California Department of Food and Agriculture

Small Dairy Climate Action Plan

Office of Environmental Farming and Innovation summary of "An economic evaluation of strategies for methane emission reduction effectiveness and appropriateness in small and large California dairies"

This summary developed by the California Department of Food and Agriculture's (CDFA) Office of Environmental Farming and Innovation, is intended to provide clarification and project outcomes to the study titled "An economic evaluation of strategies for methane emission reduction effectiveness and appropriateness in small and large California dairies". This study was required per legislative mandates in Item 8570-001-0001-2017 of the 2017-18 Budget Act.

The California dairy industry is an economically important sector that adds billions of dollars to the state economy and provides year-round employment. Senate Bill1383, passed in 2016, sets a methane emissions reduction target of 40 percent below 2013 levels by 2030, from dairy and livestock manure handling. Because the impact of this legislation on dairy industry economics is largely unknown, the CDFA, through competitive solicitation contracted with the California Dairy Research Foundation (CDRF) to analyze the economic impact and greenhouse gas reduction potential of implementing methane emission strategies on dairies of different sizes.

The report reviewed data for herd size distribution across the nine California regions as defined by State Water Resources Control Board (SWRCB) and noted the following:

- 91 percent of mature cows (lactating and dry) reside in Region 5 (Central Valley), followed by 4.3 percent in Region 8, with all other regions having the remaining 4.7 percent of the animals.
- The average herd size ranged from 333 (Region 1) to 2,802 (Region 6).
- Dairy facility type varied within a specific region and between the regions.
- More than 74 percent of dairies in Region 5 use freestalls for housing lactating cow; these dairies contain 71.3 percent of the Region's mature cows.
- Dairies in the northern counties (e.g. Humboldt and Del Norte) mostly utilize pasture-based systems that are very different from freestall manure management. In general, manure management in these northern regions utilizes scrape systems, with manure stored as a slurry, semi-solid or solid, or it is not collected from the field.
- Dairy facilities in Region 6 (Lahontan), Regions 7 (Imperial), Region 8 (Santa Ana) and Region 9 (San Diego) are predominantly non-freestall and majority of manure is deposited in dry form and is scraped and solar dried.
- In Central Valley (Region 5), approximately 1.2 percent of dairies use partial or complete vacuum collection method and 1 percent utilized "weeping wall". 1.5

percent dairies reported the presence of aerators to increase oxygen content and reduce methane emissions.

- A total of 17 California dairy operations reported to have anaerobic digesters on their dairies and some are nonfunctional. These digesters were installed prior to CDFA's Dairy Digester Research and Development Program.
- For Region 5 dairies, 58.2 percent use some type of gravity separation system; 36.5 percent have a mechanical separator; 25.7 percent use no solid separation system; 20.3 percent use both gravity separation systems and a mechanical separator.
- The report identified no definitive group of manure management practices that are used based on herd size or housing type.

Authors noted significant challenges to harmonize data maintained by various state and county agencies. There are no common variables among various permits to compare information from different regulatory agencies. Based on the data collected and analyzed, the authors were not able to categorize dairies as being small or large. The authors also noted a lack of definition or use of inconsistent categorizations for small or large dairies at the federal level.

While analyzing the greenhouse gas emissions from dairies of various sizes, the authors used freestall and non-freestall housing and their associated manure management systems to quantify estimated methane emissions as low, high and average. The authors noted that installation of weeping walls as a management practice had the greatest emissions reductions, which were nearly twice the emissions reductions of mechanical separators. Emissions reductions were similar within a practice category and herd size regardless of type of housing facility for solid liquid separation. The authors recommended to allow for inclusion of gravity separation systems for baseline and project calculations in the AMMP Benefits Calculator Tool developed by the California Air Resources Board since a significant number of dairies have such systems.

While reviewing new and innovative methane emissions reduction technologies for dairy and livestock operations, the authors noted that several efforts were made recently to analyze potential manure management technologies. The lack of quantifiable data from technology developers and vendors produced an inconclusive scientific review and evaluation of new technologies.

The authors categorized California dairies into seven groups based on herd sizes and facility type to analyze the economic impact of methane reduction practices on small and large dairies. The economic and environmental impact of various methane reduction strategies were evaluated based on six scenarios. These scenarios varied on adoption rates of methane reduction strategies among these dairy groups. The authors concluded that manure management costs change substantially in some scenarios for some dairy groups. However, manure management contributed a relatively small share

to dairy operating costs, which were predominantly comprised of costs such as herd replacement, feed and labor.

While analyzing the impact of methane reduction strategies for 1, 5 and 10-year time horizons, the authors concluded that the scenarios where small dairies adopted costly practices resulted in substantial decline in the quantity of milk production for long time-horizon whereas the effects on larger dairies were smaller in all scenarios and in all time horizons.

The authors also evaluated the economic sustainability of small dairies for 5, 10 and 20-year time horizons. Based on past trends, the authors suggested that the total number of cows in California will likely remain the same for long time-horizon. The number of cows on smaller dairies will decline rapidly whereas increase in herd size of larger dairies will occur at a slower pace. It was also observed that the impacts of methane reduction strategies are small compared to other economic and resource constraints especially for small dairies.

The authors concluded that:

- There are no specific manure management practices that differentiate small dairies from large dairies.
- The cost associated with adoption of methane reduction practices is small compared to the overall operational costs of the dairy.
- The current decline of small dairies is expected to continue as a result of greater consolidation to address several economic and regulatory pressures.
- The dairy methane reduction strategies for small dairies are not effective from a cost-benefit perspective.

The final report submitted to the CDFA can be found on department webpage.