

# The Silo: A Century of Experimentation On the Michigan Farm

by Hemalata C. Dandekar and John A. Savitski

The vertical silhouettes of silos — sentinels standing beside a big red barn — are to many the key elements in the landscape of the family farm. In today's era of declining family farms, the silo is often the last farm outbuilding remaining intact. Standing tall amidst dilapidated, abandoned farms, silos are a bleak reminder of a way of life that now appears to be almost over.

These sturdy cylinders of durable materials such as concrete, ceramic tile or metal are tangible reminders of an important phase in the evolution of family farming in Michigan. (Fig. 1) The story of the development and use of silos in America is a fascinating microcosm of American farming and the ongoing quest to attain an economic edge through scientific cultivation and animal husbandry. The modern silo was itself not an American innovation. But the ease by which farmers embraced the technology and the refinements of its design occurred most significantly on American soil, primarily in mid-western states such as Michigan.

Over a century ago the Frenchman M. Auguste Goffart experimented on the design of silos and the preservation of maize (Indian corn) by ensilage. This process, defined by Goffart as "the act of compressing into pits, trenches or compartments called silos," caused a stir in the United States farm community. Since 1852, Goffart had attempted to develop a method of preserving green fodder through the winter months to feed cows so they would produce excellent milk and butter year round.<sup>1</sup> One might conclude, from reading Goffart's *The Ensilage of Maize, and Other Green Fodder Crops* [translated in 1879] that the author was driven by his own demanding gastronomical needs. He plaintively notes, "the cow, which gives us in summer, while feeding on green grass, such excellent milk, and butter of such agreeable color and flavor, furnishes us in winter, when she eats the same grass converted into hay, an inferior quality of milk, and pale insipid butter".

For twenty-five years, 1852-1877, Goffart experimented with pit silos. Horizontal and dug into the ground, pit silos were not new to human civilizations having been constructed by the Egyptians, Romans and American Indians. But in 1877, Goffart constructed three new silos on his farm in Burtin, France. They were elliptical in plan and built to stand vertical. This was a significant innovation. The dead weight of the chopped corn in these vertical silos exerted a compressive force that helped to maintain the high pressure that was needed for airtight preservation of the silage. These first vertical silos in France were important precursors and prompted continuous experimentation in America with techniques of ensilage and related silo design and construction. Goffart's book was republished in 1880, in pamphlet form, by the New York Plow Company and more widely distributed as an advertising promotion that also included an illustration



Figure 1. Solid and reliable concrete stave silo of a family farm.

and specifications of the New York Plow Company's Ensilage Cutter. A social and technical debate on the virtues of the new process ensued, along with widespread construction of silos and a tangible and long-lasting impact on farmstead architecture.

American farmers fervently debated the pros and cons of ensilage. Some adopted the notion quickly and enthusiastically. Dr. Manly Miles of the Illinois Industrial University built his first silos in 1875 based on early technical reports received from France.<sup>2</sup> By 1881 almost every issue of the *Michigan Farmer* had articles about the new approach. One reader, a dentist from New Hampshire, worried that the corn and other material in silage, cut so fine and subjected to such pressure, would become too soft and moist. If fed to cows, he noted, "it is probable that in two at the most three years, the surroundings of the teeth will be diseased, the teeth loosen and drop out."<sup>3</sup> Allen Noble in *Brick and Stone: The North American Settlement Landscape* notes that "Because ensilage fermented to some extent, many dairy operators, sensitive to religious arguments against the use of alcohol, objected to feeding cows "liquor."<sup>4</sup> Others wrote much more favorable reviews. The Missouri Dairy Commissioner enumerated ten advantages of the silo and its efficiency.<sup>5</sup> Included among these virtues was that silage kept young stock growing throughout the winter, produced fat beef more cheaply than dry feed, was more convenient to handle and helped cows produce milk and butter more economically.



The silo increased efficiently by converting corn stalks, containing about one-third of the food value of the entire crop, into food which was palatable to cows. Ensilage eliminated aggravating corn stalks in the manure and the technique preserved corn even if it matured at a rainy time of the year when drying would have been next to impossible. Silage and silo construction together increased the number of animals that could be sustained on a given number of acres and permitted intensified dairy production. Also, since silage contained water, less drinking water was needed for the animals, thereby reducing the many hours of winter labor farm families spent breaking up and thawing ice for the animals.

