Spartan Dairy Newsletter

Fall 2025 Vol. 5 No. 3

We've Moo-ved!

Research begins at the new dairy

Photos of the new dairy — Page 3

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Modeling dairy expansion — Page 10

Dairy Educator Phil Durst visited Salem Sue, the world's largest Holstein cow in North Dakota this summer.

Want us to feature your photos? Email ANS.SDN@msu.edu

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Dairy at MSU

@DairyMSU

Dairy at MSU

The cows 'moo-ve' in

MSU dairy herd relocates to new dairy facility

Michigan State University's dairy herd moved to the new $75-million Dairy Cattle Teaching and Research Center in late July 2025. The new dairy farm replaces the old one, which was built in the 1960s and was so limited in space, cattle and equipment that researchers have put funded research projects on hold, in some cases as long as two years. The new 165,000-square-foot dairy farm allows MSU to modernize and triple the size of the existing dairy farm to house up to 680 cows, up from the existing herd of 260.

Upgrades at the new Dairy Cattle Teaching and Research Center will bring MSU's facilities into the 21st century – increasing research output and applicability, training the next generation of industry leaders and addressing the dynamic needs of Michigan's dairy producers.

A $30-million investment by the State of Michigan provided the initial funding for the project. Continued support from alumni, donors, the corporate sector and stakeholders in the dairy industry remains essential to fully realize the farm's long-term vision for programming and research.

The MSU Dairy Cattle Teaching and Research Center serves as a hands-on learning center for Spartan students enrolled in the Department of Animal Science, the College of Veterinary Medicine, and the MSU Institute of Agricultural Technology's Dairy Management Program. Spartan dairy students will now be training on a modern farm, equipped to replicate even the most high-tech operations in the world today.

The juxtaposition for former MSU dairy students touring the new facility was striking. Many recalled fondly, maybe with a tinge of jealousy, their experiences milking, monitoring and moving cows at the former MSU dairy farm – a facility that supported award-winning production and renowned graduates for more than 60 years.

Spartan dairy students will be training for the future, on a modern farm, equipped to replicate even the most high-tech operations in the world today. It's also proof of MSU's commitment to advancing its dairy cattle teaching programs while some universities across the country are eliminating their programs.

Michigan is home to nearly 850 dairy farms and approximately 436,000 dairy cows. Michigan's dairy industry contributes $15.7 billion to the state's economy (No. 6 nationally) and the state leads the nation in production efficiency – ranking No. 1 nationally in milk-per-cow production.

What's Next?

Research at the new facility will explore ways to:

- Reduce emissions while promoting sustainability
- Protect communities and waterways
- Advance production efficiency through precision management
- Build a technologically-adept agricultural workforce
- Promote animal health, nutrition, reproduction, behavior, and well being

Want to visit us?

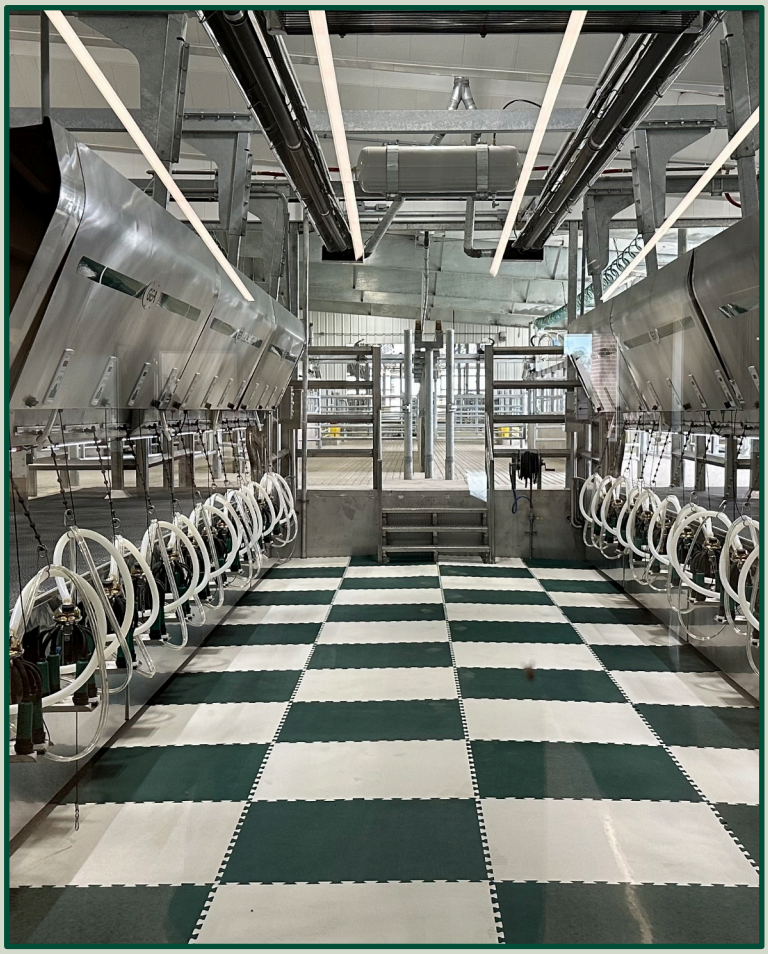
We look forward to engaging the community at the new dairy facility. While it is currently closed to visitors, we look forward to hosting tours and public events in the spring of 2026. Please visit canr.msu.edu/dairy/events for up-to-date program offerings.

