Animal Waste Management Systems Expert Panel

Preliminary Report

06/16/2016

Panel Composition

Shawn Hawkins, PhD, P.E. 	Panel Chair, Animal Waste Management Specialist University of Tennessee
Peter Vanderstapen, 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, PhD	Chesapeake Bay Program Non-Point Source Analyst University of Maryland

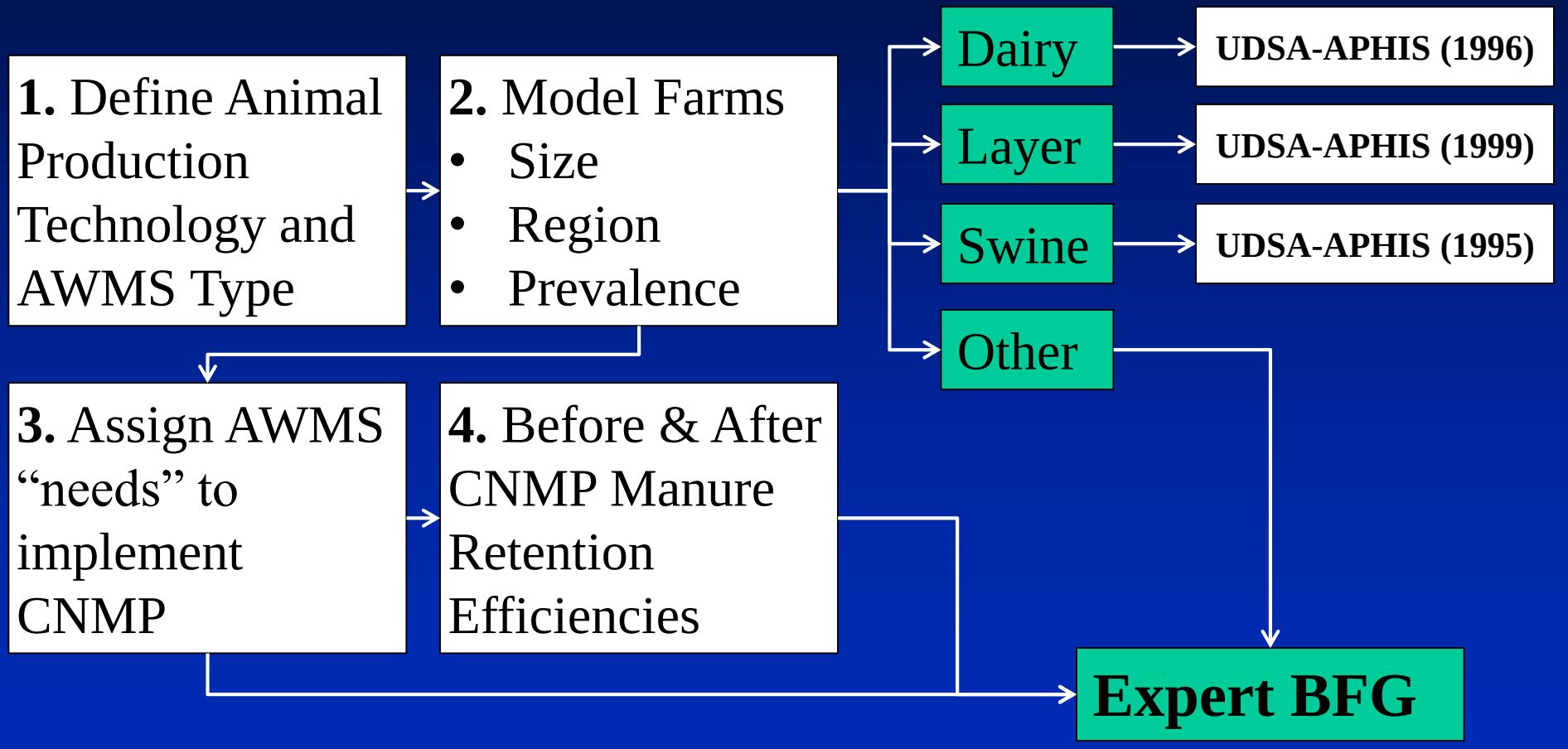
Panel Topic

- Animal Waste Management System (AWMS)
  - "practices designed for proper handling, storage, and utilization of wastes generated from confined animal operations"
  - CBP Watershed Model component
    - Baseline manure nutrient losses from "improper storage and handling" (Solids – Liquid)
    - AWMS BMP is applied to reduce the baseline loss
- An AWMS is NOT simply a storage facility