The adoption of the silo in Michigan dates to 1882. The silo was part of a larger scientific farming movement in the United States which spanned from 1865 to the turn of the century.<sup>6</sup> The scarcity of male labor during the Civil War, followed by the Industrial Revolution which drew labor from the countryside to the city, prompted farmers to innovate and adopt new, efficient, labor-saving devices to compensate for the labor shortage. At the same time, railroad improvements opened up larger regional markets and thus the number and variety of crops Michigan could sell in competition with its nearby states, Ohio, Illinois and Iowa. Wheat, the predominant cash crop in Michigan, reverted to a subsistence crop while dairy cattle, hogs and pigs became increasingly important. And as the center of dairy farming shifted from New England and New York State to the northern midwest, there was a corresponding increase in the number of silos. By 1924, Michigan had 49,000 silos, the third largest number of any state.<sup>7</sup>

As the resistance to the ensilage system disappeared, debates concentrated on what type of silo was best to build. There was a rapid evolution of silo form as a consequence. The earliest vertical silos, also referred to as tower silos, were sometimes built inside but more often outside the barn so that the construction did not disrupt the normal farm operation within. They were square or rectangular and often used one or more barn walls for their sides. Constructed of wood, they were easy to build and the materials were inexpensive and readily available in the midwest. Indeed farmers could build the silo themselves without a great financial commitment, thus allowing those who were curious – but not converted – to build a silo and then judge its effectiveness.

The friction at the corners of square silos created pockets of trapped air and caused spoilage. The octagonal and, eventually, cylindrical silos were developed to minimize this problem. There was also some experimentation with round, hexagonal, or many sided, banked barns with silos in the center, which were designed with labor efficiency in mind. None of these styles became widespread but some examples still exist in Michigan. Rather than redesign the whole barn it was much simpler to position a new vertical silo next to an existing barn. As silos became more popular they made redundant the old style billowing roofed gambrel. There was simply less need for large storage of hay and fodder that these barns traditionally provided. The silo thus helped to usher in a later period when low slung pole barns would become the choice of farmers.

As the idea of silos and ensilage caught on, farmers experimented with various materials. Stone, brick, concrete block, ceramic tile, pressed metal sheets, and poured-in-

place concrete were utilized. Stone silos were built in Michigan in areas where stones were cheap, often obtained during the clearing of the land. (Fig. 2.) Typically 18" in thickness at the base, tapering to 10" or 12" at the top, plastered smooth with portland cement on the inside and reinforced by 1/2" iron rods, the stone silo was a sturdy and durable structure that can still be found in the Michigan countryside.



Figure 2: Rubble walled stone silo missing its roof but still standing.

Colon C. Lillie, providing expert advice in 1908 in the *Michigan Farmer*, very practically noted "I do not know which is the best kind of silo. There are several kinds that are good. The most practical one for any particular person to build will depend upon circumstance."<sup>8</sup> The circumstances, of course, were availability and relative costs of materials. Farmers tried to build with what they had at hand. Lillie dissuaded H. W. Calkins, a farmer from Allegan County, from building a wood block silo (with oak, ash, elm and basswood from his land), suggesting instead that he construct a wood stave silo, thereby saving wood and labor and creating a more airtight structure as was needed for ensilage.<sup>9</sup> Such homemade wood stave silos were held together with metal hoops made by blacksmiths, telephone cable, four strands of #11 fence wire twisted together and other "available and affordable" materials. (Fig. 3.) These handmade wood silos were also called "tenant silos" as they were easily dismantled and rebuilt on rented fields.<sup>10</sup>

The demand for these wood silos increased so greatly that ready-made stave silos were eventually produced. They were more expensive but more efficient. The Farmers Handy Wagon Company in Saginaw offered the Handy Saginaw Silo. Their advertisement in the *Michigan Farmer*, August 8, 1908, proclaimed, "Stockmen and dairy men have grown rich, aided by these wonderful silos . . . Big profits on small farms multiplied profits on large farms."





Figure 3: Wood stave silo.

The Saginaw, Mitchell and McClure Lumber Company enlisted agents, who went from farm to farm marketing wood stave silos and ceramic tile silos. The company sales manual reminded agents that profits were in silo accessories and urged them to sell farmers silo roofs with built-in dormer windows and special door frames and hardware.<sup>11</sup>

As ensilage became more acceptable, stronger and more durable silos were built. About the time of World War I, sturdier materials were introduced. Concrete masonry silos and silos made of prefabricated poured concrete, stackable, interlocking rings (Fig. 4) represented a substantial improvement in silo technology. Concrete stave silos were first constructed in southwestern Michigan. Also constructed were expensive but almost indestructible solid



Figure 4: Silo constructed of stackable prefabricated concrete rings.



