N-4. Require Best Management Practices for Manure Management

GHG Mitigation Potential

Varies

Variable reduction in GHG emissions from manure management practices

Co-Benefits (icon key on pg. 34)

Climate Resilience

Improving manure management can improve water and air quality, thereby improving community health and resilience. Depending on the alternative management practice, it can also increase the amount of compost produced, which can go toward gardens and farms and help improve soil health as well as food and crop production.

Health and Equity Considerations

Fertilizer and manure are major causes of groundwater contamination in California, especially in the Central Valley. Improved manure management can help to improve water quality for rural and vulnerable communities.

Measure Description

This measure will require best management practices for the management of manure from livestock. Well-managed pasture systems and aerobic dry composting systems tend to have lower emissions, while anaerobic wet handling systems generate more CH_4. This measure is thus intended for manure collection systems that are currently managed by anaerobic decomposition of manure volatile solids stored in a lagoon or other predominantly liquid anaerobic environment. Utilizing alternative practices to manage manure results in reduced agriculture emissions from livestock by decreasing the amount of volatile manure solids that are stored in wet, anaerobic conditions.

Scale of Application

Project/Site and Plan/Community

Implementation Requirements

Emission reductions can only be quantified for projects with existing manure management practices that include the anaerobic decomposition of manure volatile solids stored in a lagoon or other predominantly liquid anaerobic environment.

Cost Considerations

Incorporating best practices for manure management may entail initial costs to build the related storage and processing ability. Cost savings come in the form of reduced need for inputs like fertilizer if the manure is used on site and avoided water pollution and greenhouse gas emissions.

Expanded Mitigation Options

See the *GHG Reduction Formula* section below for tools to quantify GHG reductions from various alternative manure management practices.

GHG Reduction Formula

Users are directed to CARB's (2021) *Benefits Calculator Tool for the Alternative Manure Management Program* (AMMP tool). The AMMP tool quantifies GHG reductions from livestock manure management based on user-entered parameters, including the livestock type, number of cattle, the type of existing manure collection system, and the user's chosen alternative type of manure collection system. The AMMP tool is only applicable to users who have existing manure management practices that include the anaerobic decomposition of manure volatile solids stored in a lagoon or other predominantly liquid anaerobic environment.

The user can choose from many alternative manure management practices, such as pasture-based management, and various methods of solid separation and scrape conversion. The tool also quantifies GHG reductions from energy savings (e.g., MWh, diesel fuel gallons), if applicable.

Because of the wide range of manure management practices, which corresponds to GHG calculations that have many user-entered variables that influence the amount of GHGs reduced, this Handbook recommends that users use the AMMP tool directly. Tools like AMMP comprehensively account for these variables, enabling users easily to calculate the approximate benefits that each manure management practice will achieve.

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	GHGs reduced from alternative manure management	[ ]	MT CO_2e	calculated
User Inputs				
B	Project county	[ ]	text	user input
C	Type of alternative manure management practice to be adopted	[ ]	text	user input
D	Existing livestock by category	[ ]	text & number of livestock	user input
E	Existing manure collection practices	[ ]	text	user input
F	Existing number of months livestock spend at pasture	0–12	months	user input
G	Existing solid-separation and secondary solid separation	[ ]	text	user input
H	Existing storage/treatment practice for separated solids	[ ]	text	user input
I	Specification of milk produced, if applicable	[ ]	%	user input
J	Existing electricity consumption from manure management activities	[ ]	MWh per year	user input
K	Existing diesel fuel consumption from manure management activities	[ ]	gallons per year	user input
L	Alternative number of months livestock spend at pasture	0–12	months	user input

ID	Variable	Value	Unit	Source
M	Alternative solid-separation and secondary solid separation	[ ]	text	user input
N	Estimated alternative electricity consumption from alternative manure management activities	[ ]	MWh per year	user input
O	Estimated alternative diesel fuel consumption from alternative manure management activities	[ ]	gallons per year	user input
P	List of stationary and mobile sources associated with manure management activities	[ ]	text	user input
Constants, Assumptions, and Available Defaults				
	None			

Further explanation of key variables:

- (A) – The GHG reductions achieved by the implementation of alternative manure management practices are calculated by the AMMP tool. On the GHG Summary tab of the AMMP tool, the GHG reduction is given for a 5-year period. Thus, if the user would like to know the annual number of reductions, that value can be found on the For Technical Reviewers tab of the tool, or by simply dividing the 5-year reduction by 5.

  For more information on the inputs for the AMMP tool, users should refer to the AMMP tool user guide, which provides technical details on the input parameters of the tool (CARB 2019).

GHG Calculation Caps or Maximums

None.

Example GHG Reduction Quantification

The user's livestock operation in Sonoma County (B) currently has 400 lactating dairy cows in freestalls, 100 dry cows, and 100 grazing heifers (D). The current manure management technique has a flush system for freestalls and milking parlors (E), and all cattle are at pasture for 9 months per year (F, L). There is no solid separation currently, and this will not change for the alternative practices (G, H, M). The current energy consumption is 200 MWh per year of electricity (J) and 600 gallons per year of diesel fuel (K). The average milk production is 55 lbs per day per cow, with 3.75 percent milk fat, 3 percent true protein, and 4.9 percent lactose (I). The alternative manure management practice will involve the installation of a new compost bedded pack barn (C). With the alternative manure management practices, electricity consumption will be reduced to 150 MWh per year (N), and diesel consumption will increase to 1,200 gallons per year (O). Based on these inputs, the user will reduce GHG emissions by 2,720 MT CO_2e for five years, or 544 MT CO_2e per year. This example is taken from the AMMP tool user guide (CARB 2019).

Quantified Co-Benefits

The AMMP tool calculates criteria pollutant reductions (lb), fuel savings (gallons of diesel), and soil health benefits (tons of compost production). All values are over a 5-year project life.

Sources

- California Air Resources Board (CARB). 2019. *User Guide–California Department of Food and Agriculture Alternative Manure Management Program*. Available: https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/cdfa_ammp_finaluserguide_2-8-19.pdf. Accessed: January 2021.
- California Air Resources Board (CARB). 2021. CCI Quantification, Benefits, and Reporting Materials. Available: https://ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials. Accessed: January 2021.