Suggested References

- USDA NRCS: Chapter 11, AWMFH, Waste Utilization (only Table 11-5 is useful)
  - USDA NRCS: Chapter 9, AWMFH, AWMS
- 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



Model 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")

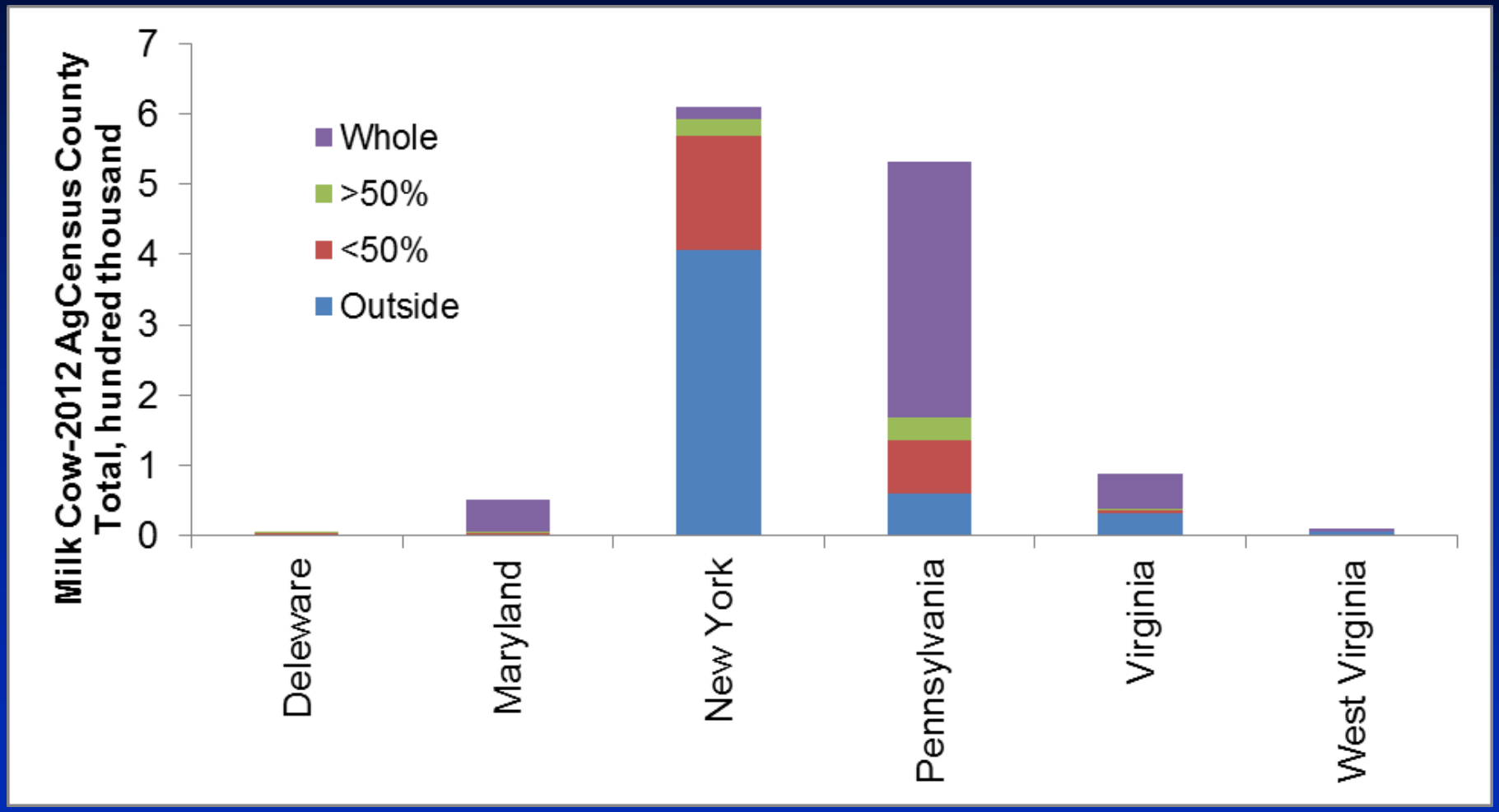
#3 Liquid-Slurry storage, deep pit or above ground tank (no earthen storage), some solids storage (spreading > monthly)

