



arc1031
dairy agriculture timeline
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1824

Cylindrical Barn, Hancock
Massachusetts

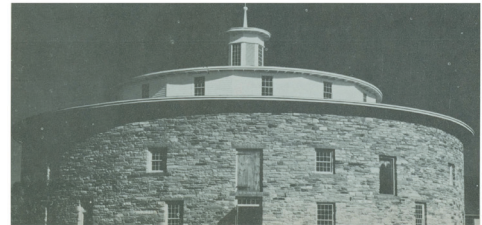


figure 1. *Shaker Barn*, Arthur and Whitley, 1972¹

There were, and are a variety of agricultural barn typologies in North America, ranging from the typical rectangular shape with stone foundation, to some more unique and rare types like the cylindrical Shaker barn pictured above. This barn utilizes a round floor plan, with stone walls, and a timber interior with radial spatial organization in from the center. The context of this barn in relation to other types in its time (1824) are related to the ideals and taste of Shaker Christian communities². In *An Age of Barns* by Eric Sloane, he says there is a saying that the round barn was intended “to keep the devil from hiding in corners”.³

A TIMELINE OF LOOSE
CONNECTIONS WITHIN DAIRY
PRODUCTION

This timeline is an amalgamation of a variety of case studies related to the dairy industry, past and present. It includes the infrastructure of dairy production (represented by the case studies concerning barns), milking technology (historical milking machines and modern milkin machines), and a large scale geographic context (seen in Addis Ababa peri-urban dairy production).

I understand that some of the links between these elements might be tenuous, but I feel that a wide breadth of coverage is useful in examining this very broad topic. These case studies all cover unique aspects of the spatial relationships of dairy production.

1836

early milking machine by William
Blurton, United Kingdom

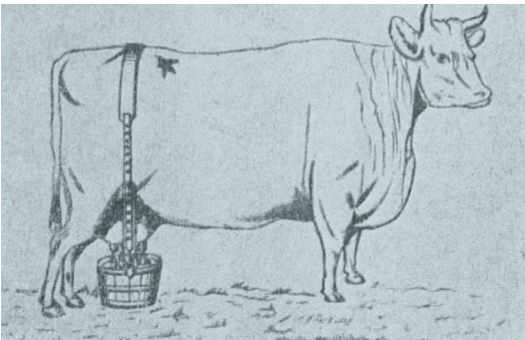


figure 2. *Device for Extracting the Milk from the Cow*, Willam Blurton, 1836⁴

This object illustrated in figure 2 is one of the earliest examples of industrial dairy infrastructure, with William Blurton obtaining the patent for its design in 1836⁵. The machine consisted of metal tubes with a perforated top that were then inserted into the teat of the cow, with milk then allowed to flow freely out of the udder.⁶ This object appears crude, but it’s nonetheless a part of the history of the development of dairy production technology.

1981

Canadian dairy barns

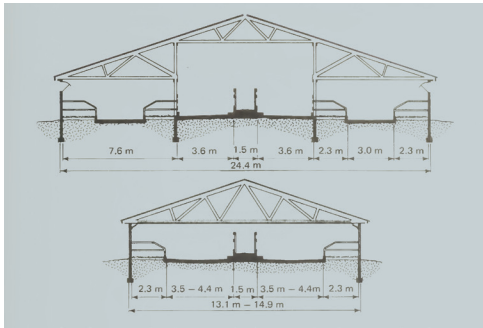


figure 3. *Typ. Sections of free-stall dairy barns for small and large herds*, Agriculture Canada, 1981⁷

The diagram in figure 3 is taken from a guidebook or manual published by the Canadian Government concerning regulations, best practices, and data on dairy agriculture in Canada. Specifically, figure 3 shows regular dimensions for dairy barn stalls in two configurations. These configurations are supposed to be the most efficient spatial organization for a standard barn while optimizing cattle health and milk production.⁸

2016

peri-urban dairy agriculture
in Addis Abada, Ethiopia



figure 4. Cattle in Addis Ababa, photo by Minasse Wondimu Hailu/Anadolu Agency⁹

Rapid urban growth in Addis Ababa, combined with limited government oversight of development have led to significant loss in valuable fertile farmland (24% lost between 2006 and 2011), which is an important source of income for many residents of Addis Ababa.¹⁰ Dairy production in Ethiopia is some of the most extensive in Africa, and plays a large part in urban and peri-urban food systems¹¹.

