

JUNE 2018

SMALL DAIRY CLIMATE ACTION PLAN:

A REPORT TO THE JOINT LEGISLATIVE BUDGET COMMITTEE



A CALIFORNIA DEPARTMENT OF FOOD AND
AGRICULTURE REPORT TO COMPLY WITH ITEM 8570-
101-3228 (1)(B) OF THE 2017 BUDGET ACT



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INTRODUCTION

The Budget Act of 2017 (Item 8570-101-3228(1)(b)) required the California Department of Food and Agriculture (CDFA) to provide to the Joint Legislative Budget Committee a Small Dairy Climate Action Plan that discusses how emissions levels from small dairies may differ from larger dairies and describe cost-effective strategies to reduce emissions of methane gas at small-scale dairies by July 1, 2018. The purpose of this report is to address these requirements. The report highlights CDFA's current efforts to develop detailed recommendations and objectives for the Small Dairy Action Plan, including a [research project](#) that has been funded by CDFA to address this need and inform future drafts of the Small Dairy Action Plan.

Methane is a potent greenhouse gas (GHG) that has a global warming potential 25 times that of carbon dioxide over a 100-year timeframe. It is also a short-lived climate pollutant; a climate gas that remains in the atmosphere for a much shorter time than longer-lived climate pollutants like carbon dioxide. Therefore, the impacts of methane as a GHG occur within a shorter timeframe. In California agriculture, methane is primarily emitted from manure storage lagoons on dairy operations and through enteric emissions from the dairy cattle digestive process. Agriculture in California accounts for approximately 8 percent of total GHG emissions in the state (<https://www.arb.ca.gov/cc/inventory/data/data.htm>).

CDFA does not have a definition for small and large dairies since dairy operations vary greatly in the State of California and can range from less than a hundred to greater than 10,000 cows. CDFA administers two incentive programs designed to reduce greenhouse gases (GHGs; methane in particular) that fit both small and large dairies. CDFA's dairy and livestock methane incentive programs result in an annual reduction of 633,643 MTCO₂e, specifically from manure management activities, which constitutes 2.7 percent of California's total GHG emissions. This value is significantly larger (5.6 percent) if methane emissions specifically, from manure management ([Figure 1](#)), are taken into account.



