The Impact of Sanitation Reform on the Farm Landscape in U.S. Dairying, 1890–1950

In the late nineteenth and early twentieth centuries, spectacular advances in bacteriology brought profound responses in the United States ranging from the public level down to the personal. Among the many American landscapes affected by the germ theory, perhaps none was more thoroughly transformed than the dairy farm. Progressive- and New Deal–era governments imposed milk sanitation regulations that reached far into the hinterland, reshaping the farm—and farm dwellers’ spatial practices—to an unprecedented degree through state control.

The subject is significant partly for its sheer scale and landscape impact; this dairy version of a Great Rebuilding affected thousands of farms across the nation. To comply, dairying families rebuilt their barns, erected milk houses, and rearranged their farmsteads, but before long the role of architecture itself in securing clean and safe milk was called into question. Some scientists contended that other factors contributed far more to reducing bacteria counts: proper milking, handling, and cooling practices; animal-disease eradication campaigns; and above all, pasteurization. Yet architectural requirements persisted—as they do to this day. In the public mind visual cleanliness and modern appearance were still crucial indicators of proper sanitation. Located at the nexus between food production and consumption, the modern milk house and sanitary dairy barn functioned as key elements in a landscape discourse between country and city.

The story appears through published sources such as dairy bacteriology texts and farm journals; archival materials such as completed dairy score cards and agricultural extension materials; and the landscape itself. Barns and milk houses reveal how milk producers interpreted the mandates and engaged in a dialogue with consumers. The broader landscape context suggests how the new spatial organization subtly reshaped daily experience. The examples discussed are mainly from Pennsylvania, but they well represent the nationwide range of landscape responses to the new imperatives.

Producing milk for fluid consumption was tied to the rise of cows’ milk as a popular substitute for human breast milk. A new infrastructure developed to funnel milk from farm to city, starting when human workers milked from the cow into a pail and then emptied pails into metal cans. These were sent, in turn, by rail into the city. Over time, large corporations organized the milk supply across an ever wider geographic area. They built local plants where their “patrons” delivered milk to be pasteurized, bottled, cooled, and sent to market. Truck transport, via a developing highway system, expanded the “milk shed” (analogous to a watershed) beyond rail routes by the 1930s.

Fluid milk consumption was growing just at the moment when it became apparent that cows’ milk was an ideal growth medium for bacteria. Soon, researchers expanded the list of suspected milk-borne human diseases to include tuberculosis, diphtheria, undulant fever, typhoid, infantile diarrhea, cholera infantum, scarlet fever, septic sore throat, and foot-and-mouth disease. As epidemiologists began to piece together the processes by which disease reached humans through
milk, public officials devised multiple strategies to deal with the “Milk Question.” Campaigns to eradicate bovine tuberculosis and other diseases focused on testing, culling, vaccinating, and certifying herds. Urban health departments formulated regulations designed to ensure a cleaner raw-milk supply by requiring producers to follow specific milk-handling practices in a clean environment.8

Dairy regulation typically blended thresholds for bacteria counts with evaluations of a farm’s environment (barns, milk houses, water supply, and waste disposal) and handling practices (milking, straining, keeping cows and humans clean, cooling milk). They tied these standards to milk grades and, increasingly, to prices paid. Regulation developed over a half century and varied geographically; major cities led the way, while many smaller municipalities and rural districts were still not covered until as late as 1950. State and municipal regulations overlapped, and competing companies’ milk-supply lines crisscrossed, leading to inconsistencies in expectations. Yet where architecture was concerned, basic requirements varied little.

The laws affected multitudes of producers. A typical dairy herd in the early twentieth century numbered between five and ten generally low-producing cows, so city milk sheds were typically fed from thousands of small-scale dairying operations. In 1935, for example, over 82,000 New York State farms sent milk to New York City; the city also took in milk from five other states and Canada. In 1935, 14,000 farms supplied Detroit. And so on. Every one of these farms was eventually required to have barns and milk houses that met sanitation standards. Landscape change could take place rapidly as farmers scrambled to finish building before mandates went into effect. When statewide legislation was passed in Pennsylvania, state bureau of health official H. E. Shroat announced that “milk houses sprang up like magic and the month of August [1931] shall go down in dairy history in Pennsylvania as the month of two by fours and ten penny nails. Milk houses were erected by the thousand and construction not confined to lumber as a large percentage was made from concrete blocks.”9

The earliest dairy regulations drew from prevailing understandings of how bacteria lived, multiplied, and traveled. At first, many believed that the cow’s udder was sterile, so that all milk contamination must occur outside the animal. Therefore, the focus fell on handling and environment. Henry Ogden, author of Rural Hygiene (1911), confidently declared that “in the clean stable, where so few germs enter, disease germs could hardly find any opportunity for lodgment.”

He and other sanitarians proposed that disease germs got into milk from dust particles released through incompletely sealed surfaces and that pathogens multiplied in dark, humid conditions. Some critics proposed that inadequate ventilation led to dangerous stale air, leading somehow to disease. “Ventilation and sunlight,” Ogden declared, “are both excellent antiseptics . . . the value of the window is in its disinfecting power on the bacterial life of the stable.” Researchers discovered that cow manure teemed with bacteria and therefore called for regular manure removal and stringent fly control.10

In the harsh light of germ consciousness, traditional barn types underwent radical reevaluation. The famous Pennsylvania forebay barn, for example, had long been lauded as a model of efficient and productive design. Now, it seemed a veritable germ factory. E. Grant Lantz of the Pennsylvania State College proclaimed in 1926 that “sunlight and fresh air are two antagonistic foes of dirt and disease, yet both were sadly neglected in the original design of the Pennsylvania bank barn.” No longer a clever space-extending device, the forebay was now a light-blocking impediment. The cellar stables had once been praised as warm, comfortable animal shelters; critics now depicted them as dark, dirty, dusty spaces harboring all manner of microbes. Wooden partitions and mangers came under fire for sheltering germs, and accumulated stable manure, once regarded as the sine qua non of the Pennsylvania barn, was recast as a sanitary horror. Neither did sanitarians spare from criticism other traditional barn types in New York State and the Midwest.11