2020

automatic milking machines by
Boumatic



figure 5. Automatic Milking System from Boumatic Robotics¹²

Boumatic is a manufacturer of robotic milking systems, with a variety of products that allow for efficient and rapid extraction of milk from cows. It is up for debate whether or not these machines are a good or bad thing for dairy production and society in general.

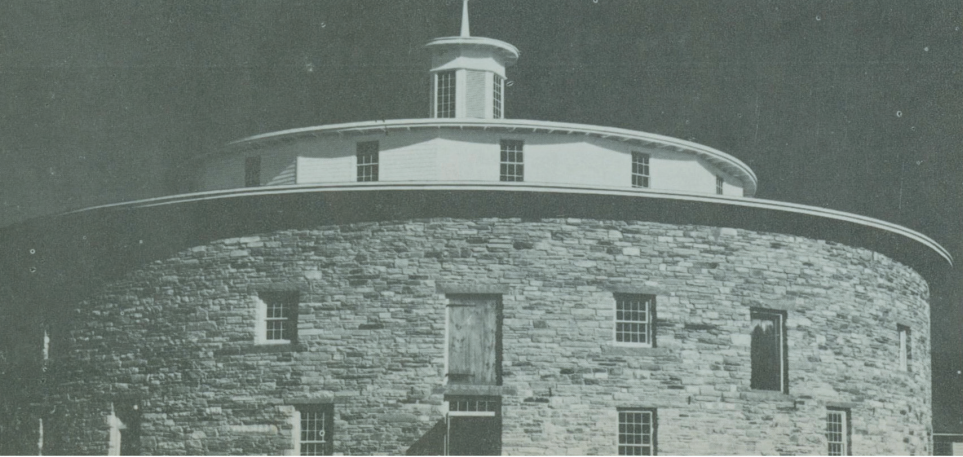
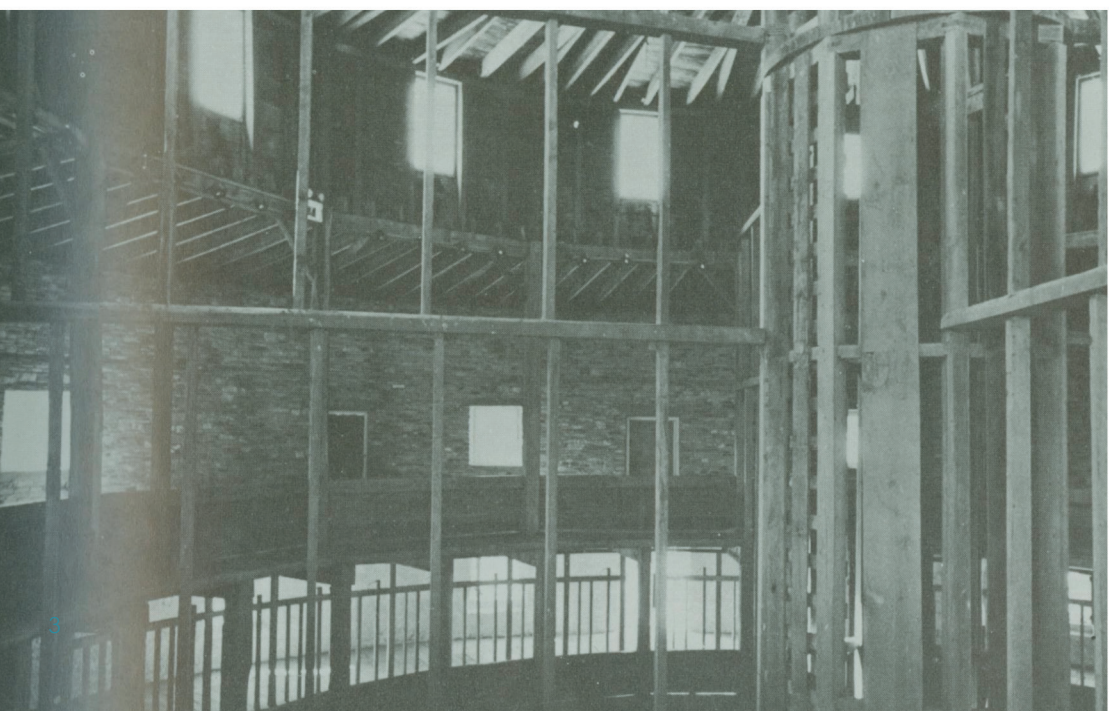


