



The Costs and Benefits of Mechanization: A Look at the Dairy Sector

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American agriculture has been experiencing labor shortages for many years. Domestic workers left the sector for higher-paying opportunities, and farmers constantly struggle to find people for multiple tasks. While H-2A visas and importing food products from other countries (especially Mexico) are viable alternatives in the short-term, automation is seen as a long run solution to persistent farm labor shortages (Gutierrez-Li, 2021). Machines can be developed to mimic harvesting tasks currently performed by human beings. In addition, robots can tolerate wider weather conditions (like heat waves, smoke from fires, droughts, or excess rain) and operate for longer hours. Drones and other technologies can harvest fruits and vegetables, apply pesticides, water crops,

and transport and pack commodities. If mechanization offers so many benefits, why have farmers not automated more production processes? The answer is simple: costs. Designing, creating, and testing machines involves high R&D investments, meaning the price tag for automation is often cost prohibitive for small and medium-sized farmers.

One major limitation of the current H-2A program is that its use is restricted to seasonal agriculture, putting year-round sectors, like dairy, at a disadvantage. For this reason, dairy farmers have had more incentives to invest in automation, given their inability to access foreign legal labor. To better understand the unique needs and challenges of dairy farmers related to labor, we surveyed dairy producers in Wisconsin and Minnesota, two important milk-producing states. We were interested in learning about the use of automatic milking systems (AMS). AMS use robotic arms to attach teat cups using sensors, yielding a “hands-free” milking process. These technologies are more prevalent in other regions (particularly Europe), where dairy farmers have more readily adopted robots capable of conducting some of the tasks previously performed by humans.

Our survey targeted 2,000 dairy farmers and received 650 responses in January 2023. Of those, only 39 farmers were already using AMS. Most adopters of this technology considered their investment in AMS worthwhile. Some of the benefits mentioned include increasing productivity, reducing the workload of existing workers, allowing owners and workers to plan more efficiently, cows being more comfortable, and farmers not being under the constant stress of finding and managing crews. However, not all comments were positive. Some producers mentioned constant issues with robots breaking down and high maintenance costs. The size of the operation (number of cows) and availability of skilled labor (or the lack thereof) also determined the net value of AMS. A selected sample of comments (each from a different respondent) is included at the end.

In summary, tight agricultural labor markets, political divisions complicating the passing of immigration reforms, and a growing population to feed emphasize the importance that mechanization will play in U.S. agriculture. However, the transition to automated food production processes is complex. Technologies take time to be developed, do not entirely eliminate the need for labor, and are costly to maintain and repair. Farmers' decisions to mechanize their practices will depend on the feasibility of realizing increases in productivity that will outweigh the costs of automating. Other considerations such as commodity prices, availability of specialized labor, animal welfare, environmental concerns, and farm succession to the next generation also play a role.

Farmers' Perceptions about Using Automatic Milking Systems

Positive Experiences

"Yes, it was well worthwhile. it made improvements in all parts of our operation. It's only been a year and a half, but we are seeing better production, breeding, health, and much easier handling of the cows. We remodeled our existing free stall barn for dry cows and heifers so now we have all animals in 2 barns. So much more efficient and can do all the work in less time. Don't regret doing it at all!"

"Yes, because the cows are more relaxed and comfortable. The workers are also more relaxed and get more free time."

"The stars all lined up for this project. -Stall pipes needed to be replaced anyways, so it was a good time to redo the barn. - Milking is hard on a lot of bodies especially during cropping. - Finding people to help milk wasn't getting easier. - This project was money well spent."

"Yes, I do. It often is a different type of flexibility than a traditional parlor, but it also ties you down more. Tough to leave further than 30 minutes away because it is difficult to find qualified people to be "on call". In the last 11 years we have gone from 4 to 8 robots."

"For our farm it was either sell the cows or put in an AMS system. My husband's knees and shoulders are shot, and he's not old enough to retire, with the AMS he is able to do the other chores (mixing feed, cleaning barn, and feeding calves). It was a big investment, but it is serving us well and it allows me to continue to work full time off the farm. The cows do really

well with it, the information you get on each cow is amazing. It also has improved our heat detection and insemination rate.”

“Yes. Before AMS, we were milking 180 cows in a D8 parallel. All labor included was 18-man hours/day. That’s everything. Breeding, feeding, bedding, milking calves, heifers, everything! After Ams, it’s 12-man hours for same work plus 80 more cows on milk and 10x more milk.”

Negative Experiences

“Had robots from 2001 to 2007. Anything and everything went wrong. Robots called house almost every night for problems. Spent hours trying to fix robots. In summer 2006 a new update was put into computer causing virus to get into the system which made cows 2 and 3 titers. Had 30 rows come down with Mastitis in 2 weeks’ time before we figured out where the problem was coming from. The decision was made to pull the robots out and put a herringbone parlor in place of the robots. now we milk 2x per day and can walk away when milking is done and can sleep thru the night without a robot calling us to come to the barn for another problem.”

“We’ve had robots for 9 years. Certainly, we cannot milk all cows ourselves (just me and my husband) But the monthly bill is extreme. We can fix some things ourselves, but they have to come a lot always something wrong. We find them very frustrating. Would I recommend them? After 9 years I’m still not sure.”

References

Gutierrez-Li, A. (2021). The H-2A visa program: addressing farm labor scarcity in North Carolina. NC State Economist. North Carolina State University.

Gutierrez-Li, Alejandro, Cesar Escalante, and Shree Ram Acharya. “The Costs and Benefits of Mechanization: A Look at the Dairy Sector.” *Southern Ag Today* 4(16.3). April 17, 2024. Permalink

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