Animal Waste Management Systems Expert Panel

Working Draft Report Update

09/07/2016

Panel Composition

Shawn Hawkins, PhD, P.E. 	Panel Chair, Animal Waste Management Specialist University of Tennessee
Peter Vanderstappen, P.E. 	Pennsylvania Assistant State Engineer USDA NRCS
Doug Hamilton, PhD, P.E. 	Animal Waste Management Specialist Oklahoma State University
Mark Risse, PhD, P.E. 	Director of Marine Outreach University of Georgia
Jonathon Moyle, PhD 	Poultry Extension Specialist University of Maryland
Bridgett McIntosh, PhD 	Equine Extension Specialist University of Virginia
Mark Dubin 	Chesapeake Bay Agricultural Technical Coordinator University of Maryland
Matt Johnston	Chesapeake Bay Program Non-Point Source Analyst University of Maryland

Animal Waste Management Systems

- "Practices designed for proper handling, storage, and utilization of wastes generated from confined animal operations"

- CBP Watershed Model component
  - Baseline manure nutrient losses for "before" or "improper storage and handling"
  - AWMS BMP applied to reduce the baseline loss for "after" or "proper storage and handling"

Panel Directives

- Report % recoverably of manure generated:
  - Focus on time confined to the "barnyard"
  - Disregard time on pasture to loaf or graze
- Limit recoverability:
  - Consider the effect of manure storages
  - Disregard storm water diversions, fencing
  - Disregard mortality management