figure 6, exterior of barn¹⁴



figure 7 & 8, interior of barn¹⁵

Cylindrical Barn 1824, Hancock Massachusetts



The Shakers loved circles! As mentioned previously, there may be a religious connection between the Shakers and the circular barn typology (re: devil in the corner), but I think it would be more useful to look into the efficiency of the spatial organization of the barn. The Shakers, known for their distinctive communal lifestyle and dedication to craftsmanship, embraced circular barns as a unique manifestation of their values and practical considerations¹³. An important feature is the centralized design, which facilitates streamlined workflows and operations within the barn.

The circular layout allows for efficient circulation of both personnel and livestock (see figure 9). In the central area of the barn farmers can easily access different sections of the barn without unnecessary detours. Eric Arthur refers to the central area of the barn as the “hay mow”, which I believe refers to the area where hay is stored for the cattle and other livestock. This centralized design minimizes the time and effort required to tend to farming tasks, contributing to increased productivity.

The cows occupy the area circling the central hay mow, with the cow’s heads in an aisle allowing for efficient feeding. This can be seen in figure 7 & 8 showing the radial cow stalls.

The circular shape of the barn also maximizes natural light exposure and ventilation. The ventilation at the center of the structure (see figure 9 “ventilation perforation”) allows for even air flow through the structure. This architectural choice is not only practical but also aligns with the Shakers’ emphasis on simplicity and functionality.

In conclusion, the efficiency of the spatial organization of circular barns, particularly within the context of Shaker communities, can be attributed to their practical benefits. With Eric Arthur’s insights into barn architecture, one can gain a deeper understanding of how the Shakers harmonized their religious values with the functional aspects of their built environment, ultimately creating spaces that were both efficient and reflective of their communal lifestyle.