The very construction techniques used in traditional barns came under criticism. Ernest
Kelly, author of the standard USDA Farmers’ Bulletin on clean milk production (1914; revised 1931), maintained that barns “which have many exposed beams, braces, and ledges on which dust may lodge are undesirable.”13 His description fit any timber-frame barn and implicitly applied to most existing barns in the Northeast. Critics also faulted construction that left cracks for dust and dirt to collect. The influential 1909 publication Milk and Its Relation to Public Health featured a photograph of an unkempt stable with hay straggling through yawning ceiling cracks. The caption read, “This is the kitchen where baby’s breakfast is prepared.”14 As sanitarians navigated this new, dangerous world, they proposed regulatory solutions that had a strong architectural component. The barn stable attracted considerable attention as the site where cows were milked daily and housed evenings and winters. By the mid-1930s most major milk markets required concrete stable floors on the assumption that impermeable surfaces would reduce bacterial contamination. For the same reason, reformers preferred easy-to-clean metal components like stanchions, feed troughs, and window frames. They urged barn builders to reduce dust-gathering surfaces, construct tight tongue-and-groove ceilings, and provide ventilation and light (Figure 1). Authorities often recommended a specific square footage of window space (most often four) per cow as a desirable standard. Many markets required twice-a-year whitewashing. Most ordinances also stipulated that horses, swine, and chickens must be physically separated from cows to minimize cross-species contamination. Laws generally mentioned well-drained barnyards with separate manure-storage facilities. Disposal of human waste also received greater scrutiny.15

All milk markets required producers to build a milk house, a dedicated building where the milk would be cooled in cans and readied for transport. Utensils would often be washed and stored here. Milk house requirements generally demanded concrete block or other “impervious” material, sloping floors for drainage, adequate light, ventilation, screened openings to exclude flies, and space for equipment to cool milk, heat water, and clean utensils. Direct connection between the barn and the milk house was prohibited, as was siting near pigsties, poultry houses, or manure piles.16

Compliance with the new regulations was measured through various means, but the most popular was the dairy score card. By 1923 an estimated 240 cities in twenty-five states used a dairy score card.17 These score cards were filled out by health department inspectors. Large milk distributors employed barn inspectors or fieldmen who used the cards to monitor their suppliers in advance of the health inspector’s visits.18 Typically, the dairy score would derive from a combination of handling practices and building features. The score card system offered some flexibility by assigning partial scores and by deriving the total score from multiple separate factors. The USDA score card (a model for many markets) deducted for milk houses where flies were found, where walls and ceilings were unpainted wood, or where cooling facilities were absent. It gave points if the milk house had separate rooms for washing utensils and handling milk (Figure 2). Later on, score cards were updated to reflect electric-powered technology.19

The new architectural regulations brought significant departures from traditional farm building design practice. Farmers expecting to solve an agricultural problem did not devise specifications; public-health officials intending to solve a sanitation problem defined them. Ill-in-
# Official Score Card

United States Department of Agriculture, Bureau of Animal Industry.
Dairy Division.
Indorsed by the Official Dairy Instructors' Association.

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>SCORE</th>
<th>METHODS</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>COWS</td>
<td>Perfect</td>
<td>Allowed</td>
<td>COWS</td>
</tr>
<tr>
<td>Health</td>
<td>6</td>
<td>Cleanliness of cows</td>
<td>8</td>
</tr>
<tr>
<td>(If tested within a year and no tuberculosis is found, 2)</td>
<td>5</td>
<td>Cleaning of quarters (Free from coarse dirt, etc.)</td>
<td></td>
</tr>
<tr>
<td>(If tested within a year and reactive animals are found and removed, 2)</td>
<td>2</td>
<td>Stable air at milking time</td>
<td>6</td>
</tr>
<tr>
<td>Food (clean and wholesome)</td>
<td>2</td>
<td>Freedom from dust</td>
<td>3</td>
</tr>
<tr>
<td>Water</td>
<td>2</td>
<td>Freedom from odors</td>
<td>2</td>
</tr>
<tr>
<td>Convenient and abundant</td>
<td>1</td>
<td>Cleanliness of bedding</td>
<td>1</td>
</tr>
<tr>
<td>STABLES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location of stable</td>
<td>2</td>
<td>Clean</td>
<td>1</td>
</tr>
<tr>
<td>Well drained</td>
<td>1</td>
<td>Well drained</td>
<td>1</td>
</tr>
<tr>
<td>Free from contaminating surroundings</td>
<td>1</td>
<td>Removal of manure daily to field or proper pit</td>
<td>2</td>
</tr>
<tr>
<td>Construction of stable</td>
<td>4</td>
<td>(To 60 feet from stable, 1)</td>
<td></td>
</tr>
<tr>
<td>Tight, sound floor and proper gutter</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth, tight walls and ceiling</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper stall, tie, and management</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision for light: Four sq. ft. of glass per cow</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Three sq. ft., 2 to 8 sq. ft., 2 to 8 sq. ft.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedding</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision for fresh air, controllable fan system (Windows hinged at bottom, 1 sq. ft.; sliding windows, 1 sq. ft.ubbles, 1 sq. ft.)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cubic feet of space per cow, 500 ft.</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 500 ft., 5; less than 400 ft., 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision for controlling temperature</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UTENSILS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction and condition of utensils</td>
<td>1</td>
<td>Cleanliness of utensils</td>
<td>2</td>
</tr>
<tr>
<td>Water for cleaning (Clean, convenient, and abundant)</td>
<td>3</td>
<td>Thoroughly washed</td>
<td>2</td>
</tr>
<tr>
<td>Facilities for steam (Hot water, 0.6 ft.)</td>
<td>1</td>
<td>Sterilized in live steam for 15 minutes</td>
<td>3</td>
</tr>
<tr>
<td>(Ice milk house, not in kitchen)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk cooler</td>
<td>2</td>
<td>Placed over steam jet, or scalded with boiling water, 2</td>
<td>3</td>
</tr>
<tr>
<td>Clean, dry hands</td>
<td>3</td>
<td>Inverted in pure air</td>
<td>3</td>
</tr>
<tr>
<td>Unused and dried</td>
<td>6</td>
<td>Cleanliness of milking</td>
<td>9</td>
</tr>
<tr>
<td>Drenched with moist cloth or brush at least 15 minutes before milking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HANDLING THE MILK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleanliness of attendants in milk room</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk removed immediately from stable without-pulling from pail</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooled immediately after milking each cow</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooled below 50°F</td>
<td>6</td>
<td>(51°F to 55°F, 4; 56°F to 60°F, 2)</td>
<td></td>
</tr>
<tr>
<td>Stored below 60°F</td>
<td>3</td>
<td>(51°F to 55°F, 2; 56°F to 69°F, 1)</td>
<td></td>
</tr>
<tr>
<td>(If delivered twice a day, allow perfect score)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRANSPORTATION below 50°F</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(51°F to 55°F, 1; 56°F to 60°F, 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equipment + Methods = Final Score.