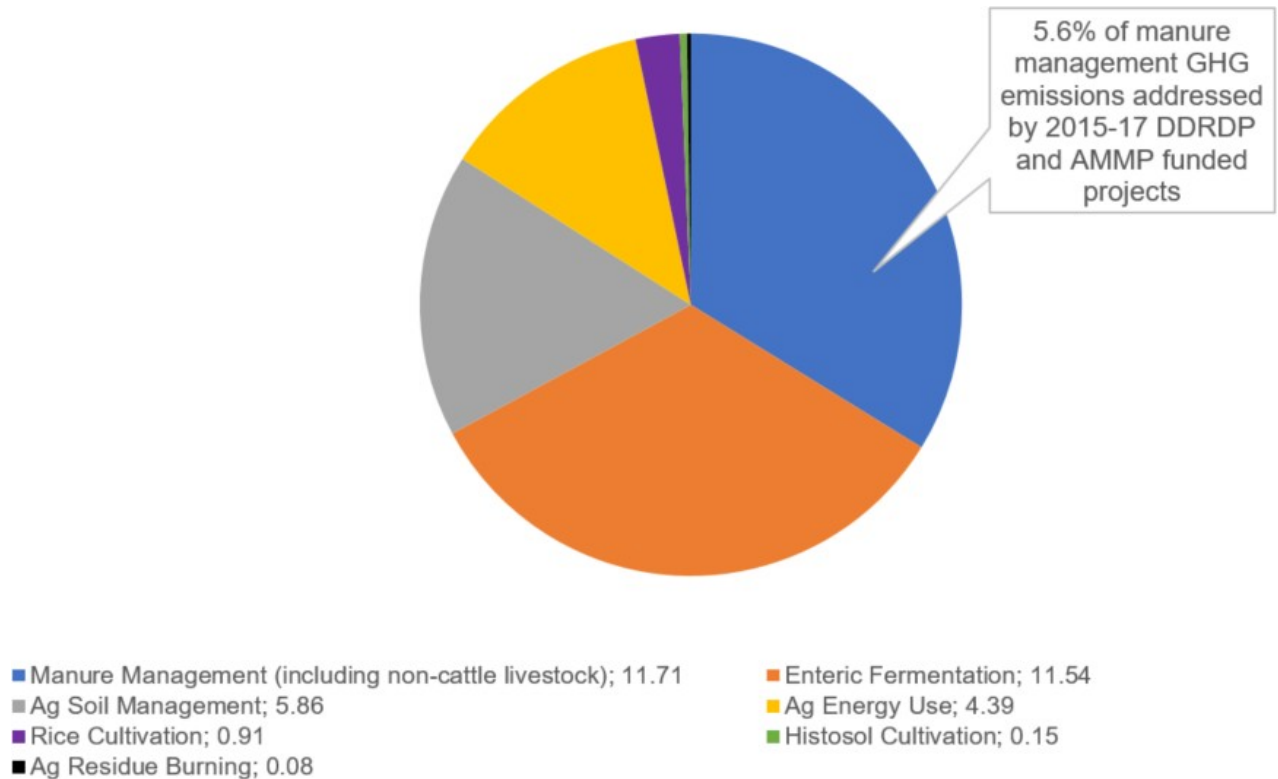


Figure 1. GHG emissions from Manure Management as a proportion of total Agriculture Sector GHG emissions inventory (8 percent or 34.7 million MTCO₂e) in California in 2015.

This Small Dairy Climate Action Plan highlights efforts to address methane reductions from dairy operations with smaller herd size numbers by: incorporating the results from stakeholder meetings to determine what small dairies need to adapt to climate change, identifying research undertaken to further understand how emissions levels from small dairies may differ from larger dairies, and, describing cost-effective strategies to reduce emissions of methane gas at small-scale dairies.



BACKGROUND OF CALIFORNIA DAIRY INDUSTRY

The California dairy industry is composed of approximately 1.74 million milking cows with an average herd size of 1,304 animals per farm. In 2017, California produced 39.8 billion lbs. of milk, which is equivalent to almost 19% of the US milk supply. Approximately 1,330 dairy farms are distributed across the state. However, the Central Valley has the highest concentration of dairy cows with approximately 89% of the animals in the state within that region. Most of the dairy farms in the Central Valley are equipped with manure flushing systems that use water to move animal manure into anaerobic (oxygen lacking) storage lagoons. These lagoons in turn produce methane, which is a potent GHG.

A smaller percentage of California's dairy cows are located in Southern California (approximately 6%) and handle manure using dry lots; an enclosure of limited size usually lacking vegetation where the manure is collected on a regular basis as a solid, without a flushing system. The remaining 3% of California's dairy cows are in the North Coast region of California where pasture based manure management is most common; grazing on land with grass or other live forage plants where no collection of manure takes place. The North Coast can accommodate such management practice strategies for raising dairy cows due to cooler temperatures and higher annual moisture distribution compared to other regions of the state. The distribution of dairy cows by different herd sizes in California is provided in [Image 1](#).

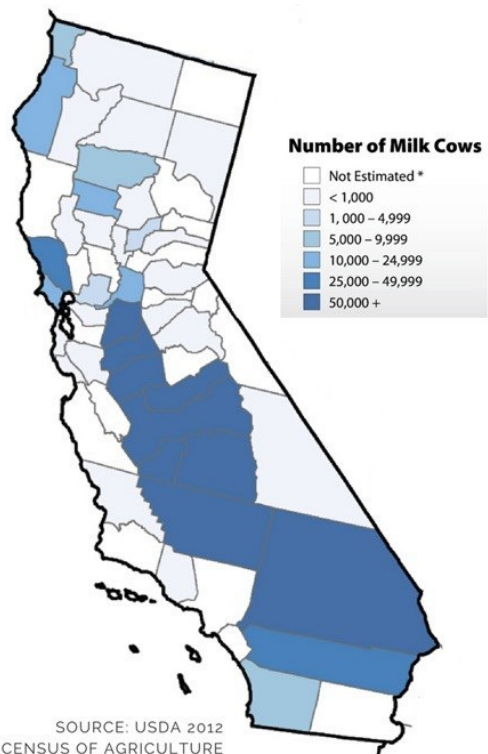


Image 1. Distribution of dairy cows by herd size in various regions of California.