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

Model Dairy Sizes

- < 35 USDA Animal Units
  - Not a part of the survey
  - #1 model farm only
- 35-135 AU
  - All model farms
- 135-270 AU
  - All model farms
- > 270 AU
  - #2 and #3 model farms only

Panel Research: 2012 AgCensus



Panel Research: 2012 AgCensus

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%

Dairy Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm (PA, NY)	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1 No storage	29	45-50	**50**	60	60-80	80-85	80-90
#2 Solids storage	47	50-60	75	70-80	**40**-80	90	90
#3 Liquid deep pit/slurry	7	55	75	75	75		
#4 Liquid basin/pond/lagoon	17	55-60	75	**40**	**30**		

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.

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	55.3	67.75	?	?	?	?

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						

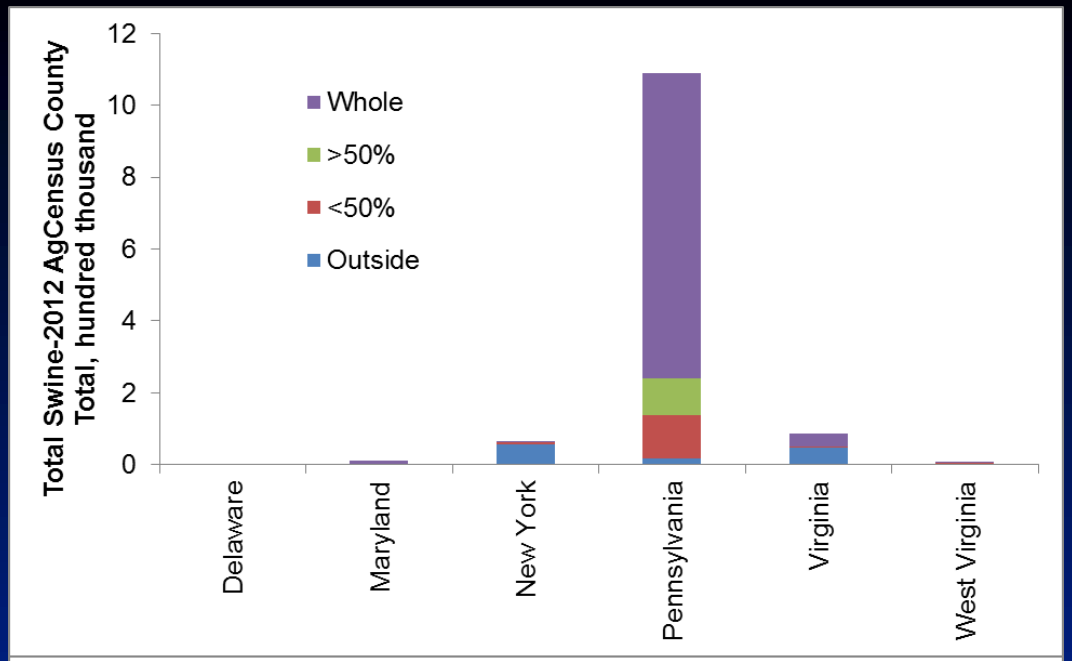
Phase 6 Model

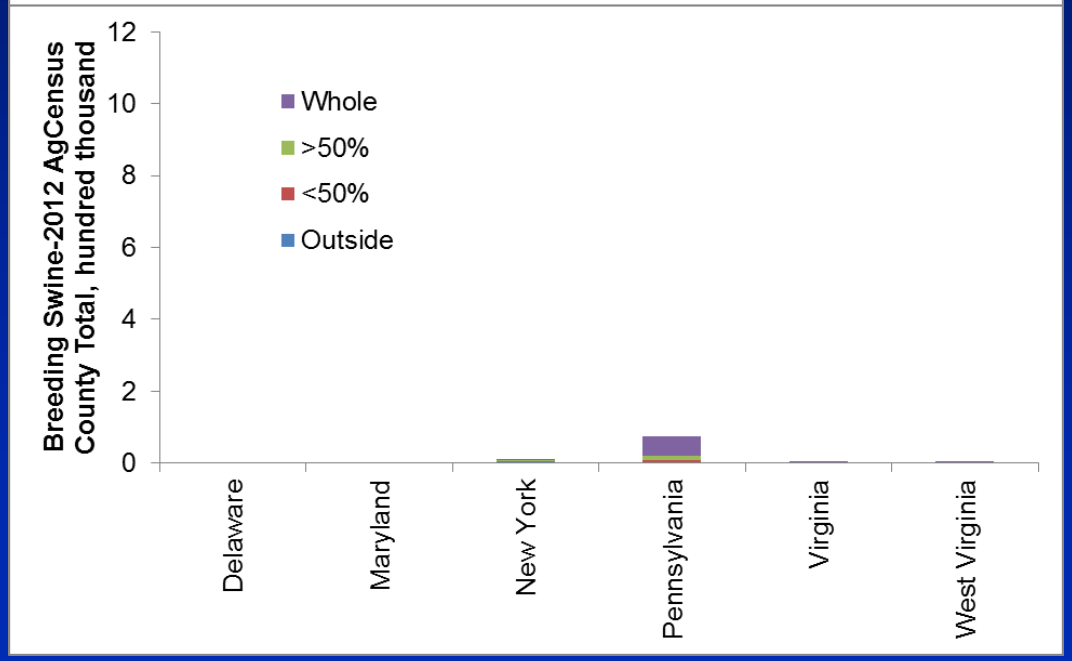
Draft Percent Recoverability Factors for Manure

Animal Type (Ref Doc Region)	"Before" Loss	AWMS BMP Reduction
Dairy (North Central, Northeast Milk Cows)	49	75
Broilers (Northeast)	25	
Layers and Pullets (North Central and Northeast)	15	
Turkeys (East)	23.5	
Beef (PA, NY, NJ Fattened Cattle)	40	
Other Cattle (Average Beef and Dairy)	45	
Hogs for Breeding (North Central and Northeast)	25	
Hogs for Slaughter (Northeast Pastured)	0.7	
All Horses, Sheep and Goats (Northeast Pastured)	0.59	

QUESTIONS

Panel Research: 2012 AgCensus





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**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1 Confined, liquid, lagoon	6	85	97	25		85	
#2 Confined, slurry, no lagoon	53	80		80		90	
#3 Building/outside, liquid	14	70	95	75		90	
#4 Building/outside, solid	27	75	90	70		80	

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

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	77.5	94.83	?	?	?	?

