Assessing livestock greenhouse gas emissions with **COMET**-Farm

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Introduction to COMET-Farm

COMET-Farm is an integrated web-based decision support tool developed to aid farmers, agricultural producers, land managers and conservationists.

COMET-Farm provides total farm greenhouse gas (GHG) accounting and carbon sequestration occurring from these practices:

- Cropland, Pasture & Range
- Livestock
- Agroforestry
- Energy usage

By generating reports from users' current and potential future management scenarios, COMET-Farm allows users to evaluate how conservation practices may reduce GHG emissions and sequester carbon.

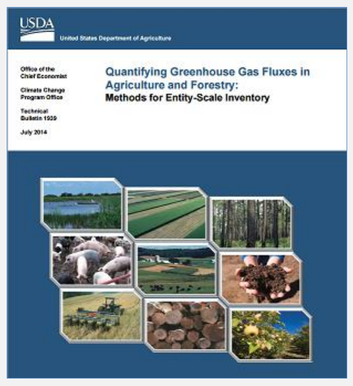
Animal Agriculture

Photo courtesy of USDA Natural Resources Conservation Service

Livestock management practices contribute a significant amount of GHG emissions in the agricultural sector. COMET-Farm reports estimate:

- Methane from enteric fermentation
- Methane from housing and manure management
- Nitrous oxide from housing and manure management

Scientific Basis



COMET-Farm utilizes peer-reviewed greenhouse gas (GHG) inventory methods published by the USDA. The USDA report provides methods for estimating changes in GHG emissions and carbon storage at the farm scale. COMET-Farm integrates these methods into a powerful and useful tool.

Using COMET-Farm

Animal Agriculture Demo

This poster showcases the capabilities of the Animal Agriculture module of COMET-Farm utilizing real data from California Polytechnic State University's Cal Poly Dairy in San Luis Obispo.

Baseline Scenario

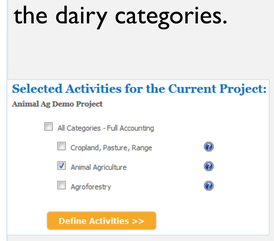
- Population of 350 cows including heifers and calves
- 180 lactating cows
- Housed in free stall barns
- Manure flushed into a single-cell lagoon

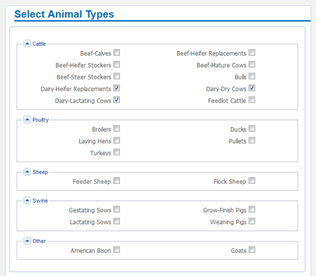
Future Scenario: Digester Install

- A methane recovery system has been constructed at the dairy.
- The new anaerobic digester system is a covered lagoon with a flexible membrane cover that floats on the surface and a gas collection system attached.
- Biogas that is captured generates electricity for the dairy.

Getting Started

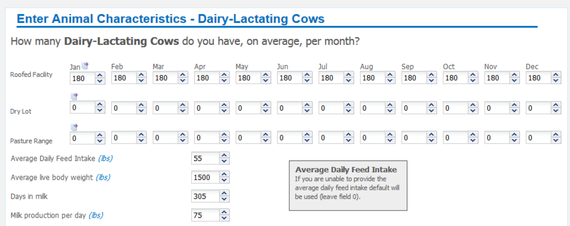
Creating a livestock project in COMET-Farm is easy. Simply create and name your customized project and begin to define activities. COMET-Farm relies on accurate climate data so location information is collected. Methods have been implemented to quantify emissions from a wide range of livestock categories. For the purpose of this poster we will be showcasing the dairy categories.





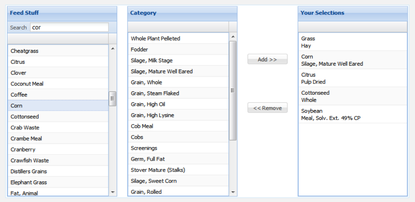
Animal Details

Specific management data is collected from the user, starting with Animal Details. Animal details such as monthly populations, feed intake and milk production for each animal category are recorded.