Given the diverse forms of dairy manure management practices, herd sizes and economic scale in California, there is a need to address methane emissions from dairy manure management through a variety of practices and technologies. Dairies of different sizes deal with manure through very different management practices. These and other management practices and technologies are currently incentivized through two programs administered by CDFA, the Dairy Digester Research and Development Program (DDRDP) and the Alternative Manure Management Program (AMMP), both of which are discussed in this report. The programs are designed to primarily reduce methane GHG emissions and allows the dairy operators to determine which program best fits their operation while providing significant flexibility in voluntary management practice adoption to reduce methane GHGs. Not only are the programs designed to mitigate GHGs from dairy operations in California but also create climate change adaptation mechanisms such as renewable energy production as incentivized by the DDRDP. Each of the programs are described in more detail below.

DAIRY METHANE REDUCTION EFFORTS AT CDFA

CDFA administers two incentives programs that aim to reduce methane from California's dairy and livestock operations:

1. DAIRY DIGESTER RESEARCH AND DEVELOPMENT PROGRAM (DDRDP)

awards competitive grants to California dairy operations and digester developers for the implementation of dairy digesters that result in long-term methane emission reductions on California dairies and minimize or mitigate adverse environmental impacts.

Funding for these two programs is provided by the Greenhouse Gas Reduction Fund (GGRF) which under the California Climate Investments (CCI) Program. CDFA has received \$161 million from the CCI to date for dairy digesters as well as non-digester practices for methane reduction on California's dairy and livestock operations. A detailed breakdown of funding allocations is provided in [Table 1](#). The DDRDP was first created in 2014 while AMMP was created in 2016. Administrative costs to implement the program have ranged from 4.9% to 10%.

2. ALTERNATIVE MANURE MANAGEMENT PROGRAM

awards competitive grants to California dairy and livestock operations for non-digester technologies and specific management practices that result in long-term methane emissions reductions and maximize environmental benefits. These non-digester manure management practices include practices such as:

- (a) conversion from a flush to scrape manure collection system and/or solid separation, followed by drying, spreading, solid storage or composting; and
- (b) pasture-based management practices such as conversion of a non-pasture operation to a pasture-based management, increasing the amount of time livestock spend at pasture, and/or construction of a compost bedded pack barn.

Table 1. Summary of CDFA DDRDP funding to date

Year	Dollar Allocation (millions)	DDRDP Grant Funds Awarded (millions)			Administrative Cost (millions)
		Dairy Digesters	Dairy Digester Research	Non-digester Practices (Alternative Manure Management Program)	
2014-15	\$12	\$11.1	\$0.2	\$0	\$0.7
2016-17	\$50	\$35.3	\$0	\$9.9	\$4.8
2017-18	\$99	\$61-75*	\$0	\$19-33**	\$4.9

*Applications accepted until February 23, 2018 are currently under review.