Swine Recoverability Factors

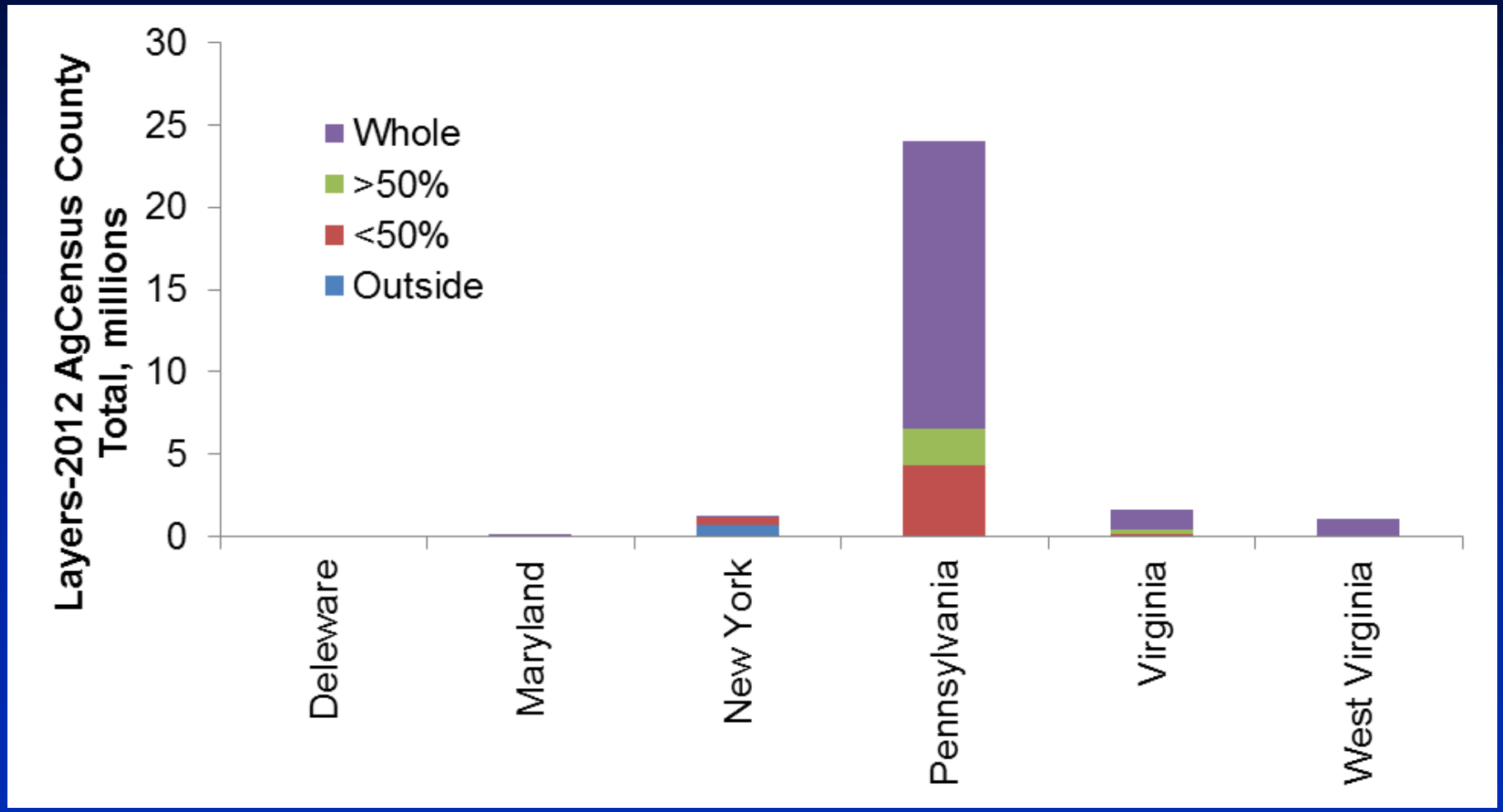
Hogs for Breeding

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm (DE, MD, PA, NY , VA, WV)	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1 Confined, liquid, lagoon	6	85	97	25		85	
#2 Confined, slurry, no lagoon	53	80		80		90	
#4 Building/outside, solid	27	75	90	70		80	

1. Farms with < 35 AU are not represented in this table; use pasture/lot. Otherwise, farm size has no effect on recoverability for the model farms. **Values are identical to Hogs for Slaughter.**

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	79.8	96.02	?	?	?	?

Panel Research: 2012 AgCensus



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**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1a High rise, ground level pit	55	80	95	70		95	
#1b Shallow pit, ground level	25	85		85		90	
#3 Manure belt	20	85		70		95	
1. Model farms were "derived" from a 1999 USDA, APHIS survey of 526 layer farms in 15 states.							