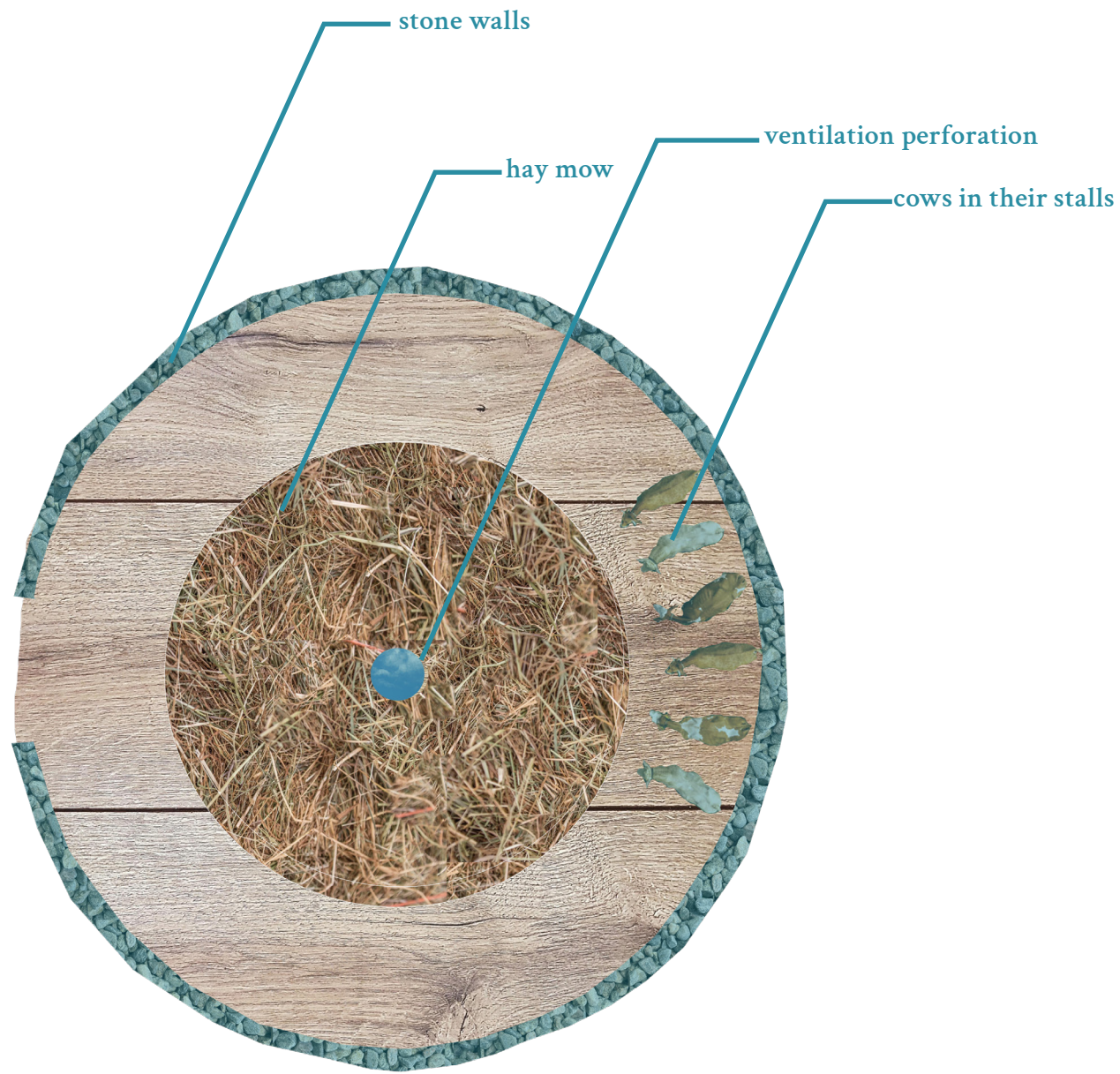


figure 9, circular barn diagram.



figure 10, overview of Addis Ababa, Ethiopia

5000 m



figure 11, Ayat area, Addis Ababa

500 m

peri-urban dairy agriculture in Addis Ababa, Ethiopia 2016

In the urban landscape of Addis Ababa, driven by rapid growth and accompanied by limited government oversight, a dramatic loss of valuable fertile farmland has occurred. Between 2006 and 2011, 24% of this vital agricultural resource vanished, posing a threat to the city's food security and the livelihoods of its residents¹⁶. As urbanization encroaches upon arable land, we can look to dairy farming in Addis Ababa as a component to offer both sustenance and economic stability to a significant portion of the population.

Dairy production in Ethiopia stands out as one of the most extensive in Africa, assuming a pivotal role in both urban and peri-urban food systems¹⁷. The multifaceted nature of this agricultural practice is explored by Pauleit, Pribadi, and El Wafa in their essay, "Peri-urban agriculture: lessons learned from Jakarta and Addis Ababa." The scale of the city of Addis Ababa can be seen in my disagram above and right, with the whole city above, and a small per-urban area to the right. The city comes right up on the edge of the farmland, with some fields interspersed within the housing blocks at the edge of the city.

The work done by Alemu Melaku in "Urban and peri-urban dairy cattle production in Ethiopia: a review," provides a focused examination of the dairy farming sector. Alemu's research offers a lens through which we can

examine the unique challenges and opportunities embedded in Ethiopia's urban and peri-urban dairy landscape. In a context where fertile farmland is diminishing due to urban sprawl, the significance of dairy farming becomes even more pronounced, not just as a source of sustenance but as representation of the difficulties created by urban development

Dairy farming's prominence in Ethiopia is deeply intertwined with the socioeconomic fabric of the nation. As urban spaces inevitably expand, encroaching upon agricultural lands, the small scale dairy farming so important to many residents of Addis Ababa will become more and more difficult. The loss of fertile farmland highlights the need for a balance between urban development and the preservation of agricultural activities.