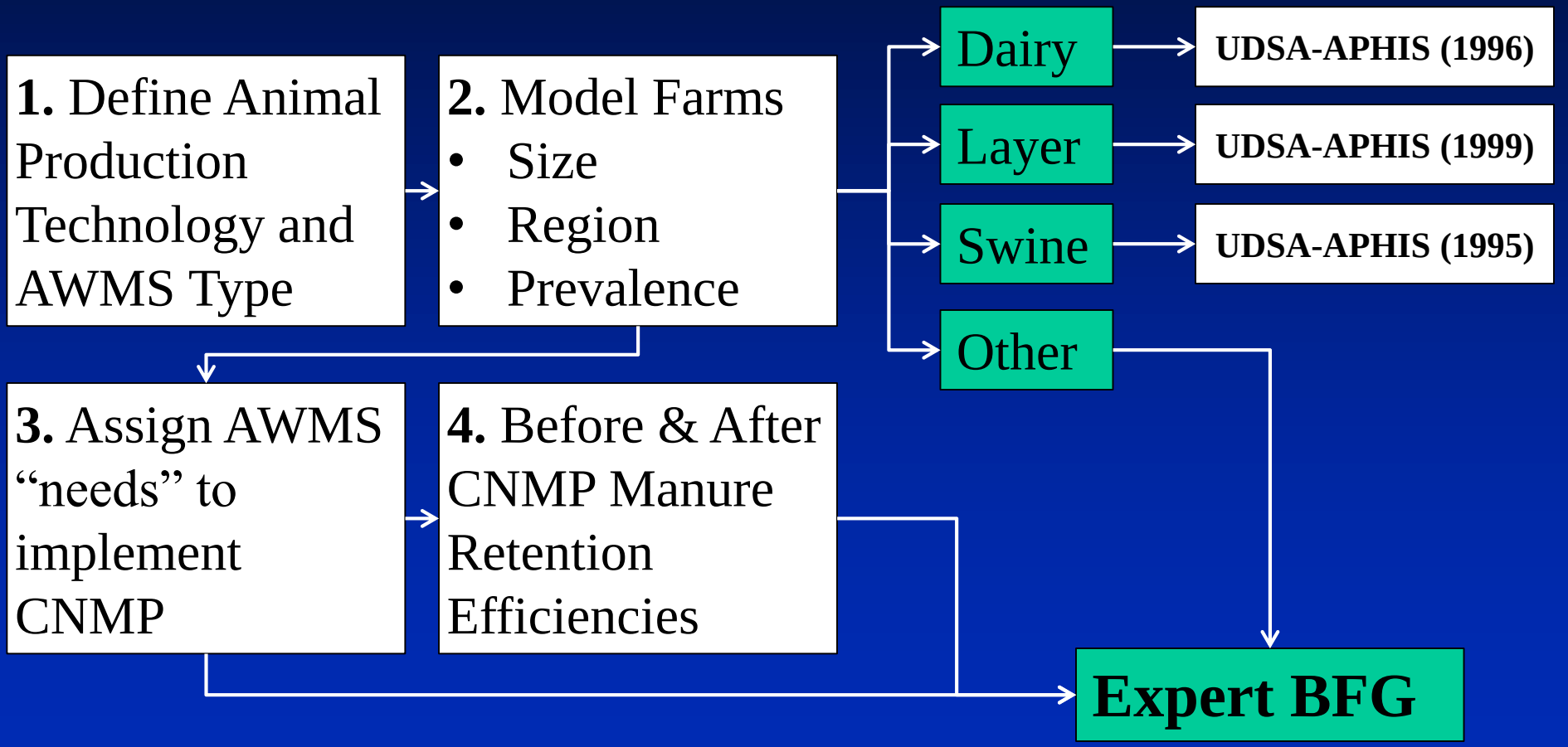
Panel Limitations

- There are no data that assign different types of AWMSs to CBW farms – both for the "before" and "after" conditions
- "Section 1619" regulations protect individual landowner data from public release without their written consent – AWMS BMP data are available but not assigned to an animal type

Primary Reference

- USDA NRCS Table B3: "Costs Associated with Development and Implementation of Comprehensive Nutrient Management Plans. Part I – Nutrient Management, Land Treatment, Manure and Wastewater Handling and Storage, and Recordkeeping"

CNMP "Needs" for Manure and Wastewater Storage



Dairy

Primary Reference Dairy AWMSs

Model farms "derived" from 1996 USDA-APHIS survey of 2,542 dairies in 20 states (PA & NY)

#1 Essentially no storage (frequent spreading)

#2 Solids storage, no liquid storage (assumed to be "typically outside")

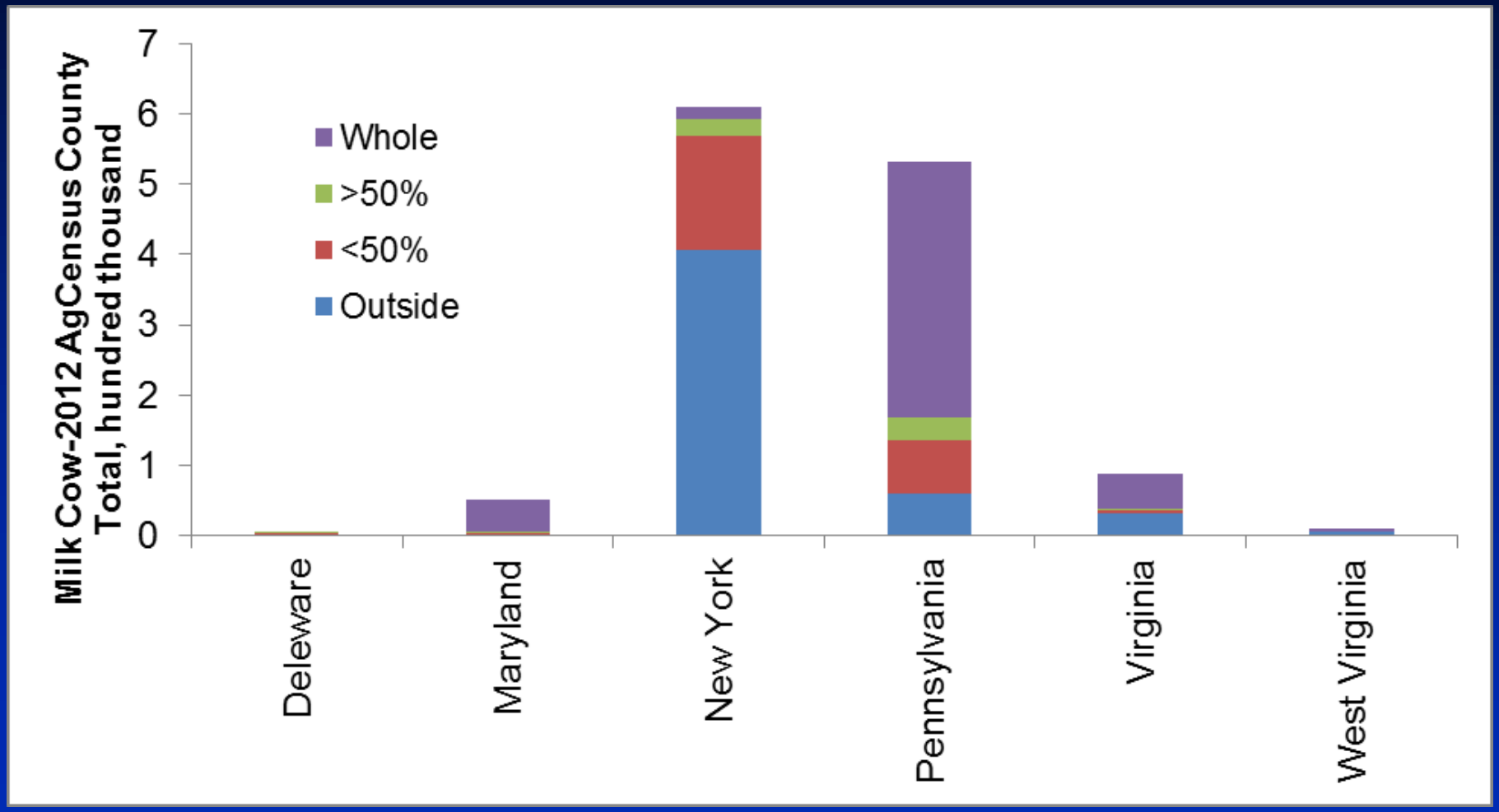
#3 Liquid-Slurry storage, deep pit or above ground tank (no earthen storage), some solids storage (spreading > monthly)