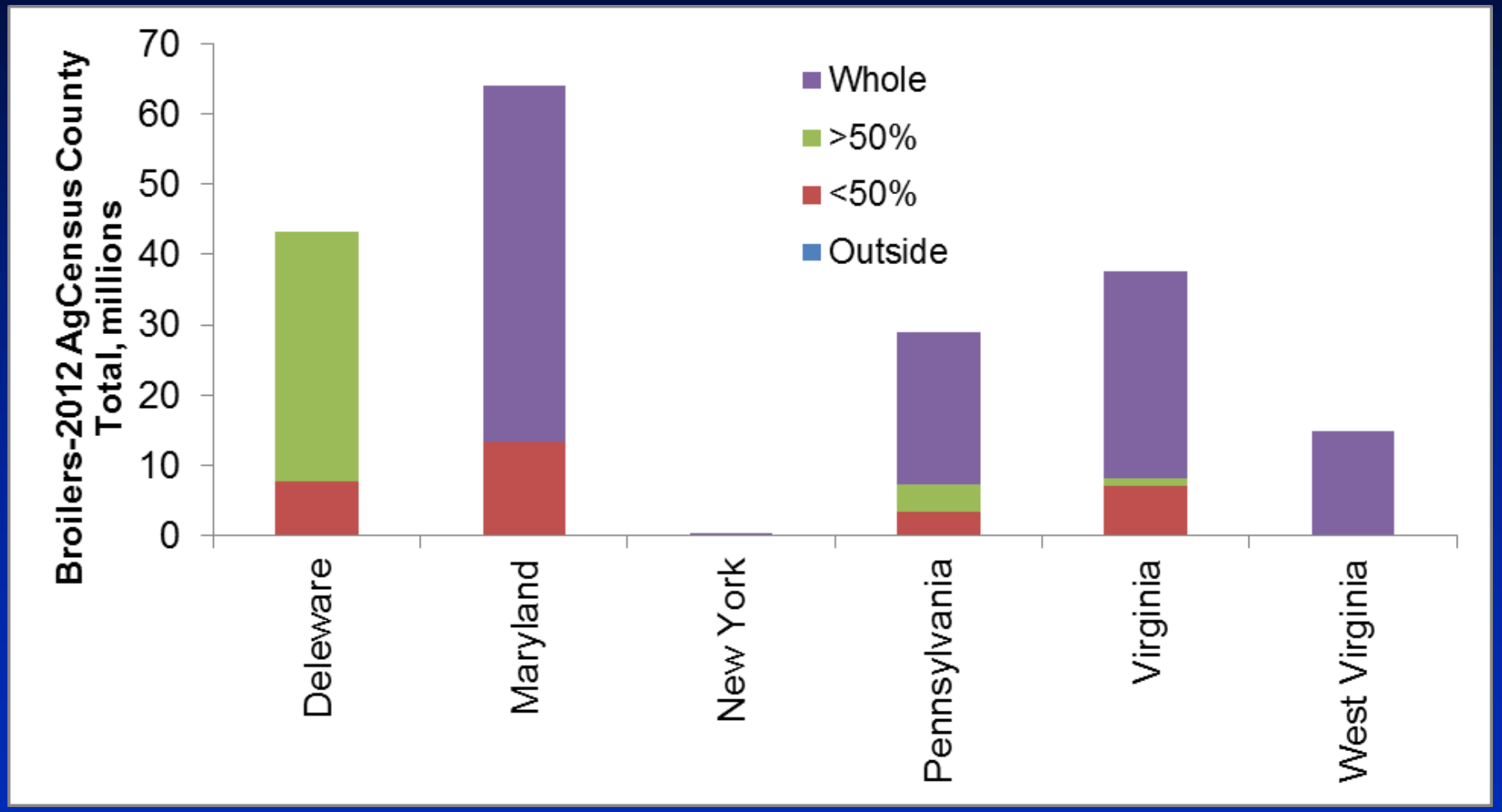
Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	85	95	?	?	?	?

Pullet Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm (DE, MD, PA, NY , VA, WV)	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
Layer-type confinement house	100	85	95	70		90	
1. No model farm basis – those with and without storage are unknown?							

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	85	95	?	?	?	?

