed their foods through decentralized, small-scale alternative markets—such as food coops, farmers' markets, and independent health food stores, rather than centralized, corporate-driven supermarkets. In the case of organic milk, however, conventional supermarkets were pivotal.[30] By 2006, Walmart sold more organic milk than any other company.[31] Like members of cooperative butter factories who marketed their product nationally through chain stores in the interwar period, organic producers relied on conventional food distribution channels to invigorate economic and ecological sustainability.

With demand for organic milk outstripping supplies, supermarkets sought large, predictable supplies of organic food. By 2007, three companies—Organic Valley Cooperative, Dean Foods' Horizon, and Aurora Organics Dairy—provided more than three-quarters of the nation's organic milk. Aurora Dairy's milk filled the store-brand bottles for Safeway, Costco, Target, Walmart, and Wild Oats supermarkets. As organic dairy came to be dominated by centralized, corporate firms, some citizens worried that dairy farms and retailers eager to capitalize on demand for organics were not practicing in the spirit of the organic movement and compromised the standards set forth by the USDA.[32]

In the early 2000s, journalists and organic farming organizations exposed contradictions between the perceived organic ideal and the actual circumstances of organic dairy production. On large operations in Colorado and Idaho, thousands of confined dairy cows ate from troughs filled with organically produced grain and were milked three times a day. Milk from these farms flowed to supermarkets backed with the organic label. To critics, the practices seemed counter to the anti-industrial, small-scale, pasture-based model to which the term "organic" hearkened, and they weakened the integrity of the organic label as a whole. Critics also worried that the scale and mass quantities of milk that large organic farms produced would endanger the economic viability of farms operating on a small-scale, pasture-grazing model. Their vision of milk's purity rested not simply on the absence of technological residues in milk but also on factors like animals' quality of life, use of farm-grown feeds, and local control.[33]

In response to this criticism, the USDA Organic Certification program issued new rules to better align the provisions of the certification process with the conception of organic. Issued in 2010 and implemented in 2011, the new USDA regulations forbid cows to be continuously confined, required at least 30 percent of an organic dairy cow's nutrients to come from pasture and for organic dairy cows to graze at least 120 days a year, and demanded that organic farmers submit a pasture management plan as part of certification.[34] The revisions seem to benefit small-scale organic farms whose operators are more experienced with and dependent on pasture grazing, particularly those in the upper Midwest, and to disadvantage the large-scale dairies in the West, which rely more heavily on confinement feeding.

The ultimate effects of this policy change, however, may be difficult to disentangle from the effects of the economic downturn on organic dairying. In 2009, for the first time since the 1990s, organic dairy sales declined. High prices for organic alfalfa and grains have been especially difficult for northeastern organic dairies, whose operators rely more on purchased feed. As the price for conventional milk has fallen, cost-conscious consumers are reluctant to bear the bigger gap between the premium prices of organic and conventional milk. Many who continue to choose organic have cut costs by purchasing store-brand organic milk, which is more likely to come from large-scale organic dairies.[35] The state, by setting federal organic milk marketing standards, and supermarket retailers, by establishing milk prices that favor store brands, play an important role in shaping the alternatives to individual milk purchasers.

Questions raised about the meaning of the word "organic" inspired some consumers to embark on a further search for a more natural milk and a more direct relationship with its origins. In this quest, they have turned to a new-old product: raw milk. Debates about whether to drink raw or pasteurized milk are not wholly new; indeed, physicians and consumers challenged pasteurization as it was first adopted in the Progressive Era. But the contours of the debate over raw milk have shifted. Today's raw milk supporters place great emphasis on entrusting consumers, rather than state actors, with verifying the wholesomeness and purity of food and appeal to the revival of small-scale agriculture through decentralized milk distribution. In so doing, raw milk supporters aim to reject not simply the influence of modern technologies on their milk but also disavow the modern regulatory and distributive systems by which most milk reaches consumers. Although raw milk proponents see the food as a "traditional" one, the ideas and meanings they attach to raw milk reflect a particular historic moment of the 1990s and 2000s.