Note 1—If any exceptionally filthy condition is found, particularly dirty utensils, the total score may be further limited.

Note 2—If the water is exposed to dangerous contamination, or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.
formed farmers found to their chagrin that it was risky to build without first consulting experts who understood the regulations. Agricultural extension agents quickly stepped in, disseminating designs produced by trained agricultural engineers. The plans usually contained detailed instructions, photographs, bills of materials, and drawings showing layout and construction details (Figures 3 and 4).20

Commercial enterprises also moved to offer products tailored to new standards. The Portland Cement Company advertisements touted the supposed sanitary advantages of concrete and marketed designs for milk houses built of concrete block (Figure 5). Makers of hollow-tile blocks, metal windows, stanchions, and ventilators freely used “sanitary” as a watchword when marketing their wares (Figures 6 and 7). Popular architectural catalog companies featured milk house and barn designs.21

Dairy reforms swept through the barn basement with transforming force. Today, in Pennsylvania it is unusual to find a barn with its original lower-level configuration. Transverse wooden stalls, mangers, horse box stalls—all were ripped out. Then, the dirt floor was concreted over, with the floor organized into raised platforms, gutters, litter alleys, and feed alleys—as recommended. Most farmers installed mass-marketed metal stanchions, sometimes with integrated individual water cups.22 A popular type of metal-framed window tilted inward on the theory that “fresh air is admitted above the cow’s [sic] bodies,” thus garnering points for both lighting and ventilation (Figure 8). Builders frequently enclosed the Pennsylvania barn forebay with an amply glazed wall (Figures 9 and 10) and sometimes pierced stone gable-end foundation walls with new openings (see Figure 9).23

Some farming families chose to build anew. Land-grant colleges and commercial concerns published plans for modern barns usually built on a single level (Figure 11). A gable-end door led to a longitudinal center aisle flanked by stanchions. The original flooring in these barns was concrete, with integral gutters and alleys. Large windows lined the long sidewalls. The upper level provided ample hay storage. These barns offered spatial or-
ganization for specialized, sanitation-conscious dairying. 

The milk house was a new building type even more closely regulated than the barn. We might therefore expect to find marked architectural uniformity in milk house examples, but field study shows that milk houses exhibit scarcely more standardization than do traditional forms like the Pennsylvania barn. Within a consistent set of design parameters, builders interpreted the milk house in varied forms, materials, and finishes. Average herd sizes between five and ten animals meant that most milk houses in Pennsylvania were small—as small as eight feet by ten feet, but usually around two hundred square feet. Milk houses were usually sited at the gable end
If you will take care of your stock—your stock will take care of you!

Dairy stock needs fresh air and plenty of it. The excessive moisture and poisonous gas thrown off by a herd of cattle, if allowed to linger, will corrode and contaminate everything in the barn.

**MILCOR**
GUARANTEED
Ventilating Systems
For Barns and Creameries

Prevent tuberculosis and contagious abortion because they take out the foul air and poisonous gases and keep the stock supplied with fresh, vitalizing air. Milcor Ventilation means healthier stock, greater milk production, and perfect sanitary conditions.

"Daylight" Puttyless Hog House Windows let the sunshine in—which keeps the hog house more sanitary and healthy and goes a long way toward preventing hog cholera and other profit destroying diseases. "Daylight" Windows and No. 12 Hog House Vents make the Hog House safe for the porker. ASK FOR CIRCULARS.

MILWAUKEE CORRUGATING COMPANY
Milwaukee, Wisconsin

Branch at Kansas City, Missouri
Minneapolis Sales Office,
Lumber Exchange

---

of the barn, on the side nearest the house and lane. As the rules dictated, they lacked any direct connection into the barn, even if they abutted it. Roof styles ranged from gabled to shed, pyramid, and hipped versions. Plain concrete block was the most common milk house material, but rock-face block, refractory brick, hollow-tile block, and beaded board also appeared. Ventilation requirements were interpreted variously, from simple louvered openings in a gable peak to metal roof-ridge ventilators. Windows ranged from metal types that tilted or swung inward to wood-frame sash styles (Figures 12, 13, and 14).