#4 Liquid storage in earthen impoundments or "lagoons", some solids storage, (spreading > monthly)

Primary Reference Dairy Size

- < 35 USDA Animal Units (≈ 26 head)
  - #1 model farm only
- 35-135 AU (≈ 26-100 head)
  - All model farms
- 135-270 AU (≈ 100-200 head)
  - All model farms
- > 270 AU (≈ > 200 head)
  - #2 and #3 model farms only

Panel Research: 2012 AgCensus



Panel Research: 2012 AgCensus

Pennsylvania Dairy Farm Data

Farm Size	Lancaster		Franklin		All Others	
	# cows	%	# cows	%	# cows	%
1-9	377	0%	62	0%	738	0%
10-19	205	0%	132	0%	1257	0%
20-49	**33936**	**10%**	**2217**	**1%**	**29548**	**9%**
50-99	**43449**	**13%**	**12279**	**4%**	**69291**	**20%**
100-199	11784	3%	16067	5%	39825	12%
200-499	5474	2%	10158	3%	28172	8%
500+	15580	5%	5489	2%	16696	5%
Grand Total	**110,805**	**32%**	46,404	14%	185,527	54%

Basis for Nutrient Retention

Model Farm			Farm "Needs" to Implement CNMP		% recovered					
					Before			After		
Size	AWMS	%	Conservation Practice Standard	%	M	N	P	M	N	P
35-135	No storage	29	~~558: Roof runoff management~~	80	45	60	80	50	60	80
			~~362: Earth berm, underground outlet~~	50						
			634: Solids Collection	10						
			313: Solids Storage	100						
			635: Liquid Treatment	65						
	Solids storage	47	~~558: Roof runoff management~~	80	60	80	90	75	80	90
			~~362: Earth berm, underground outlet~~	50						
			634: Solids Collection	10						
			313: Solids Storage	20						
	Liquid slurry storage pit or tank	7	~~558: Roof runoff management~~	40	55	75	90	75	75	90
			~~362: Earth berm, underground outlet~~	30						
			313: Slurry storage	20						
			533: Liquid transfer	30						
	Liquid system pond or lagoon	17	~~558: Roof runoff management~~	40	60	40	90	75	30	90
			~~362: Earth berm, underground outlet~~	40						
			634: Liquid collection	30						
			313: Liquid storage	20						
			533: Liquid transfer	30						