Panel Research: 2012 AgCensus

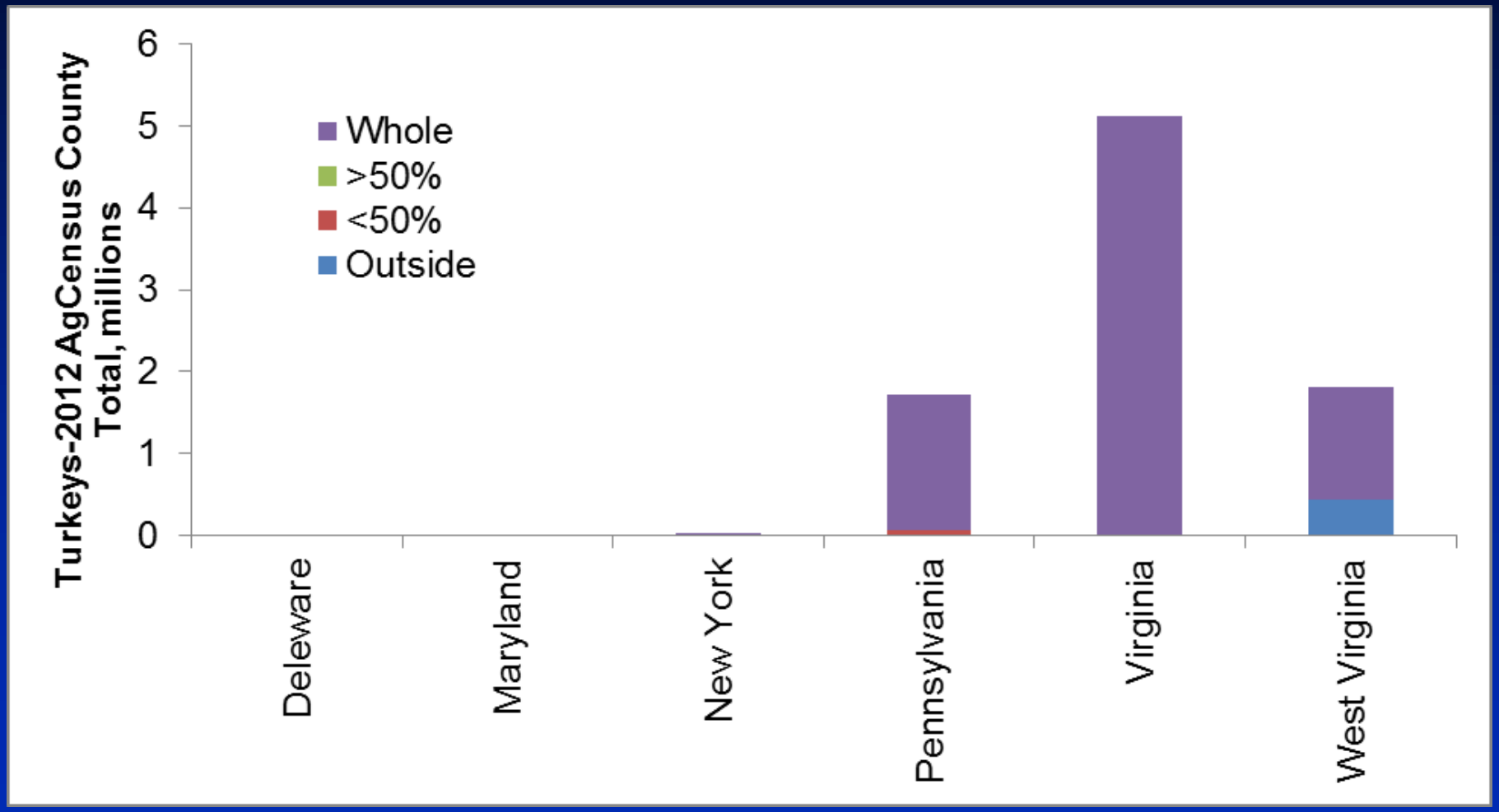


Broiler Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
Northeast (PA, NY)	100	75	98	70		95	
Southeast (DE, MD, VA, WV)	100	85		60			
1. No model farm basis – those with and without storage are unknown?							

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	75	98	?	?	?	?