Adapted from "Cows 'moo-ve' into new facility" by MSUToday and "MSU hosts tour of new dairy cattle teaching and research center" by Justin Whitmore and Jack Falinski

The dairy cattle teaching

"As a dairy farmer, I'm unbelievably excited. Our goal is to perpetuate the opportunity for the next generation."

- Glenn Preston, owner of Preston Farms



"When I was a student, we had to travel to off-site farms for cow work. Now, with the facility being so accessible, students will have more frequent and meaningful hands-on interactions, something that's critical in agricultural education. The new farm will undoubtedly attract more students and researchers."

- Mikayla Bowen, communications coordinator for the Michigan Milk Producers Association.

"This farm further establishes Michigan and MSU at the forefront of dairy research and teaching... it is vital we make investments to keep this industry viable and develop research tailored to our unique environment."

- Jerry Neyer, State Representative

and research center

"This facility is a classic example of a modern dairy. It shows that the dairy industry is not just for farmers. This is management. This is environmental protection. This is agriculture. This is communication and big data. You can hardly find a subject this center doesn't touch."

- Char Wenham, MSU Council for Agricultural Research, Extension, and Teaching (CARET) representative

"There is nothing like this facility, at this scale, anywhere in the world. This farm is indicative of MSU's position as a global leader in dairy research and education and serves as a showcase facility for MSU's land-grant mission."

- Matthew Daum, Dean of MSU College of Agriculture and Natural Resources

Dairy Spotlight

Xufei Yang and Leah Irion

Xufei Yang
Professor

Xufei Yang, Ph.D., recently joined MSU as a faculty member in the Department of Biosystems and Agricultural Engineering and the Department of Animal Science. Prior to his appointment at MSU in August 2025, he served as a faculty member and Extension Environmental Quality Engineer at South Dakota State University (SDSU). He earned his Ph.D. in Agricultural and Biological Engineering from the University of Illinois Urbana-Champaign.

Dr. Yang brings a multidisciplinary background that bridges agricultural engineering, animal science, environmental engineering, and atmospheric science. He has led and contributed to numerous research projects in animal agriculture air quality, including the development of biofilters for odor mitigation, odor footprint modeling tools, characterization of particulate matter and bioaerosols in and around livestock facilities, and litter amendments to reduce ammonia emissions. His research and Extension interests also encompass waste management, life cycle assessment, barn ventilation and insulation, and agricultural cybersecurity. Yang has authored or co-authored over 60 peer-reviewed journal papers and 20 Extension articles.

Yang was a recipient of 2025 Education Aids Blue Ribbon Award from the American Society of Agricultural and Biological Engineers for his Extension work on agricultural cybersecurity. In his previous faculty roles, he taught multiple courses, including Agricultural Waste Management to Dairy Production and Animal Science undergraduate students at SDSU.