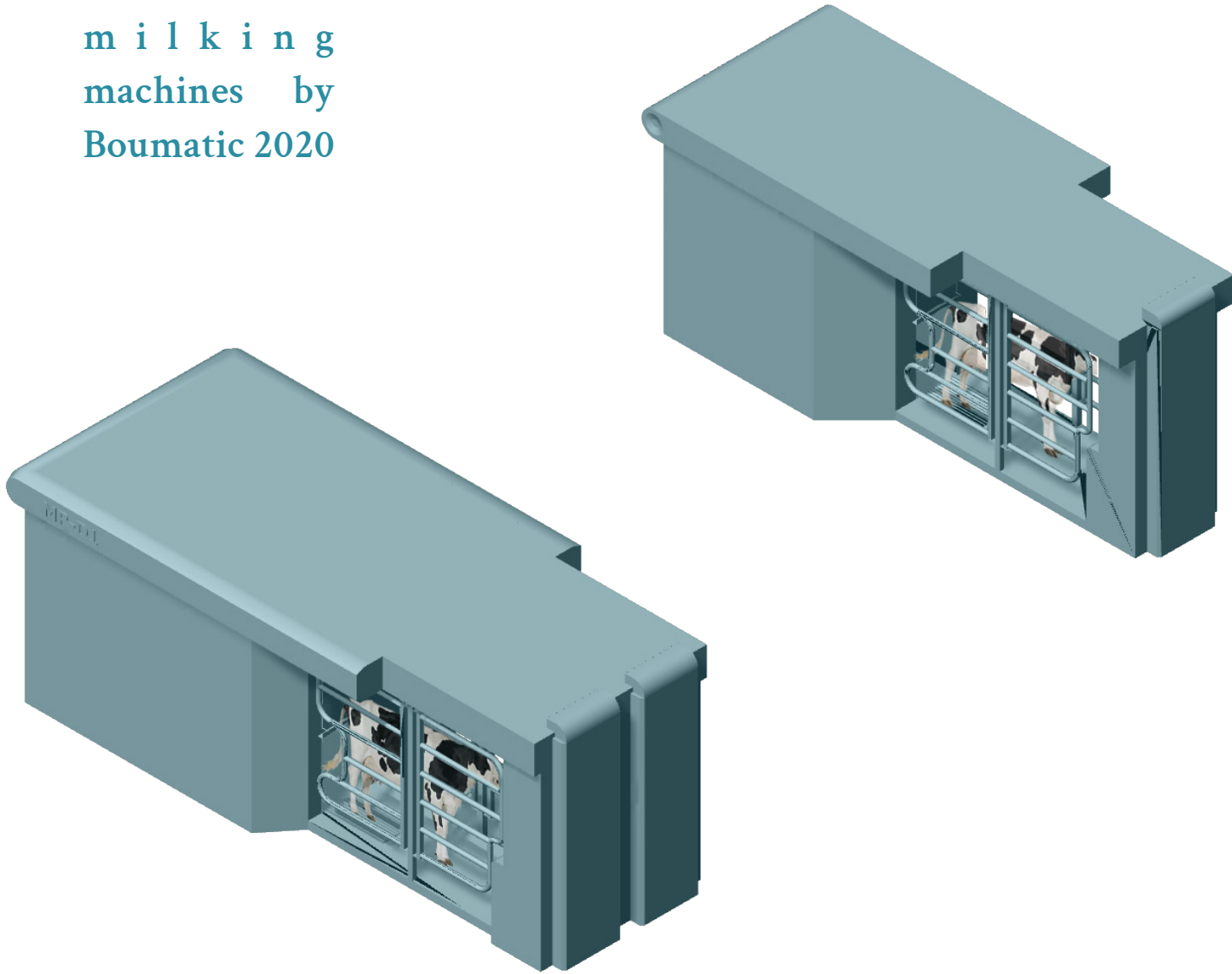
This case study makes me think that the integration of agriculture within the urban periphery, and advocating for informed policy decisions and proactive measures will be a crucial tool for further development in Addis Ababa. Farmers feed cities!