**Applications accepted until May 22, 2018 are currently under review.

AWARDED PROJECTS

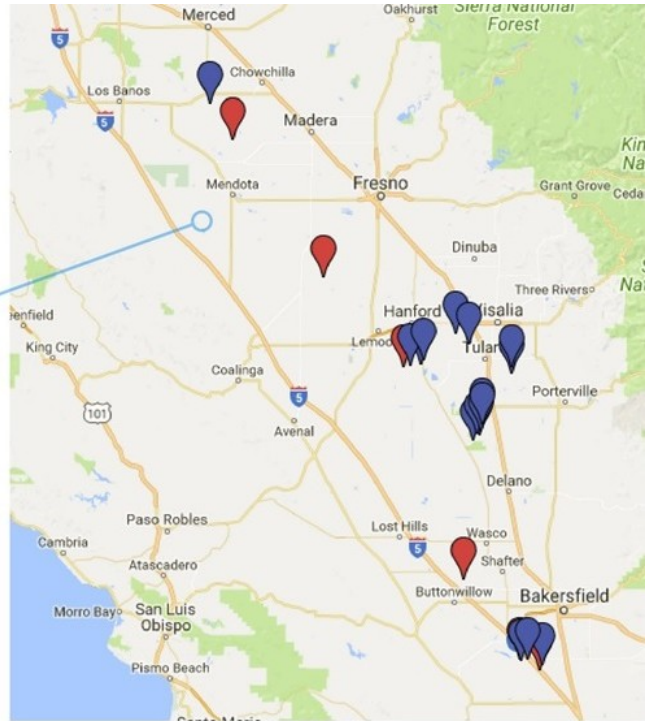
To date, CDFA has funded a total of \$46.3 million in GGRF funds to 24 dairy digester projects through the DDRDP. These projects also contributed \$107.7 million in matching funds provided by grant awardees. Statewide distribution of these projects is shown in [Image 2](#). These projects collectively have an estimated GHG emissions reduction of 5.7 million metric tons of carbon dioxide equivalents (MTCO₂e) over ten years. The average herd size of a DDRDP funded project was 9,929 in 2015 and 7,430 in 2017.



A total of \$9.9 million has been awarded to non-digester based projects through the AMMP with the FY 2016-17 GGRF allocation. Approximately \$2.1 million in matching funds by grant awardees was provided for these non-digester projects. Statewide distribution of these projects is shown in [Image 3](#). These projects collectively have an estimated GHG reduction of 328,281 MTCO₂e over five years. The average herd size of an AMMP funded project in 2016-17 was 1,934.

Although the herd size numbers may not be fully reflective of small dairies in the DDRDP, the herd size was as low as 3,346, which may include small dairies. As noted earlier, CDFA does not have a specific definition for small versus large dairies and is funding a research project to evaluate and define what constitutes a small dairy in California. CDFA encourages all dairy sizes to participate in the DDRDP. For example, applicants can apply for less than the maximum award amount of \$3 million without penalty. Further, CDFA requires that all GHG and total quantification numbers are normalized for dairy size (by milk production) to ensure that all projects are evaluated on the same baseline scale. CDFA does not award projects solely based on GHG emissions reduction but rather evaluates each project on quality of the entire proposal, which additionally includes their financial and technical merits. CDFA has identified that the AMMP management practices fit a smaller dairy operation better given the large matching 50% investment and commitment required in the DDRDP. Matching costs for the AMMP are strongly encouraged but not required. Herd size was as low as 225 in the AMMP.

² Herd size in this report refers to the number of animals on the dairy or livestock operation that are included in the project boundary, i.e., those livestock categories for which manure management will be affected by the project. Project boundaries and methods to identify them are included in the GHG emission reduction [Quantification Methodologies](#) for the DDRDP and AMMP. The project boundary delineates the GHG sources, sinks, and reservoirs (SSRs) that are included or excluded when quantifying the emission reductions resulting from the installation and operation of devices associated with the capture and destruction of methane (DDRDP) or from the adoption of various alternative manure management practices (AMMP).





-  2015: \$11.1 million awarded to 6 projects completed in 2016-18, 28.1 million in matching funds
 -  2017: \$35.3 million awarded to 18 projects currently ongoing, \$79.6 million in matching funds
- Image 2. Statewide distribution of DDRDP funded projects.