Most older Pennsylvania milk house interiors had a single room. Floors were always concrete and usually sloped. A concrete cooling tank was sometimes built into the milk house fabric. Water would have been hand-carried to the milk house, pumped by windmill, or fed by gravity power. Early sanitation requirements predated widespread rural electrification, so none assumed electric power. Today, most milk houses stand unused, and many elements have been removed, but a few retain features such as racks for storing equipment, washing facilities, and cooling boxes. Some have been adapted to hold bulk tanks.

An example from Centre County, Pennsylvania, shows how builders invested great care and thought in milk house design (Figures 15 and 16). The concrete-block structure abuts the barn gable and is slightly banked to match the barn's slope. A raised poured concrete platform joins the milk house to a Dutch door under the barn forebay, allowing for efficient transfer of milk from barn stable to milk house without violating rules prohibiting direct connection. The milk house roof extends on the front side, conferring protection from the elements. The interior has a poured concrete floor with a drain and a roof opening for ventilation. A standpipe in

---

Figure 6. Advertisement promoting barn ventilator as an aid to disease prevention. From *Farm Mechanics* 2 (February 1920): 114.
one corner brought water into the building. Probably, the cooling tank was on the blank rear wall. Two manufactured metal windows have hinged upper sections that open inward. The building’s beveled poured-concrete windowsills, exposed rafters, and wooden gable fascia board add modest decorative touches.

As time went on, the state of knowledge about dairy bacteriology changed. New research suggested that the cow’s udder was not sterile after all but could contain and thus transmit harmful bacteria. Sanitarians also realized that even milk with very low overall bacteria counts might still kill if it harbored pathogens. At the same time,
Figure 9. Renovated barn, Chester County, Pennsylvania. Originally, this nineteenth-century barn probably had the extended posted forebay characteristic of southeastern Pennsylvania. In the mid-twentieth century it was renovated for dairying. The forebay was enclosed with a concrete-block wall with windows inserted; stables were concreted; and tilting metal windows were inserted into the original stone foundation wall. Photograph by the author, 2010.

Figure 10. Renovated barn, Lebanon County, Pennsylvania. The original portion was built around 1850. About 1925 the forebay was enclosed with a stone wall with long strips of windows. Photograph by the author, 2009.
researchers investigated the contribution of various factors to bacteria counts in milk. Studies challenged the notion that dust was a major contributor and questioned the germicidal impact of fresh air and sunlight. An important 1918 publication concluded that the three “Essential Factors in the Production of Milk of Low Bacterial Content” were first, the use of sterilized utensils; second, clean cows, particularly the udders and teats; third, the use of the small-top pail. By the use of these factors it has been possible to produce milk of a low bacterial count and practically free from visible dirt in an experimental barn which represents a poor type found in this country.²⁷

Prominent dairy researcher Charles E. North inventoried the elements of “well constructed and sanitary barns” only to dismiss these “cow palaces” as irrelevant to sanitation. Indeed, a notorious milk-borne epidemic was traced to a dairy that had been held up as a model for its hygienic and modern stable design.²⁸ Dairy texts began to reflect the new science by the 1920s and 1930s.²⁹

Given these developments, it would seem that

Figure 11. Sears “Modern Barn” design, 1927, billed as meeting “modern sanitary requirements.” From Sears, Roebuck Company, Modern Farm Buildings Already Cut and Fitted Barn Equipment Catalog, 1927, 28.
architectural requirements were irrelevant to the milk sanitation problem or, at most, marginally important. Yet they remained very much in force; farmers were compelled to invest money in buildings or lose access to markets. The continued presence of architectural requirements was due to powerful aesthetic and cultural factors.

The aesthetic factors included harmless but potentially offensive odors and appearances. Farmers and sanitarians alike recognized that objectionable flavors and odors got into milk. The Sheffield Farms company newsletter warned suppliers: “I have had a woman who used a lot of milk ask me what made the milk taste like a barn and she at once left this dealer.”68 Situated away from barn, root cellar, and pigsty, the milk house seemed to provide an architectural solution to these aesthetic problems. Similarly, whitewash was supposed to “keep the barn sweet.”69

Dirt was another aesthetic problem. Workers strained the milk when pouring from pail to can, but sediment tests revealed that most milk still contained visible dirt. Although bacteriologist H. A. Harding found that dirt had little appreciable effect on bacterial counts (“a disappointment to those who hold that dirt is a large source of germ life in milk”), Milton Rosenau, professor of preventive medicine at Harvard, argued for an “aesthetic side . . . not to be ignored. . . . No one wants dirty milk even though it is not specifically dangerous.”70 Dirt control was linked to architectural features like easily cleaned or whitewashed surfaces, tight ceilings, and integral water supplies.

Still more potent forces for keeping architectural requirements in force were cultural factors. Despite the empirical evidence, the consuming public—and even the inspectors—continued to believe that if the farm buildings looked clean, then they must be clean, too, and that they must therefore contribute to the goal of safety. These older views of cleanliness persisted into the germ-theory era.71 Dairy experts recognized the popular currency of this notion even as they validated current research. Rosenau explicitly acknowledged that low bacteria counts and clean-looking dairy environments were no guarantee of safe milk, yet he hopefully proclaimed that “clean-looking things are apt to be safe things.”72

In “antiseppticconscious America,” even if milk houses and modernized dairy stables might be bacteriologically unimportant, they performed a crucial public-relations function because of their direct link to food preparation. Before universal pasteurization (after 1950), there was often no intermediary processing step between producer and consumer.73 The milk house and barn stable
therefore functioned as food preparation sites and were (implicitly or explicitly) placed in the same category as a restaurant’s kitchen or a butcher’s shop. The 1922 textbook Farm Buildings compared the dairy barn to “a factory where human food is produced, and for this reason the sanitary requirements of light, ventilation, drainage and cleanliness cannot be over-emphasized. The barn should be and often is as clean as many kitchens.” In the raw-milk era, clean barns and milk houses provided evidence that the producer had taken all possible measures within his control.