The push for raw milk departs from the general trend toward pasteurization. Pasteurized milk became the standard fare in America by the 1920s and 1930s as health codes, citing the risk of food-borne illnesses, discouraged the distribution of raw milk. In 1947, Michigan became the first state to ban the sale of raw milk entirely. Other states limited farmers from selling raw milk except directly to consumers on the farm. But as was the case with other laws governing milk safety, a patchwork of state and local laws prevailed well into the twentieth century. Currently, intrastate sales of raw milk are legal in twenty-eight states;

some of these states permit retail sales while others require consumers to buy raw milk directly on the farm site.[36] The sale of raw milk across state lines, however, has been illegal since 1987, when a federal judge ordered the FDA to prohibit interstate shipments.[37]

For its present-day backers, raw milk represents much of what organic foods symbolized in the 1970s: a counterpoint to the highly centralized, corporate-dominated, technologically dependent food system. Raw milk enthusiasts portray the food as natural and untouched by modernity. Writer Nina Planck, for instance, calls raw milk a traditional food, which she contrasts with industrial ones. David Gumpert calls raw milk wild. Sally Fallon Morell describes pasteurization as a *denature*-ing of the product.[38] Like food activists of the late 1960s and early 1970s, today's raw milk enthusiasts view the highly processed foods filling supermarket shelves as symbols of the ills of an industrial society and seek to restore the role of "nature" in their diets.[39] For these proponents, the term "raw" means more than simply unpasteurized. Rather, they associate raw milk with a particular set of practices of food production and distribution. The food's backers associate raw milk with small, local farm operations and link pasteurized milk to large-scale dairy operations. They view raw milk as the product of pasture-grazed cows and connect pasteurized milk to feedlot-fed animals.[40]

While rhetorically effective, the sharp distinction raw milk enthusiasts draw between "traditional" and "industrial" milk misrepresents dairy history. Even seemingly natural and traditional processes, like pasture grazing, have been transformed over the twentieth century. Pastures were not and are not simply plots of native grasses, but carefully managed stands—fertilized, seeded, and fenced to promote the growth of the most succulent and nutrient-rich grasses.[41] By the 1920s and 1930s, for instance, farmers carefully followed advice from modern experts to plant high-protein grasses, like alfalfa, to stimulate milk production. Industrial ideals—maximizing production and minimizing costs—guided interwar farmers planting pasture grasses just as fundamentally as they motivate managers of dairy feedlots today.

Raw milk enthusiasts also celebrate the process by which consumers obtain the food. In many states, raw milk can only be offered for sale at the site of its production. Some raw milk enthusiasts purchase it by entering cow-share agreements; they pay a farmer a fee to house and feed the cow, in exchange for its milk. The intimate set of relationships through which consumers purchase raw milk contrast sharply with the anonymity through which they obtain foods in most retail settings.[42] Raw milk distribution approximates the decentralized, underground, face-to-face model once associated with organic foods.

The decentralized, direct interactions through which raw milk is sold are also attractive to those who produce it. Direct sales promise much higher returns for farmers than they realize from selling milk to processors to be pasteurized or manufactured into other dairy foods. As the number of milk processors contracts, farmers have fewer bidders for their product and less bargaining power. In some markets, farmers must settle for the terms offered by one milk processor.[43] Selling raw milk directly to consumers offers an alternative. One Wisconsin dairyman reports making six times as much for a gallon of raw milk sold directly to consumers than he could obtain from the dairy company.[44] For dairy farmers weary from life on the economic margins, such benefits are compelling. The emergence of the raw milk underground, then, is as much a result of changes in the dairy economy as it is a reflection of contemporary desires for natural foods.

Ironically, the decentralized process by which consumers obtain the food is itself a product of state regulation. The small size of some raw milk dairies, and the direct contact with producers that raw milk drinkers enjoy, derives in no small part from the regulatory restrictions on its sale. In Oregon, for instance, only farms with fewer than three dairy cows can legally sell raw milk, so the small scale of raw milk dairies there reflects less a commitment to traditional practice than compliance with state regulation.[45] The direct connections with producers that many raw milk drinkers value result from the restriction of the food from mass retail settings or interstate shipment.