Leah Irion
Graduate Student

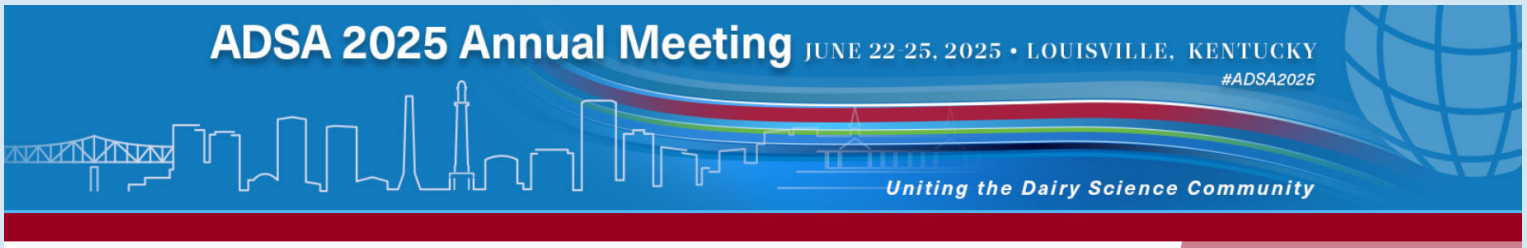
Leah Irion is a recent graduate from Michigan State University with her bachelor's in Animal Science. She is pursuing her master's degree in the Comparative Medicine and Integrated Biology program, under the supervision of Dr. Pedro Henrique Esteves Trindade.

Leah's passion for animal agriculture began on her grandpa's dairy farm in the small town of Kilmanagh, Michigan. As an undergraduate, she was heavily involved in extracurriculars including the MSU Driving Club and Animal-Assisted Therapy Club.

Leah's master's project aims to investigate if the age of disbudding pre-weaned dairy heifers can minimize long-term impacts on pain, health, and production. The project also aims to identify any practical parameters that can detect and diagnose persistent pain post-disbudding. Currently, there are no science-oriented guidelines stating the optimal age to disbud calves, and there are a lack of parameters to accurately diagnose persistent pain. In the study, there will be two groups of dairy heifers undergoing hot-iron disbudding at 3 and 6 weeks old. Disbudding younger pre-weaned heifers may allow for easier handling, smaller horn buds, and thinner tissue, but older pre-weaned heifers may have a more developed immune system to cope with the pain. Leah expects the results of the project to identify the optimal age for hot-iron disbudding to minimize negative long-term impacts, provide practical parameters to identify persistent pain post-disbudding, and to identify the impact of disbudding age on calf growth rate.

News and Updates

America Dairy Science Association honorees



Dr. Barry Bradford
American Feed Industry Association Award

Ursula Abou-Rjeileh
Midwest Scholar Award

Dr. Andres Contreras
Zoetis Physiology Award

Hannah Carlson
Foundation Graduate Student Literature Review Award: Production Division (MS)

Dr. Adam Lock
Nutrition Professionals Inc. Applied Dairy Nutrition Award

Jair Parales Giron
Midwest Scholar Award

Dr. Pamela Ruegg
ADSA Fellow

Madison Myers
Midwest Scholar Award

News and Updates

Youth dairy days

In July, Michigan State University again hosted the Youth Dairy Days in conjunction with the Michigan Dairy Expo at the Farm Bureau Pavilion for Agriculture and Livestock Education. Events included the Quiz Bowl, dairy judging, and cattle showmanship.

Michael S won this year's Novice photography contest (left) and Ryan B won the Junior photography contest (right).

Upcoming events

THE MILK CHECK: FRESH INSIGHTS FOR DAIRY VETS

OCTOBER 17TH FROM 9-4

Register here: events.anr.msu.edu/milkcheck2025

Or scan:

TOUR THE NEW MSU DAIRY AND EARN 3.5 CE CREDITS

- ✓ KPIs for evaluating dairy farm facilities
- ✓ Troubleshooting transition cow problems
  Dr. Gordie Jones
- ✓ 15 minute milk quality consult
  Dr. Pamela Ruegg
- ✓ Troubleshooting vaccination programs
  Dr. Angel Abuelo
- ✓ Optimizing 1st service success using precision technology
  Dr. Augusto Madureira

MSU Dairy Industry Tailgate

October 25, 2025

4 Hours Before Kickoff Throughout The Game

New MSU Dairy Cattle Teaching and Research Center
4075 College Rd, Lansing, MI 48910

After a busy harvest season, spend a day with Spartan fans and fellow dairy enthusiasts at the MSU Dairy Industry Tailgate! Join us for complimentary food and drinks in advance of the MSU vs. Michigan football game. Free parking at the dairy and a short drive to the pavilion for game day parking and shuttle.