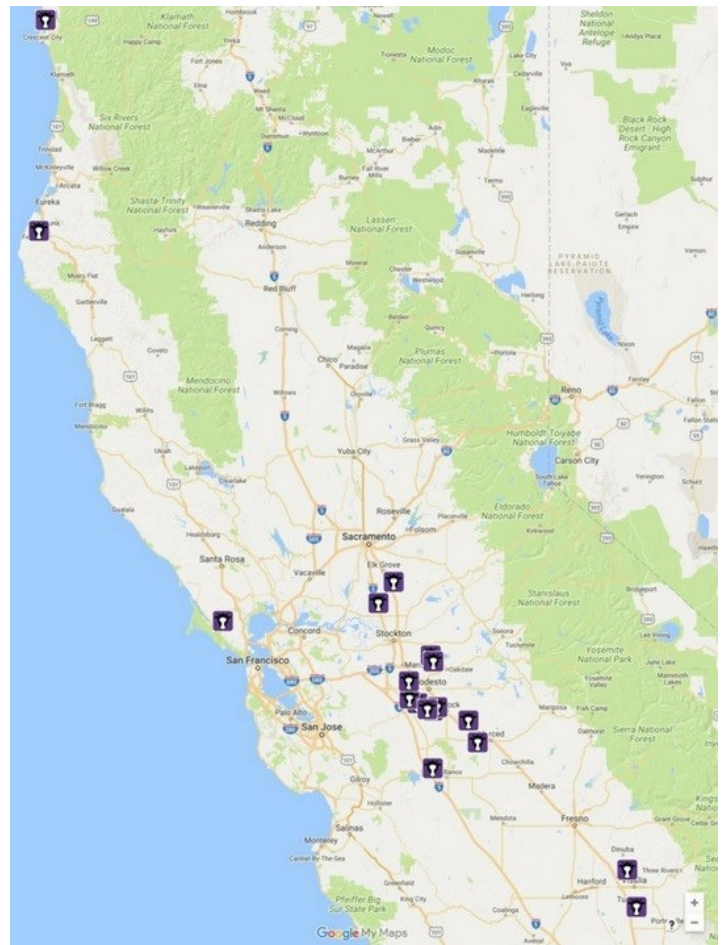


Image 3. Statewide distribution of DDRDP funded projects.

RESEARCH

CDFA does not have a definition for small dairies and does not have sound scientific and economic methods for evaluating small dairies. Therefore, research to further understand how dairy operations differ in size in California is needed. This information will also assist CDFA in understanding how small dairies may differ from large dairies in adapting to and mitigating climate change and describe cost effective strategies to reduce methane emissions from small-scale dairies. CDFA has learned that programs with management practices described in AMMP are more suited for small dairies.

CDFA, supported by a \$250,000 appropriation from the Budget Act of 2017 for small dairy climate change research, administered a competitive Request for Proposals to fund a research project to address these needs with an open competitive solicitation for applications from March-May 2018. A [research proposal](#) led by the California Dairy Research Foundation in partnership with University of California, Davis was awarded \$213,349 in May 2018. This proposal was one of three submitted for evaluation. The title of the awarded project is "Small Dairy Climate Change Research: An economic evaluation of strategies for methane emission reduction effectiveness and appropriateness in small and large California dairies." This project aims to fulfil the following objectives by June 2019:

1. Categorize California dairies by herd size, animal housing, manure treatment and storage practices to evaluate best metrics for small and large dairies.
2. Quantify estimated methane emissions as low, high and average based on herd size (small and large), housing design and manure handling categories.
3. Review strategies and technologies currently or potentially used to reduce manure methane emissions for applicability to small and large dairies.
4. Compare economic impact of methane emission reduction strategies identified in Objective 3 on small dairies versus large dairies.
5. Compare whole-farm economic and environmental impacts of methane emission reduction strategies identified in Objective 3 on small and large dairies.
6. Compare methane reduction potential at small and large dairies, presented as a cost-benefit analysis of environmental and economic impacts on 1, 5 and 10-year scales.
7. Model and project sustainability (especially economic feasibility) of small dairies in California over 5, 10 and 20-year time scales in consideration of new environmental regulations including reductions for methane emissions, inflation, interest rates, feed prices, dairy product prices, labor costs and location of the dairies.

The findings from this research project will contribute to the Small Dairy Climate Action Plan which is required by legislative mandate as part of the Budget Act of 2017-18 (Item 8570-101-3228 (1) (b)).



STAKEHOLDER FEEDBACK: PRELIMINARY FINDINGS

While dairy operations of all sizes are eligible to apply for both DDRDP and AMMP funding, smaller operations have emerged primarily as applicants for the AMMP. The reasons for this may include but are not limited to: the absence of a matching fund requirement (which are easier to secure for larger operations), the inherent economic difficulties in developing a digester project at a small dairy, and the greater variety of eligible methane emissions reduction management practices, several of which are more feasible for pasture-based dairies which tend to have smaller herds.