BouMatic’s XCALIBUR 360EX 2.0 and GEMINI UP milking machines are a technological leap in dairy farming, much more advanced than the previously referenced William Blurton machine from 1836.

The XCALIBUR 360EX 2.0 (see diagram on left) provides a 360-degree access platform for the farmer, facilitating efficient milking. Milk and cow data management add to the machine’s positive aspects, allowing farmers to monitor milking, cow health, and milk quality. This data-driven approach holds the potential to revolutionize herd management and increase overall milk production¹⁸. The advanced technology embedded in this milking machine necessitates a substantial initial investment, potentially excluding smaller operations from benefiting from these innovations. Furthermore, the need for specialized training to operate and maintain the system could pose an additional challenge for farmers, who are already incredibly busy feeding the world.

Similarly, the GEMINI UP milking machine offers potential efficiency gains but is inevitably way too expensive for a smaller scale farmer. The simultaneous milking capability, while reducing overall milking time, may not justify the cost for small-scale farmers who may not have a large herd size to warrant a robot to do what they already do. The emphasis on cow comfort and low maintenance

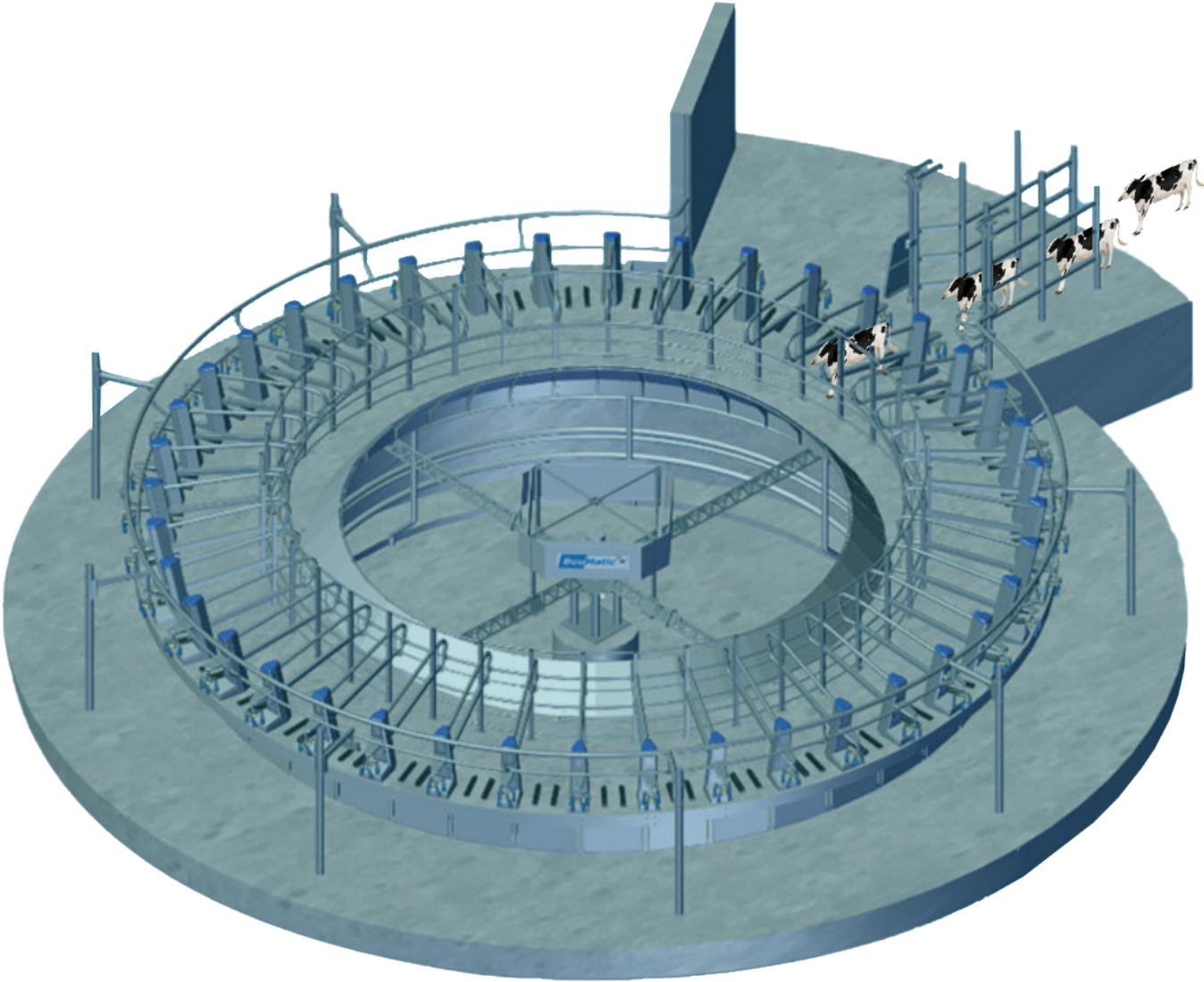
a u t o m a t i c
m i l k i n g
m a c h i n e s b y
Boumatic 2020