Bring the family, reconnect with old friends and meet some new ones!

If you are unable to access the material online, please contact ANR Event Services at 517-353-3175 or events@anr.msu.edu.

For more information:

Management tips

Steve Whittington

Continuous corn in Michigan

A popular practice, but is it sustainable?

One common practice observed during this season, especially among livestock and dairy operations, is corn-on-corn rotations, also called continuous corn. Planting corn in the same field each year helps producers meet high feed demands, typically in the form of corn silage. However, managing continuous corn has its challenges, such as nutrient management, residue management and disease pressure. In order to add diversity into the rotation and protect soil with living roots through winter, some farmers plant a cereal rye cover crop following corn harvest in continuous corn systems. The rye will establish in the fall, survive winter dormancy, and will be terminated before planting corn again in the spring.

While continuous corn with cereal rye offers benefits to a livestock producer in terms of feed supplementation, it does not fully replace the advantages of a longer, diversified crop rotation. Additionally, with high input costs and the potential for a yield reduction, the long-term profitability of the operation could be affected. Before adopting a corn-on-corn rotation, consider the following factors:

- **Economic pressures:** continuous corn relies on inputs including fertilizer and pesticides to maintain productivity. Combined with lower grain costs, producers should consider the profitability of this system
- **Nutrient management:** the high nitrogen needs of corn may necessitate a starter fertilizer, nitrogen stabilizers, and side dressing during key growth stages
- **Disease management:** corn diseases, including northern corn leaf blight, gray leaf spot, and tar spot may survive on corn residue in the field between growing season

Early spring cereal rye grown in corn residue. Photo by Steve Whittington

By Steve Whittington
MSU Field Crops Educator

Fall harvest safety tips

Samantha Wolfe

Harvest often means long hours, stressful situations, and sometimes new employees on the farm. Here are a few safety tips from Michigan State University Extension to consider on your farm to prepare for the harvest season:

- Create or review an emergency plan on your farm
- Train all equipment operators in safety practices
- Install slow moving vehicle signs on equipment that travels on public roads
- Ensure safety equipment is in good condition and ready to use, including safety glasses, hearing protection, high visibility clothing, and respirators
- Read or review the manuals for equipment you use
- Fatigue, stress, and some medications can decrease focus and lead to injury. Take breaks when necessary and get enough sleep
- Use locking hydraulic cylinders before working under equipment
- Turn off equipment and ensure all mechanisms have stopped moving before attempting to service or unclog machinery

iStock photo by Albert Pego

By Samantha Wolfe
MSU AgrAbility Educator

Research Drill Down

Modeling a path forward for expanding dairy farms

Dairy herds with less than 500 cows face economic challenges due to their relative lack of scale. While many such farms remain profitable, difficult decisions emerge when key facilities like a milking parlor become worn out and re-investment is needed.

In these situations, smaller dairy farms often face a dilemma: shift to niche marketing or expand the farm. New MSU research explores the most profitable strategies for expansion and has generated a tool for commercial farms to use for their own planning.

Over the last 20 years there has been steady consolidation within the United States dairy industry, resulting in about 40,000 fewer dairy herds in 2023 than 20 years prior (Figure 1).

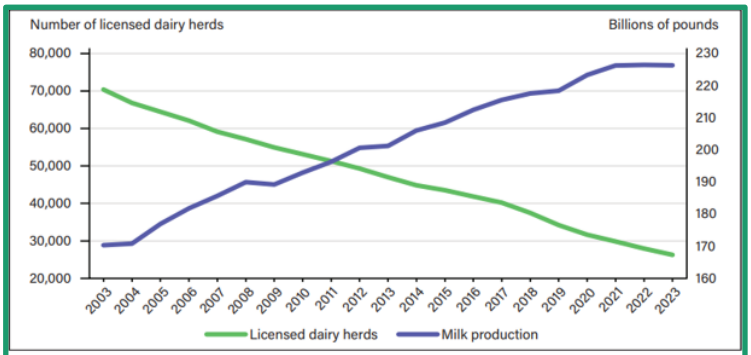


Figure 1. Trends in U.S. dairy herds and milk production from 2003 to 2023 (USDA, 2024).

