



# Climate Change Mitigation and Adaptation in Dairy Production Systems of the Great Lakes Region



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To better understand how dairy agriculture can become more sustainable, the U.S. Department of Agriculture is investing in a large, collaborative research project to examine dairy production systems across the Great Lakes region.

The project aims to identify where in the life cycle of a dairy farm beneficial management practices can be applied to reduce greenhouse gases and where adaptation measures can be used without sacrificing productivity or profit to the farmer.

## Cow Research

- The cow itself is the largest source of methane gas on dairy farms. Methane is about 25 times more potent than carbon dioxide as a greenhouse gas.
- Researchers are conducting experiments on forage digestibility to see if cows will produce less methane and ammonia when fed diets with different levels of neutral detergent fiber (NDF).
- Improved feed efficiency is one of the most important mitigation measures that can be implemented on dairy farms.



## Manure Research

- Nitrous oxide is 300 times more potent than carbon dioxide and is released when manure and commercial fertilizers are applied to fields.
- Experiments show that different methods of storing, processing, and handling manure before and after it is applied to fields results in different emissions levels.
- Manure management is one of the most important ways of reducing greenhouse gas emissions on dairy farms.



## Soil and Cropping Research

- Scientists are collecting greenhouse gas emissions data on different cropping systems typically used in dairy operations.
- Data are being collected at five research sites in Wisconsin, Pennsylvania and New York.
- Gases are collected after different manure application methods to determine which produce the lowest greenhouse gas emissions.
- Changing how cover crops, crop rotations and manure applications are used can promote sustainability on dairy farms.



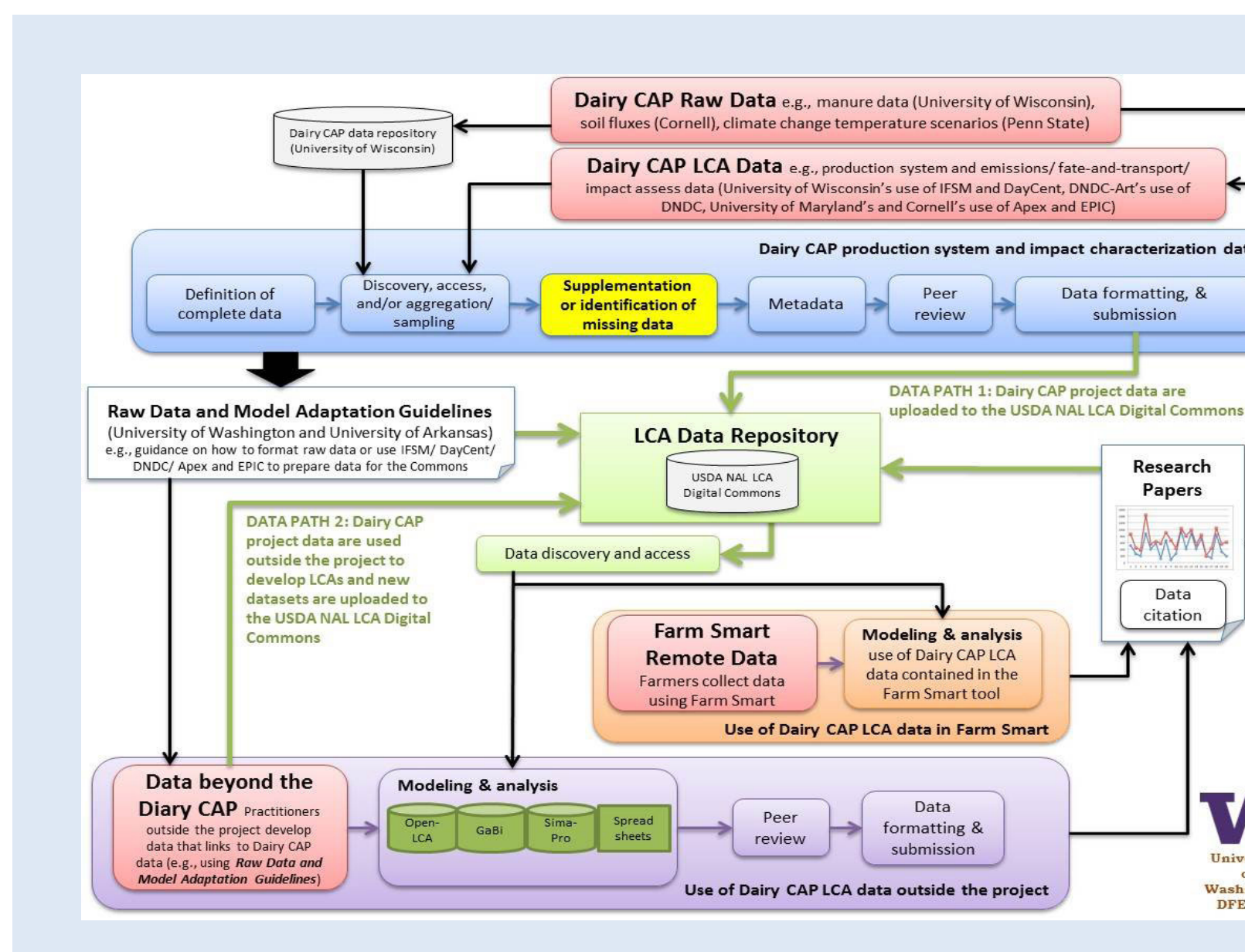
## Adaptation Research

- Extreme weather events like flooding and drought are becoming more frequent.
- Research is identifying how soils can be more resilient to extreme precipitation events by holding or moving water.
- Global climate models were downscaled to the Great Lakes region and will be integrated with farming process models to predict the effects of climate change on farm practices.