Dairy Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (PA, NY)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
#1 No storage	29	45-50	50
#2 Solids storage	47	50-60	75
#3 Liquid deep pit/slurry	7	55	75
#4 Liquid basin/pond/lagoon	17	55-60	75

1. Dairy size has limited effect on recoverability – differences are shown as ranges.
2. Different model farms/values exist for Southeast (DE, MD, VA, WV) – but those states were not a part of the survey.
3. Some dairies switch from solids to liquid storage which increases manure recovered but lowers %N in manure.

- **These factors are low, particularly for the "after" condition**
- **Prim Ref author Moffitt: "dairy systems involve grazing and loafing on pasture, manure deposited on these areas would be considered non recovered"**

Apparent Manure Collection %

Wisconsin: Powell, McCrory, et al., 2005

- "AMC as a fraction of the manure generated varies regionally and is correlated positively with the number of lactating animals"
  - AMC for 100-199 lactating cows: 95 ± 5%
  - AMC for 200+ lactating cows: 100%

- All dairy reported some storage capacity

Dairy EP Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (PA, NY)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
#1 No storage	29	45-50	50
#2 Solids storage	47	50-60	75
#3 Liquid deep pit/slurry	7	55	75
#4 Liquid basin/pond/lagoon	17	55-60	75

1. Dairy size has limited effect on recoverability – differences are shown as ranges.
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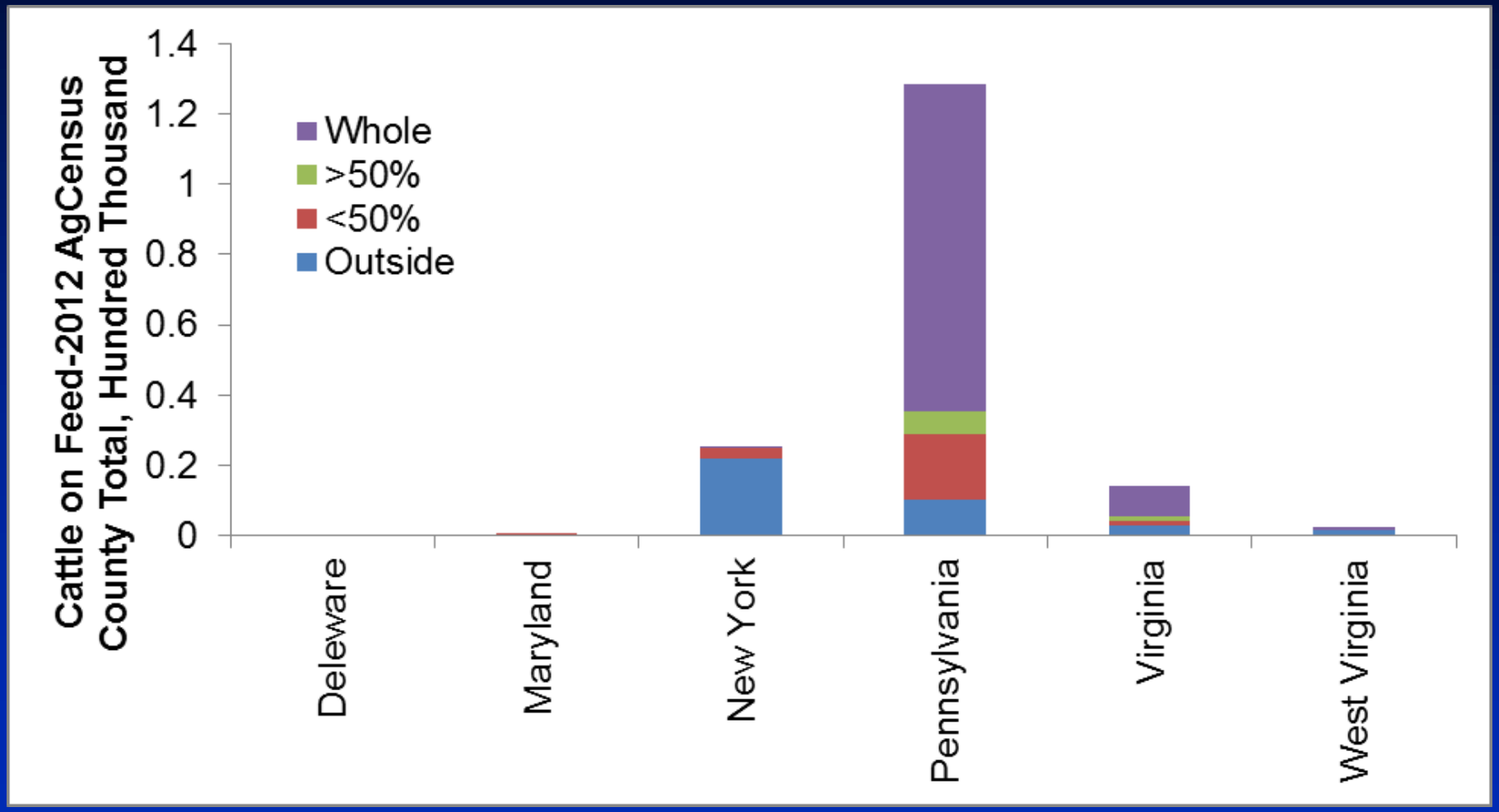
3. Some dairies switch from solids to liquid storage which increases manure recovered but lowers %N in manure.