This decline in total herd numbers has been primarily driven by a steep decline in dairy herds that milk less than 200 cows. Many herds within that size range have had to make the difficult decision to either expand to remain competitive, find an industry niche, or exit the dairy business altogether.

The primary drivers forcing these decisions are the economies of scale disadvantages faced by small dairy producers as the industry has evolved. As herd size increases, net returns per pound increase while total costs per pound decrease, with fixed costs being spread across a greater number of cows.

While the small dairies (< 200 cows) have rapidly declined, the industry has an increasing number of herds milking more than 1,000 cows. Despite the decline in U.S. dairy herds, milk production has increased from about 170 billion pounds of milk in 2003 to over 220 billion pounds in 2023.

There are some dairies in Michigan who have been very successful by finding niche markets, including a recent MSU Dairy Farm of the Year. Location, skill sets, interests of the owners, and marketing expertise are all critical factors for farm-to-consumer marketing efforts. MSU has several programs to support such efforts, and for some farms, this is a fruitful path to take.

However, it's important to also acknowledge that many farms have not succeeded in niche marketing efforts, and the reality is that 99% of dairy products are sold through conventional commercial supply chains. As such, many smaller farms will likely reach a point where they will have to decide to expand or stop milking cows. Why? The most common reason is that milking parlors have a finite lifetime – typically 20-30 years at most – and they are very expensive to replace.

We estimated that a typical 250-cow dairy today would have to spend approximately $130,000 to build a new, standard double-10-stall milking parlor,

Research drill down

and very few 250-cow dairy farms have sufficient profit margins to pay for that reinvestment, particularly when interest is included (either as opportunity cost or actual interest on a loan).

In this situation, these farms often recognize that a modest additional investment will provide a parlor with capacity to milk twice as many cows, and this often becomes the path chosen to dilute the loan payments across more animals. However, even if the decision is made to expand the farm, there are several strategies that can be considered.

Understanding these economic pressures on dairy farms and the trends within the industry, our goal was to determine the most profitable, efficient, and least risky approach to expansion for small dairy farms through economic modeling. There were four expansion strategies that were evaluated within this study:

A) DOUBLE: Double land, cows, barn capacity, milk storage, and manure storage capacity.

B) BUYFORG: Bypassing the land investment, scale up the herd size and the infrastructure at a greater rate while purchasing forages to feed the same traditional Midwest diet as in the first scenario.

C) BUYCOMM: Bypassing the land investment, scale up the cows and the infrastructure at a greater rate while feeding a byproduct-heavy diet, feeding only the forages that can be produced on current acreage.

D) ROBOT: Scale up land, cows, and infrastructure as much as the capital allows while investing in robotic milking systems.

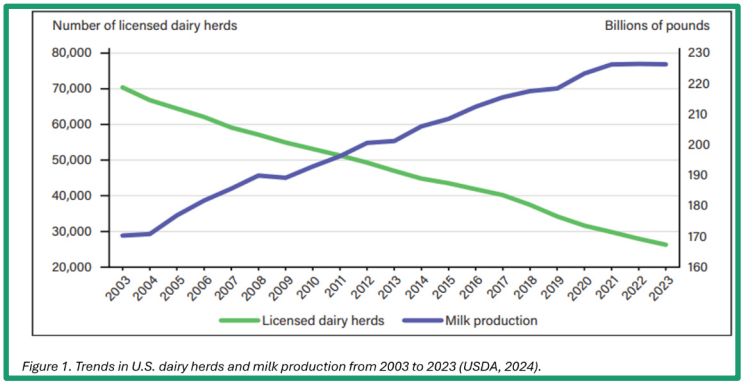


Figure 1. Trends in U.S. dairy herds and milk production from 2003 to 2023 (USDA, 2024).