## Computer Modeling

- Computer models are used to estimate greenhouse warming potential and nutrient losses from different parts of the farm.
- Data collected by the field researchers will help improve the accuracy of predicting greenhouse gas emissions and rates of carbon capture in the soil.
- Life cycle analysis of dairy farms will pinpoint where in the dairy production process alternative management practices can be implemented to improve resilience.



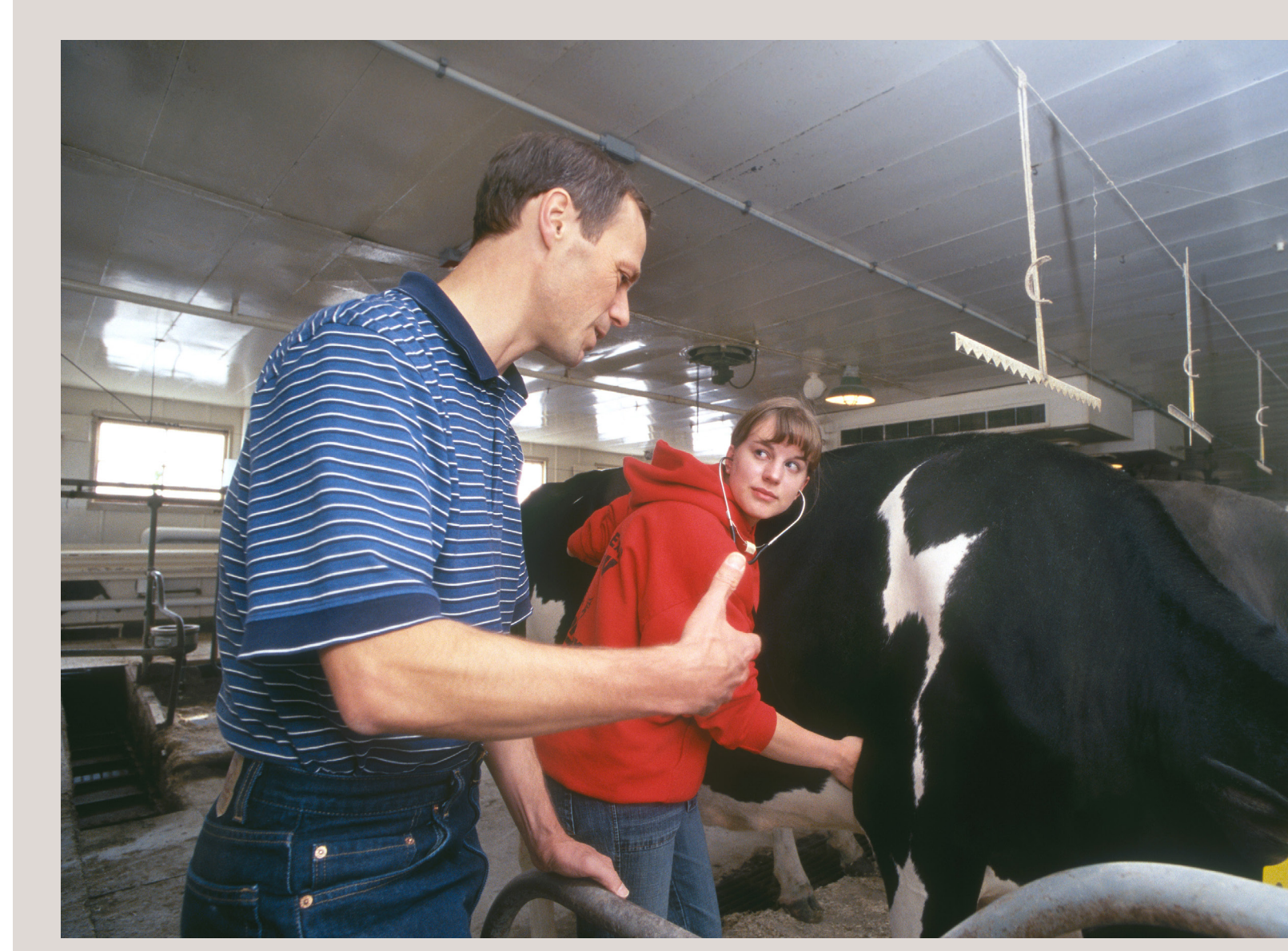
## Outreach and Extension

- A refined measurement tool is being developed to account for emissions for the whole life cycle of the farm.
- An economic tool is being tested to price the various manure management systems available to producers.
- Research results are shared with farmers and their advisors showing how beneficial management practices can be used to improve resilience to climate change and improve sustainability.



## Education

- An agricultural curriculum that is being developed and used at Vincent High School in Milwaukee will be shared with other high schools interested in urban agriculture.
- Summer undergraduate internships are hosted by the University of Wisconsin-Madison, Penn State University, Cornell University and North Carolina Ag & Tech State University.
- Research results will be available to enhance graduate and undergraduate curriculum in sustainability.



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