Figure 5: Concrete stave silo.

wall (monolithic) concrete silos, permitting the construction of taller, larger capacity silos that could be virtually airtight. These later silos tower over the low-slung profiles of pole barns and accent the flat plains of midwestern farmscape. Many of the silos still in use in Michigan are from this era. (Fig. 5.)

Steel-plated silos were also constructed, but they were not considered very effective. They rapidly conducted heat and cold and provided no insulation, resulting in spoilage during winter freezing. (Fig. 6.) At the close of World War II, a technically sophisticated silo was constructed of insulating Fiberglas bonded to sheets of metal and known by its trade name, "Harvestore." It provided a completely airtight container and featured automatically operated equipment. Augers, for instance, allowed the farmer to do all the work from the ground, eliminating the dangerous task of loading and unloading the traditional silos. By the 1960s this silo, costing more than twice the price of an equivalent concrete stave silo and conspicuous in its brilliant metallic blue color, became the mark of a successful farmer. (Fig. 7.) The "Harvestore," like its early predecessor, the wood-stave "tenant" silo could be dismantled and moved. Today the manufacturer sells "rebuilt, preowned, Harvestore structures, with a full one-year warranty."<sup>12</sup>

Vertical silos such as the "Harvestore" are no longer the favored structures for ensilage in the midwest. Economies of scale have resulted in an increase in the number of cows and cattle that make for an efficient dairy or cattle operation. The increased quantity of ensilage these farms need has made a type of horizontal silo called a bunker silo a more efficient and preferred structure. Related full circle back to the earlier pit silos on which Auguste Goffart

experimented more than a century earlier, the bunker silo is a large, low (six or seven feet high), rectangular enclosure of wood or concrete retaining walls. Silage is placed in these enclosures and densely compacted by driving heavy machinery over the top. Due to the greatly increased volume of silage that can be stored in a bunker silo, the additional spoilage at the walls and top of a bunker silo is a negligible loss by modern farm standards.<sup>13</sup>

Lacking the grandeur and aesthetics of the vertical silo, bunker silos, while possessing a quite ordinary, even ugly appearance, can be made inconspicuous if they are placed thoughtfully on the farm. Over time, if they continue to be the silo of choice for Michigan farmers, the Michigan farmscape will lose the towering cylindrical presence of the vertical silos whose scale dominated the rural landscape of the past century. Current tax structures, in fact, provide an economic rationale for farmers to tear down obsolete silos.

The phased obsolescence of traditional farm structures has had immediate consequences on the aesthetics of the American farmscape, with its old barns and towering vertical silos. Unless preservation and conservation strategies are adopted, their gradual disappearance from the traditional Michigan farmscape seems inevitable.<sup>14</sup>

This relatively rapid rise and fall of the vertical silo in the span of a century reflects the evolution of American agriculture itself. Few countries in the world have demonstrated so directly in their agrarian architecture the rapid experimentation, adoption and diffusion of technology and its impact on spatial configuration and form. The change has been primarily a scientifically-driven one. However, this phenomenon has come under increasingly critical scrutiny. Questions are being raised about the widespread and heavy use of chemicals, hormones, pesticides, fertilizers and additives as well as genetic and cloning experimentations in livestock. These matters have been debated at length in the organic farming movement, and have moved into the mainstream of American public opinion including land grant colleges and their agricultural extension efforts.<sup>15</sup>

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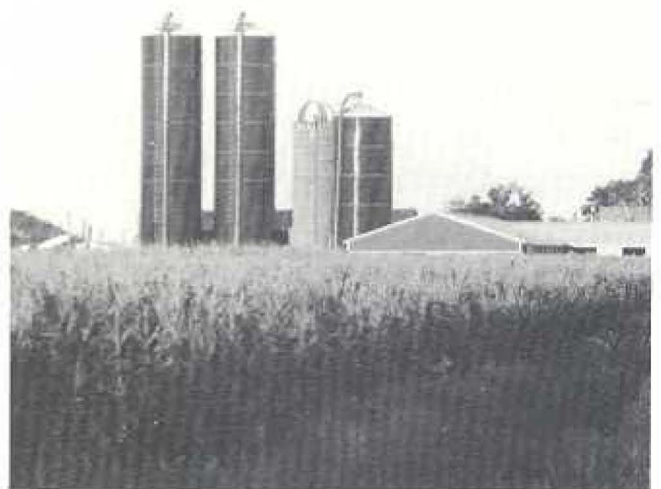
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*Figure 6: Old style metal silo.*



*Figure 7: Multiple Harvestore silos on a prosperous farm.*



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