To compare these options in an "apple-to-apples" manner, each of the scenarios utilized the same total investment cost of about $5 million, allowing the farm to remain at 50% equity after borrowing for the expansion. To evaluate these scenarios, a 250-cow base herd (prior to expansion) was defined based on average Dairy Record Management System (DRMS) statistics for herds between 100-500 cows in the Midwest. Table 1 defines the key characteristics for each scenario compared to the base herd.

As Yogi Berra once said, "It's tough to make predictions, especially about the future!" To help account for the uncertainty in projected costs and values for this farm, we used a process called Monte Carlo simulation.

In this type of simulation, a distribution of possible prices is "sampled" by the computer for each simulation. Therefore, although the expected interest rate we entered would be the most common value used in a simulation, values above and below that expected mean would also be selected sometimes, following a bell-shaped curve.

To generate those normal distributions of expected values, means and standard deviations for at least the last three years were found using USDA records, peer-reviewed research, and Extension articles for over 75 prices and costs which impact farm economics annually (milk price, heifer value, interest rate, etc.).

We examined the outcomes by running each scenario through a Monte Carlo simulation 10,000 times, pulling different values from each of those 75 variables each time. The output modeled economics of the farm for 10 years after the initial investment.

FARM OVERVIEW	Current	DOUBLE	BUYFORG	BUYCOMM	ROBOT
Herd Size *(cows)*	250	500	875	875	424
Farm Daily Milk Production *(lbs/d)*	17,404	41,569	73,209	73,209	37,715
Owned Cropping Acres	500	1,000	500	500	845
Total Investment *($)*	0	5,043,508	5,045,898	5,045,898	4,979,766
Milk Fat *(%)*	4.0%				
Milk Protein *(%)*	3.2%				

Table 1. Farm statistics after each expansion strategy.

Research drill down

Key Result #1: Avoiding additional land purchase and scaling the herd more dramatically was the most profitable financial investment and resulted in the least debt after 10 years.

Figure 2 represents the average annual net profit for each of the 10 years following the investment. Scenario BUYFORG, bypassing the land investment and scaling up at a greater rate while maintaining a forage diet, resulted in the greatest average net profit each year.

This is likely due to the ability to milk more cows than in scenarios DOUBLE and ROBOT and the reliance on a forage diet, which results in less feed cost variability. Scenario BUYCOMM, which relied on byproducts within the diet, resulted in the most variable annual net profit while ROBOT led to the least variability in annual net profit. Further, we evaluated the total return on investment after 10 years (Table 2) and found that BUYFORG was the only scenario that resulted in a positive return on investment (ROI) in that time frame. The two scenarios with the greatest number of cows (BUYFORG and BUYCOMM) resulted in the greatest ROI but also had the greatest variation in their ROI.

Ratios AFTER 10 Years	DOUBLE	BUYFORG	BUYCOMM	ROBOT
Return on Investment *Goal: > 100%*	51.1 ± 37.7%	110.1 ± 61.9%	101.1 ± 62.7%	67.8 ± 34.2%
Debt-to-Asset Ratio *Goal: < 30%*	33.2 ± 1.5%	26.3 ± 2.1%	26.9 ± 1.9%	38.8 ± 2.5%

Table 2. Profitability and solvency ratios after the 10-year simulation. Green indicates meets industry goal while orange indicates scenario does not meet industry goal.

When it came to solvency, we looked at the debt-to-asset ratio after the 10-year simulation (Table 2). We found that BUYFORG had the least amount of debt remaining at the end of the 10 years. This indicates that BUYFORG has the greatest ability to meet long-term financial obligations compared to the other scenarios.

Profitability does not equal cash flow. Yet, the BUYFORG scenario led to the greatest probability of positive cash flows each year compared to the other scenarios. Approximately 4 out of every 10 years, BUYFORG had a positive cash flow (Figure 3).