As raw milk drinkers characterize the food as one free of the trappings of modern life, they also argue that the fight for access to raw milk is about consumers' right to freely make choices about their foods, free from state interference. Raw milk drinkers see the state as an impediment to individual consumer choices, rather than an ally in ensuring milk quality. For many, on-farm interactions and personal feelings of well-being provide more reassurance of the food's safety than evidence of government inspection or scientific claims. Raw milk dealers who have been prosecuted for circumventing public health laws view such actions as part of an orchestrated government plot to stifle small farms and halt the rights of consumers. Some raw milk defenders intimate that FDA inspectors are acting to defend agribusiness from competition, while others argue that actions taken against raw milk mark an over-expansion of state regulation over food.[46] As farmer Joel Salatin, whose views have received widespread exposure through Michael Pollan's *Omnivore's Dilemma* and the documentary *Food, Inc.*, writes, "When the public no longer trusts its public servants, people begin taking charge of their own health and welfare. And that is exactly what is driving the local heritage food movement."[47]

The libertarian-leaning, antiauthoritarian views of raw milk drinkers reflect the changing political culture of American life after the 1970s. In the 1970s, political conservatives challenged the popular consensus backing consumer protection laws, casting state protections as a threat to individual consumer freedoms. Rather than argue that the state had a legitimate role to ensure the rights

and protect consumers as a body, conservatives emphasized the rights of each individual consumer to act unbridled in the marketplace. This emphasis on individual agency and autonomy also flourished among countercultural communities who emphasized individual responsibility and do-it-yourself solutions to broader environmental and social problems. Even as raw milk proponents celebrate their drink as antimodern, they also articulate views consistent with those who sought to reconcile technology and nature in the 1970s and 1980s.[48]

Contemporary raw milk enthusiasts' ideas break from past precedents on milk regulation in two ways. Although raw milk drinkers see themselves as part of a consumer movement, historically, most consumer activism surrounding milk has called for government intervention on behalf of milk drinkers, not freedom from it. In the Progressive Era, physicians and parents concerned about milk quality pushed for the creation of municipal ordinances to improve milk's sanitary qualities. By the 1950s and 1960s, even as they criticized the federal government's role in nuclear testing and indiscriminate pesticide use, consumer activists called for Congress to enact tougher standards to improve milk's purity and sought to toughen FDA enforcement. Citizens saw these public health interventions that restricted individual liberties to be justified through the constitutional principle that grants the state police power to promote the public's general health and well-being. By contrast, raw food activists regard state health inspectors, and the FDA in particular, as an oppressive force that stifles individual consumers' rights to access healthy food.

Second, raw milk enthusiasts depart from the position, widely established in the Progressive Era, that many of the bacteria milk carries pose potential health hazards. Many of the illnesses traced to milk in the Progressive Era—septic sore throat, typhoid, and scarlet fever—have subsided with safeguards to sanitize the water supply, control veterinary diseases, and improve dairy workers' health. However, public health officials still worry about the risks posed by food-borne illnesses such as *Campylobacter jejuni*, *Salmonella dublin*, and *E. coli* 0157:H7.[49] Whereas public health officials stress raw milk's role in communicating food-borne pathogens, raw milk supporters characterize the food as an elixir of health. They focus on how it helps remediate symptoms of chronic diseases, such as arthritis, eczema, asthma, and childhood behavioral disorders.[50] Although raw milk has long had promoters, the emphasis on chronic diseases and immune disorders, and their lack of concern about food-borne illnesses, distinguish today's raw milk movement from its predecessors.

Ultimately, today, as in the early twentieth century, regulators' decisions about whether and in what ways to allow the sale of raw milk turn on economic considerations. In the early twentieth century, when raw milk commanded a greater proportion of the milk sold, certified raw milk dairies were subject to more regular inspection by medical milk commissions and had to meet lower bacterial standards than pasteurized milk. At that time, the high cost of on-farm inspection is what drove many municipalities to pass pasteurization ordinances. Today, the cost of inspection of raw milk often presents the biggest hurdle to the food's legalization, because states bear the expense of ensuring that the unpasteurized milk offered at the farm is free of bacterial contaminants.[51] Legalizing raw milk requires the maintenance of sufficient staffing to conduct farm inspections and test milk samples in food laboratories. Maintaining a robust milk inspection system is costly. In cash-strapped times, devoting state resources to a food that reaches only 1 to 3 percent of milk drinkers seems to outweigh the food's benefits.

Conflicts over milk labeled raw, organic, or rBGH-free suggest that competing cultural ideals and political contests are at the heart of Americans' challenges to find a sustainable balance with nature. Consumers, producers, and health officials present diverse ideas about the risks of milk and who should bear the responsibility for food safety. But such cultural and political discussions always take place in a biological context. As policymakers and citizens deliberate over the language to print on milk labels and the meaning of organic, the nature of the farmstead continues to undergo change, presenting new challenges to health officials and farm families charged with protecting milk's purity.

For instance, in the past fifteen years, health officers have begun to track the re-emergence of some of the bacteria whose presence sparked pasteurization ordinances. In the late 1990s, state health officials began to detect isolated cases of bovine tuberculosis—the same disease that prompted Progressive Era battles over tuberculin testing—in livestock herds. The resurgence of bovine tuberculosis was surprising, for federal-state testing of cattle on regular intervals had largely eradicated the illness. So few cases were detected that by the early 1990s some states, such as California, abandoned testing. Less than five years later, though, bovine tuberculosis appeared in California cattle, and by 2010, cases had also turned up in states throughout the country.[52]

The recent outbreak of bovine tuberculosis offers both an opportunity to examine contemporary developments in relationship to the past and also challenges present-day assumptions about milk purity, nature, and consumer culture. First, at a time when questions of milk's purity among consumers had come to focus so centrally on the risks posed by technological contaminants, the resurgence of bovine tuberculosis presents consumers with a reminder of the ways that turn-of-the-twentieth-century milk drinkers conceived of milk's hazards. Although the widespread adoption of pasteurization and the ready availability of antibiotics to battle the illness means that few consumers could be afflicted, bovine tuberculosis still poses a potential risk to the health of dairy cattle and reduces the amount of milk that cows can produce. The resurgence of bovine tuberculosis challenged notions of natural purity not simply because it

reminded consumers of bacterial hazards, but also because of the vector of its introduction to dairy herds. In Michigan and Minnesota, wildlife, particularly deer populations, spread the disease. Ironically, at the very moment that consumers came to credit nature for milk's purity, the rewilding of the rural landscape reintroduced the germs of bovine tuberculosis to a select few dairy herds.

In this respect, the spread of bovine tuberculosis exposes the legacy not simply of Progressive Era health laws, but the changing fate of farming since the 1960s. When farm families left the business in the postwar era, some allowed once-grazed pasturelands to reforest. Others sold their farms to developers to be converted into residential lots or recreational lands. Road construction that allowed easy access to homeowners and nature enthusiasts crowded out natural predators and stimulated the development of edge species that fed deer populations. Exacerbating the trend, members of rural hunt clubs baited deer populations during hunting season. Close contact between animals at deer baiting sites, like the proximity of cows enclosed in dairy barns, facilitated the spread of tuberculosis.[53] The shift from farmland to recreational land after World War II carried broad implications, then, not simply for displaced farm families or the suburbanites and recreationists who replaced them, but also as it remade ecological relationships and thereby the livelihoods of those who continued to farm.

A third element to which recent cases of bovine tuberculosis draw attention is that broader biological and technological changes transcend the boundaries erected between varieties of dairy in the marketplace. Just as southern dairy farm families in the 1950s found it difficult to avoid toxic drift, and organic farmers today fear that genetically modified alfalfa will make it impossible to market milk as organic, the resurgent spread of bovine tuberculosis demonstrates the ecological and economic connections that link farms to one another. Whether they used rBGH or not, sold milk for local sale or to be churned into butter, grazed or fed animals in confinement, all farmers felt the potential risks of a bacterial hazard and the tightening measures to control the disease. Farmers in regions with active cases of bovine tuberculosis, for instance, found it more difficult to move cattle across state lines. By reminding farm people and consumers of a common fate, the disease called into question the divisions between sectors of the dairy industry highlighted by fights over rBGH or organic agriculture.

Citizens currently express considerable optimism about the ability of consumers as eaters to remake farm practices. Hoping to improve the economic viability and environmental vitality of the countryside, some flock to farmers' markets. Others sign up for community-supported agriculture shares. Still others fill their grocery cart with fair-trade coffee or local foods. These citizen-shoppers are inspired by catchy slogans that invest food choices with great significance: Eat Your View! Vote with Your Fork! Individual eaters see market transactions as a way to support local agricultural economies, to improve water and soil quality, and to limit farmworkers' exposure to carcinogenic substances. It is not altogether surprising that such efforts have yielded interest. The act of purchasing a delectable artisanal cheese or an heirloom squash provides an immediate tangible reward, as well as a way to demonstrate a sustained commitment to improving environmental quality.

In many respects, this history of milk and dairy farming in the twentieth century offers reasons to see these developments in a positive light, for it reveals tight connections between the fate of the dairy farm and consumer practice. After all, were it not for new ways of thinking about the consumption of milk in the early twentieth century, dairy farmers might not have been able to peddle fresh milk as a staple food. Only when mothers became doubtful about their capacity to breastfeed their children did they turn to cows' milk as an alternative. Over time, changing consumer practice led dairy farmers to do things once unthinkable, like conceive of skim milk as a product to be directed to consumer markets rather than used for animals on the farm. And as Americans spurned butter for lower-fat or cheaper alternatives, dairy farmers adjusted by remodeling the barnyard so they could sell milk to Grade A processors. Each of these historical examples about milk underscores a premise central to contemporary efforts to reform the food system: that the relationship between consumers and farm families is tightly linked and that consumer demands can prompt reflexive thinking and changes in practice by food producers.

But the lessons the history of milk teaches are not all so simple. The history of dairying also reveals that the power of consumers is always mediated through the intermediate sectors of the commodity chain, that is, by health officials, retailers, food processors, nutritionists, and advertisers. In the case of butter, it was fieldmen working for dairy cooperatives and chain store retailers, not individual consumers, who articulated the value of sweet cream butter and convinced farm people to adopt new techniques to make a more uniform product. By the 1940s, rationing programs limited consumers' access to butter, forcing them to either spurn the food or obtain it on the black market. In the 1960s, those who sought to obtain milk with reduced levels of radioactive contaminants were hindered from doing so by dairy companies and health officials who doubted that most consumers would be willing to pay for decontaminated milk. In the case of rBGH, supermarket retailers and food processors ultimately limited the use of rBGH by dairy farmers by refusing to purchase milk from animals treated with the synthetic hormone. Hence, even in a political moment seemingly friendly to consumers' power in the marketplace, the political and economic structures of contemporary society frame the kinds of choices consumers have in the marketplace, and in so doing, the environmental consequences of such choices.

Milk's history reminds us that present-day consumers' desire to see individual food purchases as a means to engage broader political issues is not a new phenomenon. Butter boycotters flexed their buying power to criticize the high cost of living in the 1910s. Ice cream eaters pressed the FDA for more transparency on the contents of the food in the 1950s. Postwar parents questioned the effects of farm chemicals on milk's purity. Over the course of the twentieth century, however, consumers advocating change in the dairy industry have come to place greater emphasis on the rights of individuals to make choices in the marketplace, rather than on improving access and setting standards for all consumers to obtain pure and healthful food. Pure milk reformers at the turn of the twentieth century wanted to improve the diet of their own children, but also worried about the fate of poor children who suffered from unsafe milk. As a staple food, conceptualized by nutritionists as essential to the diet of all, consumers urged shared responsibility for food safety. But as the American diet has become more diverse, the trust in nutritional science less absolute, and foodborne illnesses less common, consumers' movements are less likely to push for a universal standard of milk purity than to defend their own, individual access to a particular kind of dairy food. Hence, despite the potential inherent in the collective efforts of individual consumers to affect farm practice, present-day efforts are, in some ways, more limited than their predecessors. Transforming one's own food purchasing practices is a start, but remaking the agricultural system to be economically and ecologically sustainable and for its bounty to be within the reach of all requires more robust political action.

Rhetorically, present-day battles over rBGH or organic food tend to reiterate a distinction between nature and technology, for instance, characterizing milk from cows treated with artificial BGH or housed on feedlots as products of technology and non-rBGH or grazing animals as products of nature. The history of milk and dairy farming illustrates that whether on an organic or a conventional farm, large or small, in the distant past or more modern times, turning cows' milk into a human food requires a careful mix of technological and natural forces. At the turn of the twentieth century, each of the fodder crops that made up a cow's ration—whether hay, silage, soybeans, cottonseed meal, or other concentrates—had to be planted, cultivated, harvested, and hoisted into farm buildings to last the winter. Even before mechanization, milking required equipment—such as pails and cans to carry and store milk, and a pump to capture spring water or groundwater to use to cool it. Horses drew loads of ice to facilitate refrigeration and the carts that delivered milk to the processing plant or rail station. While processes of animal feeding, milking, cooling, and transportation became increasingly mechanized, capital-intensive, and large-scale over the course of the twentieth century, they still required a blend of human intervention and natural action. Products of the dairy farm historically, and in the present, are hybrids of human technologies and nonhuman environments.

Furthermore, despite our proclivity to think of the threats posed to food safety as either the result of natural phenomena or technological mistakes, many of the most challenging problems with milk's purity and dairy production have stemmed from the interplay of natural and technological forces. For instance, butter factories encountered the biggest problems with cream spoilage after the introduction of the cream separator and the automobile. Natural spoilage tainted milk, but unclean separator parts that harbored these bacteria intensified off-flavors. Similarly, solutions to improve the safety of dairy foods and the productivity of the dairy farm have incorporated natural and technological variables. Artificial insemination boosted production by using new mechanisms to introduce bull's semen to the cow's uterus, but still had to be performed at the appropriate moment in a cow's estrous cycle and required the cow's work in carrying the nascent calf to term. Such examples remind us that neither nature nor technology is inherently risky. Neither nature nor technology is inherently good. Rather, both the problems of impure milk and the solutions to farm productivity have required a muddled mix of nature and technology.

The murky and ever-changing lines between nature and technology have inspired many of the changes to milk and the dairy farm over the course of the twentieth century. Among farm people and agricultural scientists, the persistent influence of natural cycles and unpredictable outcomes on the farm inspires a turn toward technologies to control variability and make farm production more efficient. Among some consumers, the pervasive influence of technology on nature raises discomfort about compromising the natural purity of foods. Only by recognizing this muddled mix of environmental forces and human choices inherent in a glass of milk, an ice cream sundae, or a whey-protein shake can we come to terms with the ways in which humans have manipulated and transformed nature in the twentieth century.

The most promising feature of recent interest in food and agriculture is that it encourages eaters to think of the act of eating as one with consequences beyond the realm of the individual. Decisions about food shape not simply the contours of one's waistline or one's score on a cholesterol test, but also the health of the broader ecological and social fabric of which we are part. Food constitutes community. What eaters put on the plate or pour in the glass embeds them within social and economic relationships, engages them in political contexts, and ties them to ecological processes. By explaining how the natural and social networks inherent in a nibble of cheese or a swig of milk have changed over time, this book hopes to inspire greater consideration of these consequences and the communities that sustain us.