Sustained dairy-building requirements were therefore guided by a strong impulse to remake the farm in an image more acceptable to the growing consuming public of town and city dwellers. Cement block, hollow-tile block, factory-milled wood, and metal architectural components represented industrially produced, standardized materials. In older dairy regions these often emphasized the message of modernity and sanitation through sheer contrast against a backdrop of more traditional architectural surroundings.

The milk house’s siting was also significant as an element in its visual expression. Usually, it was located between the barn and the road or farm lane. To be sure, this location had a practical significance, yet it also allowed the milk house to serve as an architectural buffer between the farm and the city, a kind of filter that symbolically accomplished the transformation of a dirty, smelly farm product into a clean, safe, white drinkable substance free from odor or taste that might associate it with the country or even with an animal.

Barn renovations also communicated the sanitation message. Mass-produced roof-ridge ventilators suggested an up-to-date interior. The Hershey Chocolate Company advertised its wares with photographs of a tidy row of very clean cows confined in stanchions, bordering an implausibly clean manure gutter (Figure 17). This interior would have received a top score: the floors were concrete; the stanchions, metal; the ceilings, smooth; and the windows, plentiful. In reality, milking machines were notoriously difficult to keep clean, and Hershey accepted milk for candy manufacturing that did not meet standards for fluid consumption. But the adman’s phraseology of “pure country milk” and the image of clean cows and clean stables advanced a vivid counternarrative.

This visual link between country and city wasn’t always an imaginary one. In 1930 a Philadelphia dairy inspector remarked:

Our consumers in the cities today are travelling in the country in greater numbers than was ever the case heretofore. . . . The impression of such city consumers of the conditions surrounding the production of milk is largely gathered as they hastily drive through the rural districts. A neat dairy farm with a herd of healthy cattle in view, and a tidy milk house standing beside the barn creates a favorable impression in the mind of the consumer towards dairymen’s products. We can therefore, safely assume that farm inspection is not only justified from the standpoint of improving the quality of milk, but also to some extent justified by the impression created upon our consumers.

In the Los Angeles area, the 1930s Dairy Roadside Appearance Program even awarded plaques to farms whose buildings were painted and landscaped with flower beds.

If we probe a little further into the rationales
for continued architectural requirements, we find arguments that posit the dairy farm’s reformed architectural environment as a motivator to the people working in the refashioned spaces. If the buildings themselves didn’t contribute directly to cleanliness, the reasoning went, they could still inspire workers to be cleaner. Here is the old notion about the psychological and moral influence of proper surroundings, reworked to address pervasive fears about germs among consumers. These fears now fastened upon the sloppy farmer or his slovenly hired hand.

Scientists, milk distributors, and sanitarians attacked the “intelligence of the average farmer.” The USDA proclaimed in its influential standard bulletin on clean milk production: “It may be possible by taking great pains to produce good milk in a dark or dirty stable, but it is extremely improbable that clean milk will be produced under such conditions by the average person.” As an anonymous writer in the Sheffield Farms Company bulletin more explicitly put it:

There are certain so-called ethical standards which should be observed, not only for the protection of milk by a cleanly environment, but also for the psychological effect on milk producers. Nearly anyone will do more careful work if his surroundings are high class.

These utterances were cast in coded language that tapped into deep social tensions. Some invoked class mistrust, targeting the hired man. Generally, however, criticisms referred to the “average person” or the “average farmer.” These critiques reflected the growing cultural divide between rural and urban people. The popular image of the noble yeoman was giving way to the country hick or hayseed, notable above all for his ignorance. Surely, an ignorant farmer could not be trusted to produce clean milk without external motivation. Thus, the milk house and renovated barn stable—presented as architectural containers for proper dairy spatial practices—sent a message not only to the consumer but to the farmer, as well.

Whether or not modern surroundings resulted in cleaner milk precisely in the way reformers hoped, the new buildings and regulations did have an impact on spatial practices and experiences. Perhaps most profoundly, the milk house and renovated barn stable became subject to inspection from outside. The inspector was empowered to enter the premises, and if access was refused, he could bar milk from the market. The Borden Company, for example, made contracts with its suppliers that explicitly stipulated: “The contract gives the company right and access to examine the cows, stable, milk house, feed, dairy utensils and place for keeping the same at all reasonable hours.” Often, one copy of the completed dairy score card was required to
be posted in the milk house to verify that inspection had taken place.

Inspection had a different meaning on farms than it did in other places (like restaurants or factories) where sanitarians entered equipped with score cards. The barn and milk house were within the farm family's home territory, conventionally understood as private space. Court decisions validated the legality of inspection, citing an overriding public interest and legitimate state police power. By subjecting these spaces to inspection and their interior workings to public exposure, the state transformed them into quasi-public places. Not only the physical plant but the farm family's very bodies were scrutinized; doctors' certificates for all workers were required for a license to sell milk, and employers were expected to inform authorities of sickness.