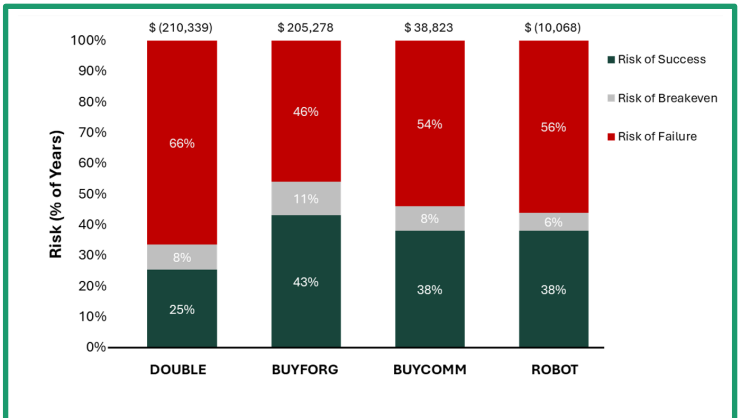


Figure 3. Probability of annual cash flow.

Key Result #2: The robotic milking scenario provides the most predictable outcomes.

Scenario ROBOT led to the most predictable outcomes, indicating that there is less variation around the mean. Having predictable outcomes becomes important for producers who rely on certainty of an outcome due to not having the ability take on a lot of risk. Whether the outcome is desirable or not, having a more predictable outcome aids producers in making smart and sustainable decisions for their operations.

Key Result #3: Sensitivity analysis revealed few scenarios that would change the ranking of options.

Sensitivity analysis was carried out to determine at which point a change in a variable alters the overall conclusions. Feed price, milk price, robot milk production, land appreciation rates, interest rates, cow value, and labor costs were all evaluated with net profit per farm annually. All sensitivity analysis was based on only one variable change and no other changes to the model or inputs.

Milk price sensitivity graphs (Figure 4) show that the more cows a farm milks, the greater annual net profit when milk price increases. Figure 4 graphs the annual net profit by farm expansion method, denoted by color, as milk price varies. The black dotted line represents how each of the scenarios rank based on the way milk was priced in the simulation ($2.70/cwt milk fat and $2.49/cwt milk protein). The yellow dotted line represents the point

Research drill down

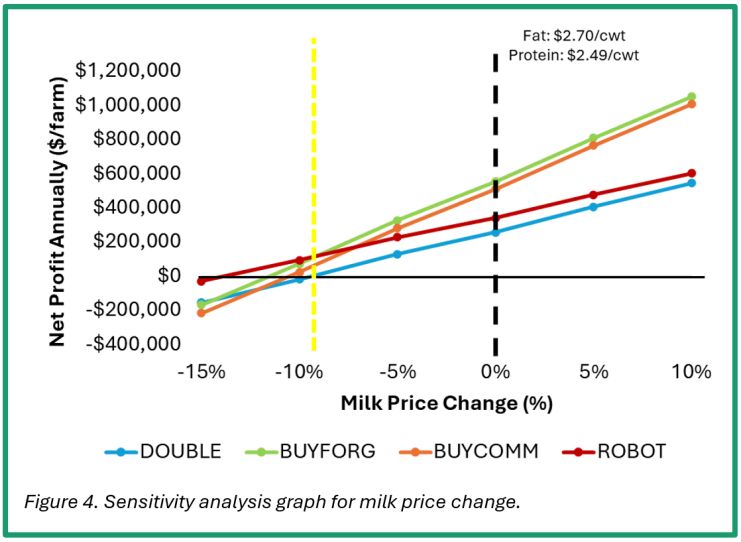


Figure 4. Sensitivity analysis graph for milk price change.

at which the milk price change would result in re-ranking of the scenarios. Milk prices (both fat and protein prices) would have to decrease by 9% compared to the prices used in our model, for scenario ROBOT to become the most profitable scenario annually.

Predicting the milk production change per cow when switching from conventional parlor milking to robotic milking systems can have a significant impact on profitability projections. Our base model included a 7.5% expected increase in milk production per cow for cows milked on robots vs. a parlor.

However, we also evaluated how scenario ROBOT would rank if there were no milk production advantage or if the benefit was greater. Sensitivity analysis revealed that if there was no milk production increase for robots compared to conventional milking, the robotic milking system would be the least profitable annually. Milk production would have to increase by 20% or more relative to conventional milking for scenario ROBOT to become the most profitable option.