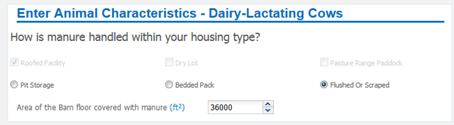
Types of Feed

Next, detailed feed information is collected from the user to carefully estimate enteric fermentation. The user may adjust feed types on a month to month basis.



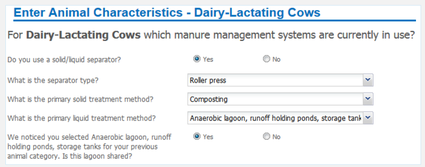
Housing Details

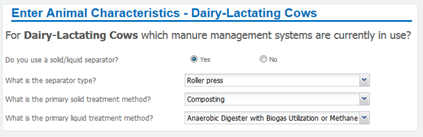
Detailed housing information is selected to accurately measure housing emissions.

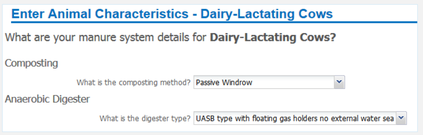


Manure System Types and Details

Finally, manure details are collected, including detailed information on the manure system type as well as specific manure details. Below are examples from the Baseline and future Digester Install scenario.

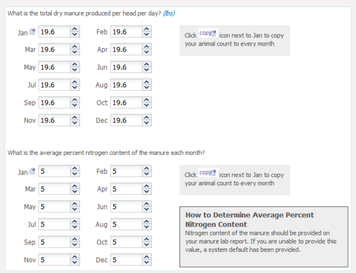






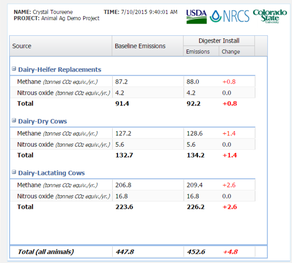
Manure System Types and Details

Finally, specific manure details are collected. These fields are prepopulated with default values allowing the user to edit them if needed.

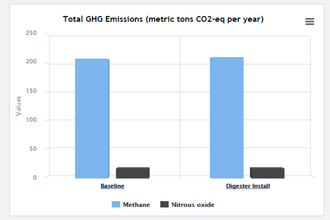


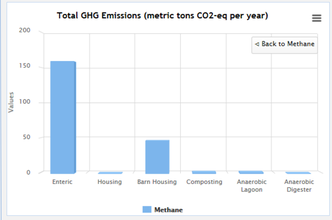
Report

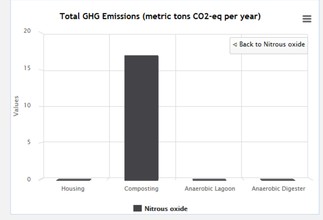
Using the methods in the USDA document, *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry*, COMET-Farm calculates potential changes in GHG emissions and carbon storage. Results are provided in easy to read detailed tables and interactive graphical reports.



The detailed report allows users to explore each source category in more detail. The interactive graphical report allows users to click an emission category and see a detailed breakdown of each source category.







The example above shows the change in emissions when an anaerobic digester with methane recovery is installed in a future scenario. Sometimes we see an increase in overall methane emissions when a digester is installed due to digester leakage. The methane generated by anaerobic digesters is usually burned in a generator to produce on-farm electricity, is burned to heat water and buildings, or is piped to be used elsewhere to offset burning fossil methane (natural gas) in another location. These avoided fossil fuel emissions are a significant part of the overall life cycle benefit of installing anaerobic digesters, and that is the main GHG benefit to installing an anaerobic digester.

Conclusion

COMET-Farm estimates the 'carbon footprint' for all or part of the producers farm/ranch operation and allows users to evaluate options for reducing GHG emissions and maximizing carbon sequestration. Users are able to create up to 10 future scenarios with varying conservation practices to compare GHG mitigation strategies. COMET-Farm is a powerful tool designed to help agricultural producers make on-farm decisions to reduce energy costs, reduce GHG emissions and build soil health.

Acknowledgements

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