A Farmer and Rancher Guide to Climate-Smart Agriculture: Impact Worksheet

A companion calculator to the Field Guide

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Manure Management Calculator

This worksheet was created to give you a general value for your carbon sequestration or avoidance impact from implementation of climate smart practices. These values will not be exact but will help you gain a general understanding of your influence on climate resilience. As you implement more practices, revisit this worksheet to monitor your progress to achieving your climate smart goals.

Values in this worksheet were derived from the California Air Resources Board and California Department of Food and Agriculture Alternative Manure Management Program Calculator and Healthy Soils Program COMET-Planner Tool. To read the quantification methodologies of these tools, visit ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials. (Section: Natural Resources and Waste Diversion; Agency: California Department of Food and Agriculture; Project Type: Alternative Manure Management Practices)

How to use this worksheet

This worksheet is set up with a column of different manure management practices and their corresponding avoidance impacts. Manure management impacts differ based on two things: manure collection and solids management. Manure is either collected using a **flush system** (high velocity water moved down alleyways to push manure to the collection pond) or **scraping** (mechanically moving manure using a tractor/skid steer or automatic alleyway scrapers to push manure to the collection pond). Solids may be managed in a multitude of ways.

When operating a compost bedded pack barn, solids are aerated twice daily with regular management. When separating solids, managers can implement solid storage (solids stored without treatment until use), in-vessel composting (material moved to a rotating drum, reaching ≥ 131°F for 3 days), static pile composting (solids piled over an aeration system, reaching ≥ 131°F for 3 days), or windrow composting (piling solids and turning the material every 3 days, reaching ≥ 131°F for 15 days). While other management strategies exist, this worksheet focuses on these popular solutions.

Information to gather:

- ☐ Number of cows
- ☐ Manure collection system
  - ☐ Scraped manure
  - ☐ Flushed manure
- ☐ Months cows pastured (Account for hours of daily pasturing; if pasture 3 months for 12 hours per day, use 1.5 months, etc.)
- ☐ Practices being implemented
- ☐ Solids management
  - ☐ Compost bedded pack barn
  - ☐ Solid storage
  - ☐ In-vessel/static pile composting
  - ☐ Windrow composting

Inputting your Information:

1. Determine the manure collection system and use the appropriate sheet (flush or scrape)
2. Locate the practice being implemented
3. Choose the solids management used with the practice implemented in the column
4. Multiply avoidance value by the number of cows impacted by the practice
5. Subtract the number of months pastured from 12 (12 - # months) and divide the value by 12
6. Multiple the value from #4 by the value from #5 to determine total avoidance value

Notes:

- If your dairy implements both compost bedded pack barn and solid separation management, please contact UCCE for assistance, as this worksheet will overestimate the value
- This worksheet uses weather values for Sonoma/Marin County farms
- Changes in diesel and electricity are not accounted for in this worksheet
- This worksheet assumes manure is stored in a liquid slurry pond with a natural crust cover

Manure Management Calculator: Flush Manure Collection

Practices	Cows #					Months Pasture Access	Cows #	Total Reductions
Compost Bedded Pack Barn	(_____	x	4.89)	- (0.408	x	_____	x _____) =	_____
Manure Separation + Composting								
Weeping Wall								
Solid Storage	(_____	x	11.714)	- (0.976	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0)	- (0	x	_____	x _____) =	_____
Windrow	(_____	x	0)	- (0	x	_____	x _____) =	_____
Stationary Screen								
Solid Storage	(_____	x	7.904)	- (0.659	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.486)	- (0.041	x	_____	x _____) =	_____
Windrow	(_____	x	0.416)	- (0.035	x	_____	x _____) =	_____
Vibrating Screen								
Solid Storage	(_____	x	3.952)	- (0.329	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.243)	- (0.020	x	_____	x _____) =	_____
Windrow	(_____	x	0.208)	- (0.017	x	_____	x _____) =	_____
Screw Press								
Solid Storage	(_____	x	6.587)	- (0.549	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.404)	- (0.034	x	_____	x _____) =	_____
Windrow	(_____	x	0.346)	- (0.029	x	_____	x _____) =	_____
Centrifuge								
Solid Storage	(_____	x	13.173)	- (1.098	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.81)	- (0.068	x	_____	x _____) =	_____
Windrow	(_____	x	0.694)	- (0.058	x	_____	x _____) =	_____
Roller Drum								
Solid Storage	(_____	x	6.587)	- (0.549	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.404)	- (0.034	x	_____	x _____) =	_____
Windrow	(_____	x	0.346)	- (0.029	x	_____	x _____) =	_____
Belt Press/Screen								
Solid Storage	(_____	x	13.173)	- (1.098	x	_____	x _____) =	_____
In-Vessel/Static Pile	(_____	x	0.81)	- (0.068	x	_____	x _____) =	_____
Windrow	(_____	x	0.694)	- (0.058	x	_____	x _____) =	_____
Total Reductions								_____

Manure Management Calculator: Scrape Manure Collection

Practices	Cows #						Months Pasture Access		Cows #		Total Reductions
Compost Bedded Pack Barn	(_____	x	6.677)	-	(0.556	x	_____	x	_____	) =	_____
Manure Separation + Composting											
Weeping Wall											
Solid Storage	(_____	x	-2.023)	-	(-0.169	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	0)	-	(0	x	_____	x	_____	) =	_____
Windrow	(_____	x	0)	-	(0	x	_____	x	_____	) =	_____
Stationary Screen											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Vibrating Screen											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Screw Press											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Centrifuge											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Roller Drum											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Belt Press/Screen											
Solid Storage	(_____	x	5.261)	-	(0.438	x	_____	x	_____	) =	_____
In-Vessel/Static Pile	(_____	x	1.416)	-	(0.118	x	_____	x	_____	) =	_____
Windrow	(_____	x	1.214)	-	(0.101	x	_____	x	_____	) =	_____
Total Reductions											_____

Sequestration Equivalents

Sequestration Equivalents	Total Avoidance				Equivalent Value
Sequestration Equivalent to GHG Emission from:					
Gasoline-powered passenger vehicles driven for 1 year	_____	x	0.223	=	_____
Miles driven by an average gasoline-powered passenger vehicle	_____	x	2,564	=	_____
Number of smartphones charged	_____	x	121,643	=	_____
Sequestration Equivalent to GHG emission avoided by:					
Wind turbines running for 1 year	_____	x	0.0003	=	_____
Trash bags of waste recycled instead of landfilled	_____	x	43.4	=	_____
Sequestration Equivalent to carbon sequestered by:					
Tree seedlings grown for 10 years	_____	x	16.5	=	_____
Acres of US forests in one year	_____	x	1.2	=	_____