Feed cost graphs showed that the more cows a farm feeds, the greater reduction in annual net profit as feed costs increase. Sensitivity analysis revealed that total feed costs would have to increase by 15% for scenario ROBOT to become the most profitable annually.

Other than feed cost, milk price, and robotic milk production change, no other variable tested within the sensitivity analysis resulted in a re-ranking of the scenario outcomes.

Online decision-making tool

The decision and methods to expansion are not a one-size-fits-all scenario. Each dairy is unique, and one expansion method may not be most profitable or least risky for all operations. Therefore, we have developed an online extension tool that can be used by dairy producers to enter their own inputs and run the simulation.

This will provide more insight for specific operations, accounting for unique factors like local land price and access to capital. MSU Extension educators are available to assist in utilizing and interpreting simulation results. To access the tool, scan the QR Code or visit canr.msu.edu/dairymetabolismgroup/Decision-Tools.

This work is supported by the Michigan Alliance for Animal Agriculture (M-AAA), from AgBioResearch and MSU Extension at Michigan State University, in partnership with the Michigan Department of Agriculture and Rural Development.

Authors

Lynn Olthof is a PhD student in the Bradford lab. Beyond her work in dairy management practices, Lynn assists in coaching the dairy judging team and coordinates the MSU Dairy Education Academy

Kevin Dhuyvetter is a technical consultant for Elanco's U.S. Cattle Business Unit. He focuses on factors affecting the profitability of dairy operations.

Corey Clark is a Farm Business Management Extension Educator. She works on farm financial analysis and business planning.

Barry Bradford is the C. E. Meadows Endowed Chair in Dairy Management and Nutrition at MSU.

Michigan dairy recognition

Shining a light on industry leaders

Sheila Burkhardt earns Michigan Dairy Industry Service Award

Sheila Burkhardt was recognized for her dedication, leadership, and service to the dairy industry. Since joining the Michigan Milk Producers Association in 1988, she has served in various roles and is currently the Chief Corporate Affairs Officer.

"Sheila is the consummate professional who embodies the spirit of the dairy industry through connections and expertise. Her innate ability to stay connected to the ever-changing dairy environment demonstrates her commitment and dedication to not only our member-owners but to all dairy producers," states Joe Diglio, MMPA President & CEO."

Photo and article by Mikayla Bowen, MMPA

Forrest and April Robart open East Lansing Cheese Lady store

The Cheese Lady is a Michigan franchise with the newest location in East Lansing as of early September. The store offers a rotating selection of over 120 cheeses. Besides their storefront, the Robart's sell cheese at several farmers markets.

April, the owner, shared, "At The Cheese Lady East Lansing, we are proud to share our passion for exceptional cheeses and thoughtfully curated charcuterie accompaniments. Every wedge we cut and every customer we serve is a nod to the beginning of our journey - a celebration of family, food, and the beautiful community that made it all possible."

Photo Credit: Lansing State Journal

Brigitte Grobbel named outstanding 4-H volunteer

Brigitte Grobbel of Clinton County was one of six people honored as a Michigan Farm Bureau 4-H Excellence in Agriculture award winner. She has served as the 4-H livestock and dairy project leader for St.Clair County's Haybuster 4-H club for the past six years. She is also active in the livestock judging teams in both Sanilac and St. Clair counties.

"The livestock and 4-H community is the best place to encourage today's youth to instill work ethic, dedication and begin their own leadership skills," said Brigitte. "Youth development of skills and livestock education has been very rewarding."

Photo and article by Jamie Wilson, MSU Extension

2265K Anthony Hall
474 S. Shaw Lane
East Lansing MI 48824

MICHIGAN STATE UNIVERSITY | Extension

Mark your calendar

- **The Milk Check: Fresh insights for dairy vets**
  October 17th
- **Michigan Agricultural Credit Conference**
  October 21st
- **Emergency response to accidents involving livestock (ERAIL) training**
  October 22nd
- **Dairy Tailgate**
  October 25th
- **Tri-State Dairy Field Day, Plymouth IN**
  November 20th
- **Dairy Nutrition Roundtable**
  December 5th

View a complete events listing at canr.msu.edu/dairy/events

Want to connect with your local dairy extension educator? Find them here: