Institute for Agriculture and Trade Policy Comments on the Environmental Assessment Worksheet for Waukon Dairy

The Institute for Agriculture and Trade Policy (IATP) thanks the Minnesota Pollution Control Agency (MPCA) for the opportunity to comment on the Environmental Assessment Worksheet (EAW) for Riverview's proposed Waukon Dairy in Norman County.

IATP is a 33-year-old organization based in Minneapolis. We work at the local, state, national and international levels to create fair and sustainable agriculture and trade systems. IATP was born in response to the family farm crisis of the 1980s, and we continue to pursue policy solutions that benefit family farmers, rural communities and the environment. Minnesota, as one of the largest agricultural states in the country, has a critical role to play in setting a precedent for how state governments respond to the climate crisis.

We envision an animal agriculture system that keeps small and mid-sized farmers on the land, sequesters carbon and protects water quality. However, agricultural consolidation has pushed dairy farmers off the land,[1] resulting in mega-farms that concentrate profits in the hands of the few, emit potent greenhouse gases (GHGs) methane and nitrous oxide and contaminate waterways. Minnesota has an imperative to create an environment conducive to small and mid-sized dairy farmers raising animals in ways that protect the water and the planet.

The EAW for the proposed Waukon Dairy does not fully capture the operation's environmental effects and underestimates its climate impacts. It also does not consider the damaging impact of agricultural consolidation on the farm economy and rural communities or adequately evaluate more climate-friendly methods of animal agriculture that also make farms more resilient to climate impacts. Furthermore, a large hog operation (Barrick Farms) is being started in Norman County at the same time, and the combined environmental impact of these operations on water and the climate is not considered. These oversights make it impossible for MPCA to determine the significance of environmental effects fairly. We strongly urge MPCA to require an Environmental Impact Statement (EIS) for Waukon Dairy to measure fully its environmental impacts and outline alternatives.

Waukon Dairy Violates MEPA

The Minnesota Environmental Policy Act (MEPA) states that an EIS is triggered if a proposed project has the potential for significant environmental impact. In 2007, the U.S. Supreme Court found that GHGs are air pollutants covered by the Clean Air Act and that they threaten the public health and welfare of current and future generations.[2] In 2019, Minnesota Governor Tim Walz called climate change an "existential threat" that "put[s] our communities and environment at risk."[3]

---

[1] James MacDonald, Robert Hoppe, and Doris Newton, *Three Decades of Consolidation in U.S. Agriculture*, (USDA Economic Research Service, March 2018).

[2] *Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Section 202(a) of the Clean Air Act*, (US Environmental Protection Agency, 2017).

[3] Tim Walz, *Establishing the Climate Change Subcabinet and the Governor's Advisory Council on Climate Change to Promote Coordinated Climate Change Mitigation and Resilience Strategies in the State of Minnesota,* (State of Minnesota, December 2019).

The U.S. Environmental Protection Agency (EPA) has expressly acknowledged that the expansion of confinement and liquid-based manure systems has caused methane emissions to increase significantly in recent decades. EPA noted that the "manure management systems with the most substantial methane emissions are those associated with confined animal management operations where manure is handled in liquid-based systems."[4] Consequently, as animal agriculture, including dairying, becomes increasingly more industrialized and concentrated, methane emissions will also increase, leading to more adverse climate change impacts.

According to the EAW, Waukon Dairy would lead to a substantial increase in GHG emissions of at least 76,106 metric tons of carbon dioxide equivalent each year — if not more (see measurement section of this comment). This is a significant environmental impact and should trigger an EIS.

Waukon Dairy Runs Counter to Minnesota's Next Generation Energy Act

Minnesota's Next Generation Energy Act requires the state to reduce GHGs by 80% between 2005 and 2050. According to a 2019 report by MPCA, agriculture accounts for approximately one-quarter of Minnesota's GHG emissions. The report goes on to say that "strategies to reduce emissions from this sector are critical to reaching statewide goals."[5]

Minnesota missed the Next Generation Energy Act's goal of a 15% reduction by 2015, signaling that strong and additional efforts are needed to reduce Minnesota's GHG emissions. Minnesota's overall emissions did decline 12% relative to 2005 levels by 2016, but emissions from crop agriculture increased by approximately 12% and methane emissions from animal agriculture increased by approximately 8% during that same time period.[6] Since agriculture is an area where emissions are going up, it's an obvious sector to target for emissions reduction efforts. Yet, this project would add to the rising emissions within this sector.

The Waukon Dairy EAW ignores these facts. It says, "Annual GHG emissions fluctuate, but fortunately, Minnesota has been on a general downward trend since 2005… The most recently available data (2016) shows the state's total annual GHG emissions at 12% below the 2005 baseline." These numbers look at overall emissions and ignore the fact that emissions from agriculture have increased.

Minnesota's climate goals are critical in the collective effort to combat climate change, yet the EAW only frames Waukon Dairy's emissions in terms of global impact and ignores Minnesota's goals. The EAW says, "It is difficult to translate the Project's incremental contribution to global GHGs and its effects on climate change globally or regionally." It goes on to say, "In other words, while agriculture contributes to climate change generally, existing scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts."

Global climate change impacts are a result of cumulative actions across the world. No single project can have a measurable global impact. Even constructing brand new coal-fired power plants throughout Minnesota wouldn't register on a global scale. Instead, MPCA's job is to measure progress against Minnesota's climate goals, namely the Next Generation Energy Act, not against overall global GHG emissions.

---

[4] *Inventory of U.S. Greenhouse Gas Emissions and Sinks,* (US Environmental Protection Agency, 2020).
[5] Peter Cibrowski, *Greenhouse Gas Reduction Potential of Agricultural Best Management Practices*, (Executive Summary, October 2019).
[6] Anne Claflin & Fawkes Steinwand, *Greenhouse Gas Emissions in Minnesota: 1990-2016*, (January 2019).

This guidance on considering GHG emissions in environmental reviews has already been provided at the federal level through the Council on Environmental Quality (CEQ). The CEQ's guidance is for the National Environmental Policy Act (NEPA), but interpretations of NEPA's requirements can be used to understand how to implement MEPA.[7] The CEQ said, "A statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA."[8] This standard should be applied to the Waukon Dairy EAW as well; though Waukon Dairy will not significantly impact global GHG emissions, it will significantly hinder Minnesota's ability to meet its goal of GHG reductions across all sectors.

Comments on Measurement

In the Waukon Dairy EAW, it acknowledges that "Minnesota Environmental Quality Board guidance is not currently available" to determine which project-related activities should count in a GHG analysis. While this is true, the EQB process to integrate climate change into Environmental Review could take multiple years. Until then, the MPCA must use a rigorous accounting methodology to determine the life-cycle climate impact of proposed feedlots.

The EAW also says, "The information the MPCA would need to conduct a full GHG life-cycle analysis are not readily available." MPCA can and must find tools to conduct a life-cycle analysis for Waukon Dairy and other proposed feedlots. An article in the *Journal of Dairy Science* lists many tools to estimate GHG emissions from dairy farms. These tools are described in the table below:[9]

Model	**Description**
AgRE Calc	Emission factor-based carbon calculator that determines a carbon footprint of various types of farms, including dairy. (http://www. agrecalc.com)
COMET-Farm	Emission factor and process model primarily for estimating carbon sequestration and emissions of various types of farms, including dairy. (http://cometfarm.nrel.colostate.edu/)
Cool Farm Tool	Emission factor-based carbon accounting tool for a wide range of cropping systems and includes a dairy livestock component. (https:// coolfarmtool.org/)
DairyGEM	Emission factor and process simulation tool that estimates GHG, NH3, and other gaseous emissions and the carbon footprint of dairy production systems. (https://www.ars.usda.gov/northeast-area/uppa/pswmru/docs/dairy-gas-emissions-model/)

[7] *See In re N.D. Pipeline Co. LLC*, 869 N.W.2d 693, 698 (Minn. App. 2015) (Minnesota courts may look to federal courts' interpretation of NEPA when applying MEPA).

[8] Council on Environmental Quality, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* (August 2016).

[9] C. Alan Rotz, *Symposium review: Modeling greenhouse gas emissions from dairy farms*, (Journal of Dairy Science, July 2018).

DairyMod	Biophysical process simulation of pastoral dairy systems predicting GHG dynamics including direct and indirect emissions and soil carbon balance. (http://imj.com.au/dairymod/)
DairyWise	An empirical model that simulates the technical, environmental and financial processes on a dairy farm that includes nitrogen and phosphorus cycling and losses, GHG emissions and energy use.
FarmAC	Process-related emission factors represent carbon and nitrogen flows on arable and livestock farms quantifying GHG, soil C sequestration and N losses to the environment. (http://www.farmac.dk/)
FASSET	Process simulation used to evaluate consequences of changes in regulations, management, prices and subsidies on farm production, profitability, nitrogen losses, energy consumption and GHG emissions. (http://www.fasset.dk/)
Holos	Process-based emission factors estimate all important direct and indirect sources of GHG emissions of livestock operations. (http:// www.agr.gc.ca/eng/science-and-innovation/results-of-agriculturalresearch/holos/?id=1349181297838)
IFSM	Process simulation of all-important farm components representing the performance, economics and environmental impacts, including direct and indirect GHG emissions and carbon footprint. (https://www.ars. usda.gov/northeast-area/up-pa/pswmru/docs/integrated-farm-systemmodel/)
ManureDNDC	Simulation of soil and manure biogeochemical processes producing GHG and NH3 emissions. (http://www.dndc.sr.unh.edu/)
MELODIE	Dynamic simulation of the flows of carbon, nitrogen, phosphorus, copper, zinc and water within animal, pasture, crop and manure components.
SIMS(Dairy)	Process simulation of the effects of management, climate and soil properties on nitrogen, phosphorus and carbon losses along with profitability, biodiversity, soil quality and animal welfare.

Scientific literature outlines the necessity of using a life-cycle analysis to provide a valid comparison of different livestock production systems.[10] In one evaluation of GHG emissions from the national supply chain of milk, 72% of the emissions occurred in processes prior to the milk leaving the farm.[11] Without performing a life-cycle analysis of Waukon Dairy's GHG emissions, the review will be incomplete and inherently flawed.

[10] Tara Garnett, *Livestock-related Greenhouse Gas Emissions: Impacts and Options for Policy Makers*, (Environmental Science Policy, 2009).
[11] C. Alan Rotz, *Symposium review: Modeling greenhouse gas emissions from dairy farms*, (Journal of Dairy Science, July 2018).

There is extensive guidance on what should be included in a life-cycle analysis of a livestock operation. According to a recent report,[12] some of these factors include:

- Enteric fermentation
- Manure storage
- Embodied energy in fertilizers and pesticides for growing grain
- Energy use for heating, cooling and ventilation
- Soil organic carbon balance in pasture versus cropland for feed grains
- Nitrous oxide emissions from fertilized fields versus pasture
- GHG impacts of manure overapplication to surrounding acreages

MPCA chose to quantify emissions from only enteric fermentation, manure storage and manure land application because "these are the sources the MPCA uses to estimate GHG emissions for the entire agricultural sector on a statewide basis, and the EPA provides emission factors for these sources." However, there are many tools available, such as those listed in the table above, to more fully estimate the impacts of this project.

Of the emissions that MPCA did choose to quantify, the EAW's estimate for nitrous oxide emissions from manure land application is likely far too low. In many livestock-producing regions of the U.S., the amount of waste produced exceeds the capacity of the surrounding land to absorb it for plant production.[13] [14] Analyses of GHG emissions from livestock systems often assume waste application rates consistent with Natural Resources Conservation Service (NRCS) nutrient management criteria, yet farmers often exceed these guidelines. According to the EPA, heavy manure applications can result in substantial nitrous oxide emissions.[15] As a result, GHG emissions from larger confinement operations are often underestimated.

This is likely to be true for Waukon Dairy. The EAW states that Waukon Dairy "does not own or operate any of the manure application sites" and will transfer manure to apply on approximately 12,952 acres. They have agreements with the owners of the other sites to accept manure from the project, but there's no oversight of those acres and only vague wording in the EAW about when the manure would be applied. Without oversight, there's no way to know whether manure is being over-applied, which would cause the project to be responsible for significant uncounted nitrous oxide emissions.

The EAW admits that "GHG emissions are not calculated for electricity generation that is required to operate lighting, heating, milk pumping equipment, etc. Also not included are GHG emissions from fuel combustion required to deliver feed, animals, and milk, and to operate farm equipment used in growing feed, processing feed, and applying manure." Constructing barns, milking parlors and other infrastructure to accommodate 10,500 animal units will vastly increase Waukon Dairy's electricity consumption, yet that's left out of MPCA's analysis. In addition, the EAW says that the project "expects an average of 269 vehicles per week" during operation. The emissions from this increased traffic must be accounted for. Emissions from these processes

---

[12] National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge,* (Washington DC, 2019).
[13] U.N. Food and Agriculture Organization, *Livestock's long shadow: Environmental issues and options*, (2006).
[14] Peter Thorne, *Environmental health impacts of concentrated animal feeding operations: anticipating hazards – searching for solutions*, (Environmental Health Perspectives, 2006).
[15] *Inventory of U.S. Greenhouse Gas Emissions and Sinks,* (US Environmental Protection Agency, 2020).

are a critical part of any life-cycle analysis, and the omission of energy and fuel use gives Waukon Dairy the appearance of having a much smaller GHG footprint than it really does.

Other sources of emissions that the EAW does not count are the impact of using cropland to grow feed grains and the production of fertilizers and pesticides needed to grow those feed grains. According to the Food and Agriculture Organization of the United Nations (FAO), feed production and processing is the main source of emissions from livestock production.[16] Emissions associated with feed production could be mitigated through different systems of livestock production, namely pasture-based livestock production, which we address in the mitigations section later in this comment. Leaving feed-associated emissions out of the analysis obscures that fact and paints an incomplete picture of Waukon Dairy's climate impact.

Rules for Manure Application Rates are Inadequate

The EAW states that "Riverview will land apply manure at agronomic rates based on Attachment A of the MPCA MMP, and "Fertilizer Guidelines for Agronomic Crops in Minnesota" (BU-06240-s) from the University of Minnesota Extension, revised 2001." These guidelines are based on the Maximum Return to Nitrogen (MRTN), which centers around economic risk and cost factors, making it an inadequate tool to limit nitrate pollution.

The MRTN relies on calculating the price ratio for the cost per pound of nitrogen divided by the value of corn per bushel.[17] The price ratio used to calculate the MRTN varies based on the price of fertilizer; an Extension fact sheet on fertilizing corn in Minnesota gives this example:

> An example calculation of the price/value is if N fertilizer costs $.40 per lb N (or $820 per ton of anhydrous ammonia), and corn is valued at $4.00 per bushel, the ratio would be 0.40/4.00 = 0.10.[18]

For CAFOs, manure is free and abundant. As a result, the MRTN suggests using a 0.05 price ratio, saying it is "relevant to those that have manure readily available at low (or no) cost." The recommendations go on to say, "For those that pay a premium, the 0.1 price ratio MRTN, or higher, may be more relevant and will result in a lower application rate."[19] This essentially means that a farmer with free manure can apply more since it costs less than commercial fertilizer or purchasing manure.

The MRTN is an inappropriate model to use since it is based on prices and maximizing profits, which have nothing to do with crop nitrogen needs. Actual crop nitrogen needs are determined by a complex set of variables, including timing, intensity and amount of precipitation; amount of sunshine; insect, weed and disease pressures; other nutrient deficiencies; the amount of soil organic matter; and soil type and texture.

We realize this is more an issue with the General Feedlot Permit, which has manure application guidelines based on the MRTN, than it is an issue with this specific feedlot. We raised this issue in our comment on the

---

[16] Food and Agriculture Organization of the United Nations, *Key Facts and Findings,* http://www.fao.org/news/story/en/item/197623/icode

[17] Melissa Wilson, New Manure Application Rate Guidelines for Minnesota. (University of Minnesota Extension, 2019) https://blog-crop-news.extension.umn.edu/2019/09/new-manure-application-rate-guidelines.html

[18] University of Minnesota Extension. Fertilizing Corn in Minnesota. Reviewed in 2020. https://extension.umn.edu/crop-specific-needs/fertilizing-corn-minnesota

[19] Melissa Wilson, New Manure Application Rate Guidelines for Minnesota. (University of Minnesota Extension, 2019) https://blog-crop-news.extension.umn.edu/2019/09/new-manure-application-rate-guidelines.html

General Feedlot Permit earlier this year. Still, it bears repeating that the Waukon Dairy EAW underestimates the operation's environmental impacts.

Mitigations are Inadequately Evaluated

The animal feedlot EAW form requires a discussion of mitigations. It says the project must describe "any proposed feedlot design features or air or odor emission mitigation measures to be implemented to avoid or minimize potential adverse impacts and discuss their anticipated effectiveness." The EAW also says, "If the project may cause any adverse environmental impacts not addressed by items 1 to 10, identify and discuss them here, along with any proposed mitigation." It goes beyond this to also require a discussion of "any alternatives or mitigative measures that have been or may be considered." In other words, Waukon Dairy must detail not only the mitigations that it plans on implementing, but also mitigations that exist and could be implemented.

Despite the call to explore mitigations, the Waukon Dairy EAW contains no discussion of pasture-based dairy production, which is arguably the most effective mitigation of all. Management intensive grazing that is adapted to region, climate and the condition of the pasture or rangeland has multiple benefits. These include:[20]

- Distributing manure evenly on the land
- Encouraging populations of dung beetles and other beneficial soil organisms that enhance nutrient cycling
- Using little or no synthetic nitrogen or other agrichemical inputs
- Eliminating or minimizing the need for manure storage facilities
- Maximizing soil organic carbon sequestration
- Providing opportunities to integrate crop and livestock production for enhanced nutrient cycling and uptake efficiency

In addition to improving soil health, reducing the need for chemical inputs and eliminating many of the emissions associated with manure management, pasture-based systems can also reduce emissions from enteric fermentation. Some studies show that emissions per cow are about 15% less for grazing operations than for confinement operations.[21] And because animals are primarily fed grass, grazing operations also minimize the need for purchased feed and the climate impacts of growing that feed.

This is a stark contrast to the CAFO model of production proposed by Waukon Dairy. According to the EPA's GHG inventory, manure deposited on pasture or rangelands "decompose[s] aerobically and produce[s] little or no CH_4." However, manure handled in liquid-based systems decomposes anaerobically and produces large amounts of methane. Methane emissions also increase when producers use long-term storage systems like lagoons, which can collect and hold liquefied manure for 10 to 15 years.[22] This demonstrates that pasture-based operations avoid many of the GHG emissions from manure management.

---

[20] National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge,* (Washington DC, 2019).
[21] C. Alan Rotz, *Symposium review: Modeling greenhouse gas emissions from dairy farms*, (Journal of Dairy Science, July 2018).
[22] *Inventory of U.S. Greenhouse Gas Emissions and Sinks,* (US Environmental Protection Agency, 2020).

Perhaps most importantly, grazing and pasture-based systems boost the ability of a farm to adapt to climate change. In Minnesota, record snowfall and flooding in 2019 led to the latest planting on record. In addition, there were over 1 million acres of corn in the state that were "prevented plantings," or the failure to plant an insured crop.[23] These real-life impacts of climate change are making it difficult for many farmers to stay in business.

Many of the practices used on pasture-based operations boost soil health and make farms more resilient to climate impacts. Boosting soil health increases the water-holding capacity of soil, thereby increasing resilience to floods and drought. For example, "A typical degraded Midwest soil with 1% organic matter may hold less than 1" of rain before becoming saturated, at which point additional rain runs off, carrying chemicals, sediment and manure into nearby streams. The same soil restored to 5% soil organic matter may hold 3.5" of rain before becoming saturated."[24] Healthy soils also have better structure, making a farm more immune to erosion.[25] In 2017, the Minnesota Interagency Climate Adaptation Team cited building resilience to extreme precipitation as a priority,[26] which pasture-based production could accomplish.

In an extremely challenging farm economy, it is of the utmost importance that farms can withstand extreme precipitation, drought and storms. By using practices that build healthier soils, pasture-based dairies will fare much better in weather extremes. This is critical to keep Minnesota agriculture viable and help farmers stay in business.

Pasture-based agriculture can also help avoid water quality issues. Due to increasing rainfall and flooding from climate change, the risk of an overflowed or breached manure lagoon is high. In 2018, Hurricane Florence caused many manure lagoons to overflow in North Carolina, leading to contaminated water and severe public health impacts.[27] Similar manure lagoon spills occurred in Iowa last year during extreme flooding.[28]

The MPCA has denied permits for CAFOs before. Citing the need to address elevated levels of nitrate in drinking water in southeastern Minnesota, MPCA denied a general permit for the proposed Catalpa swine facility in 2018.[29] Extreme storms and flooding are likely to cause an overflowed or breached manure lagoon at Waukon Dairy at some point. This should trigger an EIS to further explore the environmental risks of the proposed expansion.

Agricultural Consolidation is Hurting Minnesota Farmers

No conversation about agriculture in Minnesota can ignore the damaging impacts of consolidation on farmers. Farmers are facing the most difficult farm economy since the 1980s. Increases in farm debt,

---

[23] John Newton, *Prevent Plantings Set Record in 2019 at 20 Million Acres,* (Farm Bureau, 2019).
[24] Duane Hvorka, *State & Local Soil Health Strategies,* (Izaak Walton League of America, 2019).
[25] National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge,* (Washington DC, 2019).
[26] *Adapting to Climate Change in Minnesota,* (Interagency Climate Adaptation Team, 2017).
[27] Shefali Sharma, *Hogwash and its Aftermath: Climate Change and Corporate Accountability after Hurricane Florence,* (Institute for Agriculture and Trade Policy, 2018).
[28] Erin Jordan, *Overflowing Manure Tanks Reported in Western Iowa, Eastern Iowa on Alert,* (The Gazette, Sioux City, March 2019).
[29] Cathy Rofshus, *MPCA Commissioner denies permit to proposed feedlot, recommends study of nitrate-contaminated waters in the sensitive karst region of southeast Minnesota,* (MPCA, 2018).

bankruptcies and land values have far outstripped farm assets and income, making it increasingly difficult for farmers to hold on to their land. Farm bankruptcies rose 24% between September 2018 and September 2019 and were at decade-high levels in some parts of the country. Farm debt is at a record high of $415 billion and has grown by nearly 40% since 2012, while asset values have climbed only 17%.[30]

Like the rest of U.S. agriculture, dairy farms are consolidating into fewer farms with more milk production per farm. Minnesota lost 315 dairies in 2019, including 47 in December alone.[31] According to the latest Census of Agriculture, the number of dairy farms fell by 20% between 2012 and 2017. Yet, milk sales went up 3.4% in the same time period.[32]

The expansion of larger and more industrialized farms has contributed to financial stress on the dairy industry, most notably on small to mid-sized farms — the exact type of farm that is best for the climate and the environment. Industrial dairies have increased their production, which has driven down dairy prices paid to farmers, often below the cost of production. In doing so, industrial dairies have put increased financial pressure on smaller dairies with higher production costs or tighter margins. Across the country and in Minnesota, small and mid-sized dairies are struggling to operate with little to no farm income, often wiping out their savings and credit to stay in business.[33] [34]

The low prices that are putting farms out of business are largely due to the overproduction of milk. For this reason, Minnesota should not continue to support mega-dairies that are harmful to the environment and climate and also contribute to the overproduction that is driving small and mid-sized pasture-based operations out of business. We need those farmers on the land to combat climate change, steward our land and support our rural communities. In addition to environmental considerations, MPCA must consider the well-being of the state's family farmers in its decisions.

IATP thanks MPCA for this opportunity to comment.

Sincerely,

Tara Ritter
Senior Program Associate, Climate Change and Rural Communities
Institute for Agriculture and Trade Policy

Ben Lilliston
Director of Climate Change and Rural Strategies
Institute for Agriculture and Trade Policy

---

[30] *Farm Bankruptcies Rise Again: Chapter 12 Filings Increase 24% Compared to Year-Ago Levels* (Farm Bureau, 2019).
[31] *Dairy Farm Activity Report,* (MN Department of Agriculture, 2020).
[32] Census of Agriculture, *Dairy Cattle and Milk Production,* (USDA National Agricultural Statistics, 2017).
[33] Justin Fox, *A Productivity Revolution is Wiping Out (Most) Dairy Farms*, (Bloomberg, 2019).
[34] James MacDonald and Doris Newton, *Milk Production Continues to Shifting to Large-Scale Farms*, (USDA Economic Research Service, December 2014).