is nice, but the financial feasibility question remains.

For small-scale farmers, the adoption of these advanced milking technologies raises questions about the return on investment. The financial burden of purchasing and maintaining these machines may outweigh the benefits, potentially leading to increased operational costs without a proportional increase in milk production. This economic imbalance could hinder the competitiveness and sustainability of small-scale dairy farming operations.

As the industry leans towards sophisticated milking technologies, along with the rest of socieies march towards our demise at the hands of an AI god, I think we should be more like the Shakers and make beautiful stone barns and maybe use William Blurton’s original miking machine if our hands get tired.



bibliography

- 1 Arthur, Eric, and Dudley Witney. The Barn: a Vanishing Landmark in North America. Toronto: McClelland and Stewart, 1972.
- 2 Ibid.
- 3 Sloane, Eric. An age of Barns. New York: Ballantine Books, 1975.
- 4 "DAIRYING HISTORY — THE FIRST MILKING MACHINE?" International Journal of Dairy Technology 8, no. 2 (April 1, 1955): 89–89. doi:10.1111/j.1471-0307.1955.tb00657.x.
- 5 Ibid.
- 6 Ibid.
- 7 Agriculture Canada. "Dairy Husbandry in Canada," 1981. P. 69.
- 8 Ibid. P. 68
- 9 Wondimu Hailu, Minasse. Ahead of Eid al-Adha in Ethiopia. July 8, 2022. Getty Images. <https://www.gettyimages.ca/detail/news-photo/ethiopiapeople-tour-a-livestock-market-to-buy-sacrificial-news-photo/1241782092?adppopup=true>.
- 10 Stephan Pauleit, Didit Okta Pribadi and Hany Abo El Wafa, "Peri-urban agriculture: lessons learnt from Jakarta and Addis Ababa", Field Actions Science Reports [Online], Special Issue 20 | 2019, Online since 24 September 2019, connection on 15 December 2023. URL: <http://journals.openedition.org/factsreports/5624>
- 11 Alemu, Melaku Menale (2019). Urban and peri-urban dairy cattle production in Ethiopia: a review. Online J. Anim. Feed Res., 9(4): 173-177. www.ojafir
- 12 <https://boumatic.com/ca-en/product-categories/canada/products/milking/>
- 13 Arthur, Eric, and Dudley Witney. The Barn: a Vanishing Landmark in North America. Toronto: McClelland and Stewart, 1972. P. 152.
- 14 Ibid, 153
- 15 Ibid, 153
- 16 Stephan Pauleit, Didit Okta Pribadi and Hany Abo El Wafa, 2019
- 17 Alemu, Melaku Menale, 2019.
- 18 <https://boumatic.com/ca-en/products/xcalibur-360ex-2-0/>