---

Figure 18. Dairy employees cleaning cows in up-to-date surroundings, c. 1909. From U.S. Treasury Department, Public Health and Marine-Hospital Service of the United States, "Milk in Its Relation to Public Health," Hygienic Laboratory Bulletin, no. 56 (March 1909).
Some boards of health used harsh tactics, including public shaming. In Lexington, Kentucky, and Waynesboro, Pennsylvania, for example, bacteria counts were published in local newspapers and board of health reports with the farmers’ names attached.9

This unprecedented incursion of the state into the farmer’s everyday life prompted considerable unease; the milk house and dairy barn stable could become contested spaces. Public health advocates advised dairy inspectors to expect resistance. Health board member J. W. Rice of Lewisburg, Pennsylvania, had the following testy exchange with farmer Walter Lilley in 1924: “From the manner in which you discussed the matter with our Officer, we felt that instead of having your co-operation in the production of good, clean milk, you were resentful of the conditions stipulated in the milk ordinance necessary for the production of a good, safe type of milk.” Even as late as 1947, Harold Adams, author of a standard sanitation manual, noted that “in an area where little if any dairy farm sanitation work has been done, one cannot always expect a too cordial reception.”50

In dealing with these conditions, experienced inspectors advocated an approach that stressed their roles as advisors and educators. Plant manager P. O. Pletcher, for example, advised field men to meet the farmer “on his own level. . . . Canvassers must be courteous and friendly and above all be able to control their tempers. . . . A smile will go very much further than a frown. . . . Get the interest of the farmer and explain tactfully the advantages he will gain by putting his buildings and surroundings in sanitary condition.”51 When inspector W. J. Lewis shifted his tactics to emphasize “education instead of prosecution,” he found that “instead of dissatisfaction we have cooperation.” Many believed that inspectors with farm backgrounds would not only have a better grasp of the issues but also be regarded less as outsiders than inspectors who were “discarded drug clerk[s].”52

This advice was practical on one level, but it could also be interpreted as a response to a delicate situation. If inspectors were educators, friends, colleagues, and advisors rather than “prosecu-
tors," their entry onto farm property would be legitimized and its impact softened. By calling themselves educators, for instance, they implicitly allied themselves with the popular agricultural extension agent or even the rural school teacher. By stressing a personal relationship, they made official inspections seem more like friendly visits, thus obscuring the reality that private space was being transgressed.

Available evidence suggests that very few farms failed inspection. Farmers were frequently given opportunities to remedy defects. Sometimes, informal collaboration took place so that the farmer knew in advance when the inspector would arrive. Resistance, coaching, and collusion helped to moderate the invasive potential of the new system. Kendra Smith-Howard has incisively analyzed a process of give-and-take between producers, reformers, and inspectors. Taking issue with interpretations that stress a binary pattern pitting small-producer resistance against large-producer accommodation, she argues for a more complex exchange. Regulators recognized small producers' difficulties, and farm people grasped the importance of disease-free milk and animals. The Pennsylvania experience confirms this give-and-take through both documentary and architectural evidence.

Thus transformed, the farm environment altered mundane, everyday spatial experiences for both humans and animals. Consider the barn floor, with its concrete cow platform, integral metal stanchions, manure gutter, concrete feeding trough, and, sometimes, piped-in water supply attached to metal dishes. Compared with the earlier wood stall, the new setup was more spatially rigid. The concrete platform was just wide enough to prevent an animal's rear hooves from slipping back into the gutter. Head restraints, partitions between feed troughs, and wide-spaced aisles limited contact among animals. Cows with water access at their stanchions walked less to drink. Even though the cows were bedded with straw, concrete floors were colder and harder than the old-style dirt. The new spatial practices ambiguously combined the old cow-as-machine analogy with a renewed acknowledgment of the cow's status as a living organism.

Under the new spatial regime, cows less often had the company of other animals in the stable or barnyard. The mandate to segregate animal species had the potential to figuratively explode the barn and to accommodate the expelled species in separate, scattered outbuildings. These changes are visible in the Pennsylvania farm landscape. Some families simply tore down the hog house. Others converted it to a machine shed, moved it away from the barn, or flipped it to face away from the barnyard. One farm family in Chester County, Pennsylvania, built a separate cow house in 1936 when regulations mandated that horses and cows be separated. The spatial separation of species mirrored the transformation taking place in agriculture toward greater specialization and less tendency to view the farm enterprise as an integrated whole.

While cows had less contact with other animal species, they probably had more interaction with humans. Sanitation mandates considerably affected human spatial practices on the farm. Milking was still overwhelmingly done by hand, and new rules required more careful techniques. Before getting down to the actual business of milking, workers had to brush the cow, wash the udder, wash and dry their own hands, and sometimes clip the cow's hair (Figure 18). Even the type of milking stool and pail were sometimes prescribed (Figure 19).
Sanitary reform brought shifts in men's work that confused gender norms. Men on dairy farms found themselves in an unaccustomed housekeeping role. Not only did they have to pay more attention to grooming themselves and their cows, but they more often performed tasks like sweeping, washing floors or windows, and sometimes washing utensils (Figure 20). Regulations held farmers responsible for monitoring their employees' health and body habits. They had to make sure employees washed their hands and used the privy (apparently not a given). The barn thus became more like the house, and the farmer, more like the farm wife and mother—at least where cleanliness standards were concerned.

A glimpse of how this shifting gendering of work played out becomes clearer when we see it against the backdrop of Progressive-era urban women's activism, sometimes characterized as "municipal housekeeping." In 1913, B. H. Rawl, chief of the USDA's Dairy Division, proudly showed a sanitation activist an up-to-date dairy farm, expecting she would be well impressed. To his dismay, she was "very much disgusted," expecting to "find the barns fitted up like a parlor." Rawl ruefully concluded that "the milk man feels it impossible to produce milk in the way in which it ought to be produced to please the ladies who are agitating the question." The hope that well-appointed dairy buildings would motivate farmers to keep them clean must be interpreted in this gendered context. The masculine associations of modern, scientific, and industrial farming coexisted uneasily with the day-to-day reality of sweeping floors.