To better understand the challenges faced specifically by smaller dairy operations in California, including applying for funding through the AMMP, CDFA conducted three listening sessions from January through March 2018 in Eureka, Santa Rosa and Modesto. These sessions were attended by several stakeholders including dairy producers, industry organizations, Resource Conservation Districts and University of California Agriculture and Natural Resources Cooperative Extension personnel who provided technical assistance (TA) for the preparation and submission of AMMP applications by dairy producers.

Key comments provided during these listening sessions are summarized in [Table 2](#) below. Steps taken by CDFA to address several of these comments to further streamline and improve the AMMP application process for FY 2017-18 are also provided, if applicable.

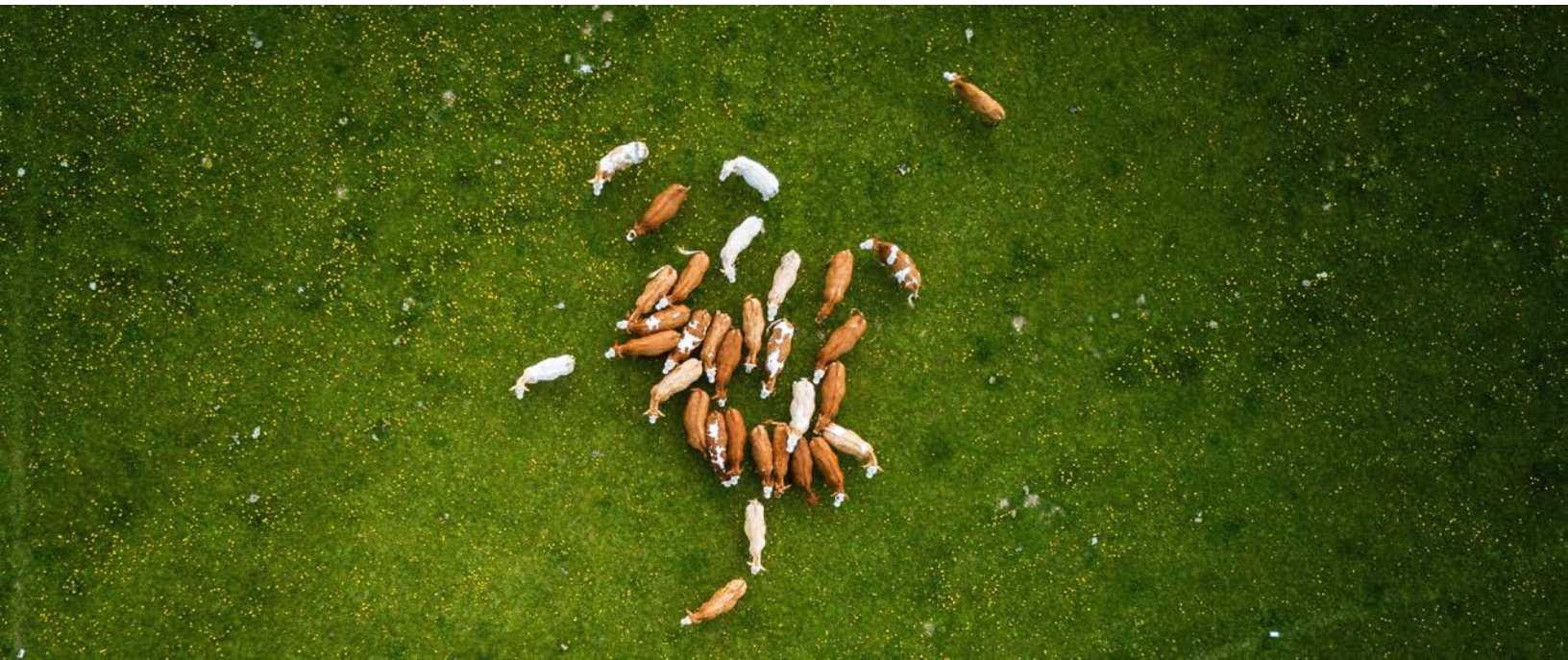


Table 2. Summary of Stakeholder Comments Addressed to Enhance AMMP Accessibility for Smaller Dairy Operations.