Expert Panel Recommendations			
Model Farm	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Mixed	100	**60**	**96**

2012 Ag Census-Fattened Cattle



Fattened Cattle Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (PA, NY, NY)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Feedlot scrape, stack	100	60	75

Expert Panel Recommendations				
Model Farm (Tara Felix consult)	**% of Farms**		**% Manure Recovered**	
	Before	**After**	**Before**	**After**
Feedlot scrape, stack	100	0	60	-
Bedded Pack Barn	0	100	-	99

Swine Recoverability Factors

Hogs for Slaughter

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (DE, MD, PA, NY , VA, WV) (Midwest, NE)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
#1 Confined, liquid, ~~lagoon~~	6	85	97
#2 Confined, slurry, no lagoon	53	80	
#3 Building/outside, liquid	14	70	95
#4 Building/outside, solid	27	75	90

1. #3 and #4 should be excluded for CBW.
2. Farm size has no effect on recoverability.

Expert Panel Recommendations			
Model Farm	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Confined, slurry-liquid	100	80	99

Layer Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (DE, MD, PA, NY , VA, WV)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
#1a High rise, ground level pit	55	80	95
#1b Shallow pit, ground level	25	85	
#3 Manure belt	20	85	
1. Model farms were "derived" from a 1999 USDA, APHIS survey of 526 layer farms in 15 states.			

Chesapeake Bay Model			
Model Farm	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Mixed	100	85	99

Broiler Recoverability Factors

(same as Pullets)

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm (broiler house)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Northeast (PA, NY)	100	75	98
Southeast (DE, MD, VA, WV)	100	85	
1. Those with and without storage are unknown?			

Chesapeake Bay Model			
Model Farm	**% of Farms**	**% Manure Recovered**	
		Before	**After**
CBW Confinement House	100	85	99

Turkey Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I			
Model Farm East (DE, MD, PA, NY, VA, WV)	**% of Farms**	**% Manure Recovered**	
		Before	**After**
#1 Confinement Houses	90	80	98
#2 Turkey Ranch	10	45	50
1. Those with and without storage are unknown?			

Chesapeake Bay Model (refers to North Central area?)			
Model Farm	**% of Farms**	**% Manure Recovered**	
		Before	**After**
Confinement Houses	100	85	99

Equine/small ruminant

- "Recoverable manure … was estimated using manure recoverability factors and nutrient recovery parameters for grass-fed beef cattle"
  - Pastured animals excluded EP consideration
  - Ref Doc does not apply to stabled horses
  - Recommend 99% of manure is collected and stored for land application during stabling