The new spatial regime meant that farm workers traveled different pathways around the farm. As the importance of quick cooling came to be better understood, rapid transfer from cow to milk house took on great importance. A World War II-era illustration in the Eastern Milk

Figure 22. Milk house, Upper Brush Valley Road, Centre County, Pennsylvania, c. 1925, floor plan. Measured by the author and drawn by Astlynn Herbst, 2011.
Producer superimposed travel lines over barn floor plans—supposedly to demonstrate how rationalized planning reduced travel time and distances—yet even the more “efficient” plan required many steps.64 Manure-removal requirements introduced another change to daily work routine, and one Pennsylvania farmer was praised for removing manure “as fast as it accumulate[d],” Even trips to the outhouse might be redirected.65

Meanwhile, farm women found themselves wearing a path between the milk house and the farm house. They were usually responsible for cleaning utensils such as pails, strainers, separators, and (later) milking machines and, sometimes, for carrying water to the milk house.66 Score cards completed by inspector J. W. Rice of Lewisburg, Pennsylvania, frequently contain comments crediting women with good sanitation work; he notes that at one farm the milk house was “kept in good shape by Mrs. Gauger.”67 Most sources suggest that over time utensil washing shifted to the milk house from the farmhouse.68

In this light certain architectural features of milk houses take on added meaning because of women’s gendered association with cleanliness. Many milk house builders took surprising care with exterior details. Pennsylvania examples exhibit contrasting brick windowsills, multipane sash windows, molded window frames, concrete window lintels, brick door lintels, scalloped wood cove trim, exposed rafters, triangular ventilation louvers framed in molding, board-and-batten gable fill, paneled doors with decorative knobs, corner quoins, and decorative roof coverings (Figures 21 and 23; see also Figures 12, 13, 14, and 15). These architectural niceties further illustrate the point that visual cues connected the milk house with domesticity and women and, implicitly, with cleanliness.69

Though the milk house might convey domestic cues from outside, inside, the story was dif-

Figure 24. Milk house, Middle Road, Centre County, Pennsylvania, c. 1945, plan. Measured by the author, 2011, and drawn by Aislynn Herbst, 2012.
thousands of milk-producing farms, the barn basement received a thorough makeover; metal ventilators sprouted from the roof ridge; milk houses appeared; hog houses were demolished or moved; poultry houses were relocated; new privies were built; water systems were installed (at least at the barn and the milk house); and new horse stables were built. Added to the silos that also became common in the period, these changes had a cumulative impact in fundamentally altering the farm's appearance. Not only was the farmstead itself rearranged, but spatial practices changed for animals and humans alike. The new elements visually associated the dairy farm with modernity and tied it to the city in new ways. On an even larger scale, sanitation regulations contributed to broad agricultural shifts that took place between 1920 and 1950. Clean, modern-looking buildings and equipment were costly. They became a factor in dairy industry consolidation, helping to drive out those who had small herds and little more than labor to invest.72

By 1950 another significant shift was taking place. The refrigerated bulk tank replaced multiple small milk cans and thus reshaped the milk house. Milk was piped directly from the cow to the tank, thus sharply reducing handling. Around the same time, the freestall barn with accompanying milking “parlor” introduced another radical spatial change. Cows “loafed” unrestrained in a freestall barn with a simple floor plan, dirt floors, and open sides. At milking time they ambled to a small milking parlor separate from the barn.73 The arrangement reduced human labor and improved cow comfort and health. These two innovations resulted from economic forces, research findings, and new circumstances. Once pasteurization was essentially complete and the milk supply thereby made much safer, architectural arrangements could shift to prioritize human labor efficiency and animal health. Gradually, health boards adapted their regulations to allow these arrangements.74

Yet regulatory language showed a remarkable consistency by continuing to invoke older aesthetic and cultural concepts of cleanliness. In the 2009 Pasteurized Milk Ordinance, the construction requirements and “Public Health Rea-

Figure 25. Milk house, Orndorf Road, Centre County, Pennsylvania, c. 1950, plan. This building retained many of its fixtures and equipment, and their location is shown here. Measured by the author, 2011, and drawn by Aislynn Herbst, 2012.
son” for barn standards echo language used in the early twentieth century:

Floors constructed of concrete or other impervious materials can be kept clean more easily than floors constructed of wood, earth or similar materials and are, therefore, more apt to be kept clean. Painted or properly finished walls and ceilings encourage cleanliness. Tight ceilings reduce the likelihood of dust and extraneous material getting into the milk. Adequate lighting makes it more probable that the barn will be clean and that the lactating animals will be milked in a sanitary manner.\(^3\)

Today, we can read this history of continuity and change in a layered dairy landscape: freestall barns, milking parlors, and bulk tank facilities coexist on many a farm along with older barns and milk houses. Together, they testify to the possibilities of ordinary buildings to tell a much larger story.

**AUTHOR BIOGRAPHY**

*Sally McMurry* is professor of history at Penn State University. She is coeditor of *Architecture and Landscape of the Pennsylvania Germans* (2011). Her book *Pennsylvania Farming: A History in Landscapes* is forthcoming. From 2003 to 2012, she served as principal investigator of the Pennsylvania Agricultural History Project, the 2013 VAF Buchanan Award winner.

**NOTES**

1. I would like to thank Cindy Falk, Ritchie Garrison, Kendra Smith-Howard, and two anonymous reviewers. This article is dedicated to the memory of my friend and mentor Pamela Simpson.


3. A large body of extant examples exists in the field documentation for the Pennsylvania Agricultural History Project at http://phmc.info/aghistory. Pennsylvania represents dairy changes well because dairying for eastern urban markets moved through multiple stages, from home cheese and butter production in the eighteenth and nineteenth centuries to fluid milk production in the twentieth.


5. This description focuses on transportation and distribution for fluid milk consumption. The picture is more complicated, since processing plants collected milk to produce not only cheese and butter but other milk products, like evaporated milk, ice cream, cream, and the like.


15. Ogden, Rural Hygiene, 63; Dr. J. E. Tompkins, "Interpretation of New York City Board of Health Score Card for Grade B Dairymen to Study andheed," Sheffield Farms Bulletin 9 (June 1924): 10; Ladd, Dairy Farming Projects, 107; Foster and Deane, Farm Buildings, 102; Journal of Dairy Science 1 (May 1917): 62–63, summary table; see also Corbin, "Checking the Activity of Bacteria."

16. Ward, Pure Milk and the Public Health, 16;


21. N. S. Grubb’s, “The Relation of Concrete to Clean Milk Production,” PADM1 Annual Report (1927), 140–42; PADM1 Annual Report (1934), 220; H. Armstrong Roberts, The Farmer His Own Builder (1918 catalogue), 20–21; Sears, Roebuck Company, Modern Farm Buildings Already Cut and Fitted Barn Equipment Catalog (1927). These enterprises paralleled other commercial forays into selling products designed to meet sanitation concerns. For example, reformer George Waring established a plumbing supply company. See Tomes, Gospel of Germs, chap. 3.


25. This information is compiled from Pennsyl-
vania Agricultural History Project field documentation of milk houses throughout Pennsylvania and selected detailed examinations of milk houses in Centre County, Pennsylvania.


32. Parker, City Milk Supply, 125, 158; Adams, Milk and Food Sanitation Practice, 75; Kelly, Market Milk, 11; Kelly, "Production of Clean Milk" (1914), 11; Ladd, Dairy Farming Projects, 130.


35. Rosenau, The Milk Question, 244; Parker, City Milk Supply, 158, 179.


38. For an incisive discussion of how cows' bodies were manipulated, see Smith-Howard, "Perfecting Nature's Food," chap. 1.

39. A. C. Berger, "Agricultural Production and Marketing in Lebanon County, Pennsylvania," Pennsylvania Agricultural Experiment Station Bulletin, no. 198 (September 1925). A letter from John W. Rice, June 30, 1924, notes that the Allendale dairy discontinued the use of milking machines because they were too hard to keep clean. Rice Collection, binder vol. 29.

40. "Relations with the Milk Producer," The Farmers' Voice, n.s. no. 108 (November 15, 1910): 10; Christopher Wells, "The Changing Nature of Country


42. Dairy Roadside Appearance Program files, folder 1/2/20, box 1, California Dairy Industry History Collection, California State Parks Archive, Sacramento, Calif. Thanks to Kendra Smith-Howard for this information.


44. Kelly, “Production of Clean Milk” (1914), 13. See *PADMI Annual Report* (1931), 125, for a satirical piece that makes fun of farmers who don’t understand cooling and thermometers.


ings,” *PADMI Annual Report* (1936), 72. The Rice Collection also contains medical reports for farm family members.


54. J. W. Rice to W. Dietrich, June 23, 1924, Rice Collection, binder vol. 29.

55. Smith-Howard, “Perfecting Nature’s Food,” 25. In informal conversations in the field with the author, older dairy farmers would joke about having been alerted before the inspector arrived.


59. Scorecards for George B. Frederick, March 12, 1926, and Harry L. Heim, November 17, 1927, emphatically note that pigs in the cow stable must be removed. Rice Collection, binder vol. 29.

60. These alterations can be seen with special clarity at Pennsylvania Agricultural History Project sites 133-FV-001, 055-LU-004, 133-FV-002, and 029-UO-002. Project records show that on farms where there was no evidence of dairying, pigsties remained in place either in the barn or closely related to it. This was the case at sites 037-GR-004, 133-CO-005, and
133-C0-006. Some—for example, 133-WI-001 and 077-HE-004—have privies attached to the pig house.


64. Whitaker, Milk Supply, 49; “Labor Saving through Job Analysis,” Eastern Milk Producer, April 15, 1944, 9; Irwin, “However Small”; Gamble, “Cooling Milk.”


67. Survey of Northumberland, Penn., milk supply, April 1927, reference to the William Gauger Farm, Rice Collection, binder vol. 30. In the same volume the records for Ralph E. Musser show two women in the family (Clementine and Viola), who were listed as milkers and “washers.”


72. For a good analysis of conflicts among political entities, large-scale dairy interests, and small-scale farmers, see Thomas R. Pegram, “Public Health and Progressive Dairying in Illinois,” Agricultural History 65 (Winter 1991): 36–50. Figures on dairy-herd size are from Kuan-I Chen and Jerome Pasto, “Facts on a Century of Agriculture in Pennsylvania,” Pennsylvania Agricultural Experiment Station Bulletin, no. 587 (January 1955). The definition of what counts as a milk cow varied over time, so these are not precise figures, but they do indicate scale well. Equipment prices can be found in The Book of Barns: Honor-Bilt-Already Cut, facsimile (1919; Chicago: Sears, Roebuck and Company, 2005); and Modern Farm Buildings Already Cut and Fitted (Chicago: Sears, Roebuck and Company, 1927). Smith-Howard, in “Perfecting Nature’s Food,” argues that Progressive reformers were not just pushing an urban agenda but wanted to improve country life; she cites the give-and-take and some evidence that regulators tried to accommodate small farms (27, 32–33). This observation is corroborated by many of
my sources, as well, but the financial issues appeared to still put great pressure on less-affluent farmers. See issues of *Eastern Milk Producer* throughout the 1950s, especially the year-end remarks in volume 30 (December 1954), 11.