Category	Stakeholder Comments on 2017 AMMP	Steps Taken by CDFA for 2018 AMMP
GHG Quantification Methodology (QM) and Calculator Tool	The equations in the GHG emissions reduction QM and Calculator Tool are based on default values of separation and movement of manure volatile solids that are not applicable to all dairies, especially pasture-based systems in the North Coast.	Applicants can enter site-specific values (if available), provided supporting documentation is included. The 2018 AMMP Calculator Tool simultaneously calculates GHG emissions reductions based on default values as well as site-specific values to provide a comparison to assist evaluation by technical reviewers.
	Calculator is complex to use.	CDFA provided funding for technical assistance providers to provide targeted one-on-one assistance to 2018 AMMP applicants.
	QM tool should allow stacking of practices.	Currently under evaluation by CDFA and CARB.
Permitting and Project Readiness	CDFA should provide region-specific permitting information to applicants.	CDFA provided online resources for local permitting information on the AMMP website and Request for Grant Applications (i.e., the solicitation document) for 2018 AMMP applicants. CDFA is also currently developing a list of required permits for AMMP in coordination with the Regional Water Quality Control Boards and Regional Air Quality Districts.
	Permitting costs can be high and if incurred prior to award, cannot be reimbursed. This may limit potential applicants.	While CDFA is unable to fund costs incurred outside of the grant agreement term, it was clarified that it is not necessary for projects to have obtained all permits prior to submission of application. Awarded projects have 6 months from the date of award to obtain all necessary permits. However, those projects that are further along in the permitting process can receive additional points during the review process.
Technical Assistance	<p>CDFA should evaluate effectiveness of TA provided in the last round.</p> <p>Costs for project design prior to application submission can be prohibitive for smaller operations.</p> <p>NRCS-EQIP application process, which involves assistance from an NRCS field officer or engineer to plan the project prior to application, is more user-friendly for smaller operations.</p>	<p>2018 AMMP TA providers are required to submit data such as names of individuals that received assistance and those who submitted applications to CDFA to allow for this analysis.</p> <p>CDFA does not have field staff resources in regional offices to provide for individual project development assistance for all applicants. However, NRCS grants are considered as an allowable match to the AMMP, allowing those applicants who have worked with NRCS engineers, an opportunity to get supplemental grant funds through the AMMP. Project design</p>

		is an essential component of the technical review of applications for funding.
	CDFA should conduct a workshop on the application process and use of the QM.	CDFA conducted 3 workshops and a webinar during the 2018 AMMP application period. CDFA will consider additional workshops.
	Increase application submission time.	Application submission time for 2018 AMMP was 8 weeks. 2017 AMMP began with an application submission time of 6 weeks which was later extended to 8 weeks to accommodate these and other stakeholder comments.
Long-term viability for equipment purchased as part of AMMP award	Funding for future repairs on AMMP funded projects would be helpful, if available.	CDFA is unable to fund costs incurred outside of the grant agreement term.
General Comments	Smaller dairy producers/operations that currently do not manage manure under anaerobic conditions should be able to get credit or financial reward for practices they already implement or be exempt from impending regulations to ensure their survival.	CDFA is currently able to fund only dairies that have some sort of removal of an anaerobic system as that is the primary means of GHG production. GHG reductions are required for all projects since the funds are allocated from the CCI.
	CDFA should instate a process where stakeholders may suggest new practices for inclusion under the AMMP.	A Request for suggesting new management practices to be evaluated for inclusion under the AMMP was announced in May 2018. Submitted suggestions will be evaluated by CDFA and CARB staff for GHG emission reduction quantification potential for future rounds of AMMP funding.
	CDFA should consider funding research or new manure management technologies for testing.	CDFA cannot use funds from the CCI for research. CDFA is exploring other opportunities to fund critical research needs.