Panel Research: 2012 AgCensus

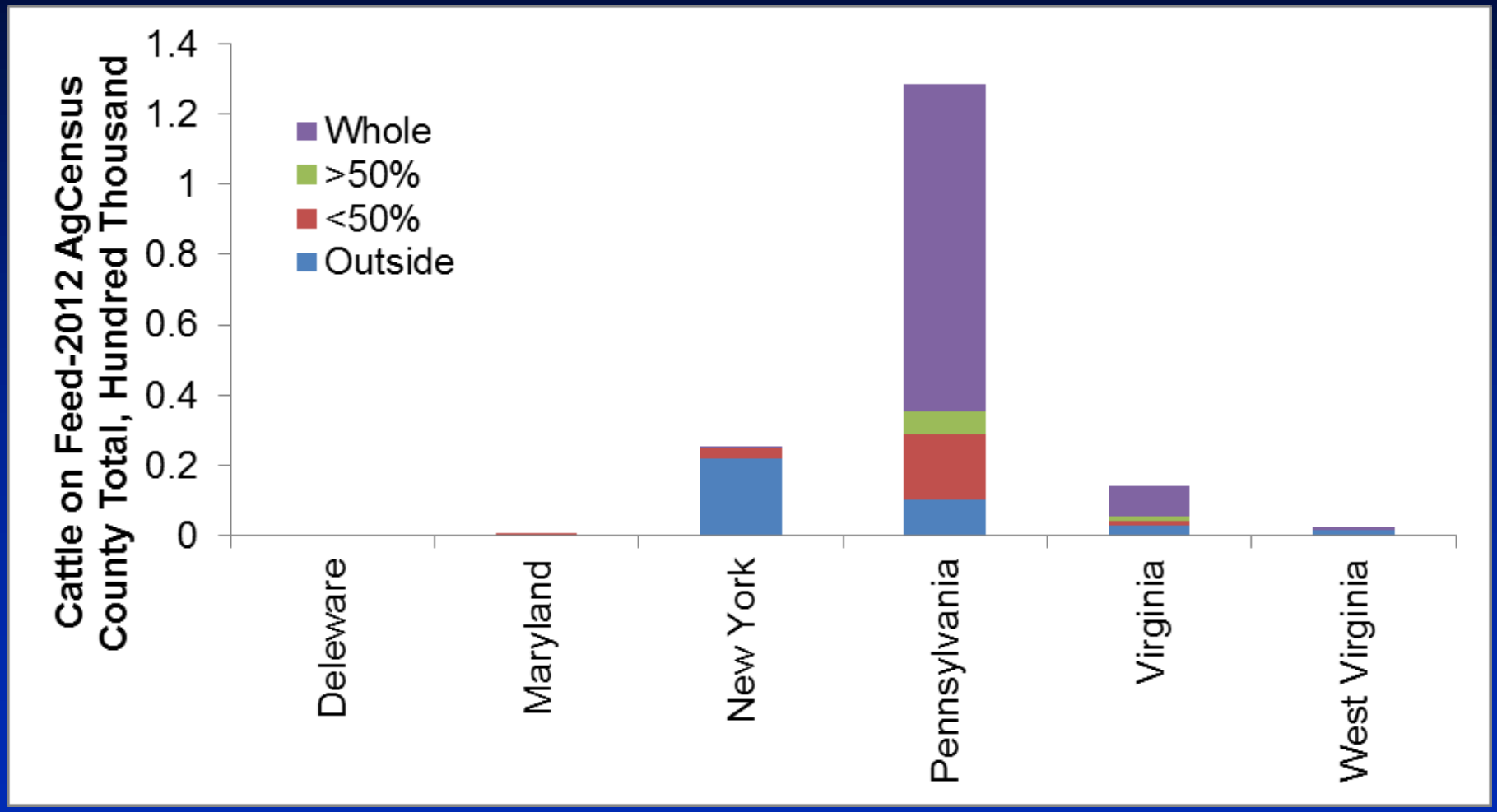


Turkey Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm East (DE, MD, PA, NY, VA, WV)	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1 Confinement Houses	90	80	98	60		95	
#2 Turkey Ranch	10	45	50			75	
1. No model farm basis – those with and without storage are unknown? Turkey ranches are now very rare?							

Chesapeake Bay Model (refers to North Central area?)							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	76.5	93.2	?	?	?	?

Panel Research: 2012 AgCensus



Fattened Cattle Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm (PA, NY, NY)	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
Feedlot scrape, stack	100	60	75	70		85	
1. No model farm basis – those with and without storage are unknown?							

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	60	75	?	?	?	?

Other Cattle Recoverability Factors

Chesapeake Bay Model							
Model Farm	% of Farms	% Manure Recovered		% N in recovered manure		% P in recovered manure	
		Before	After	Before	After	Before	After
None used	100	57.65	71.375	?	?	?	?

1. Average of dairy and beef.

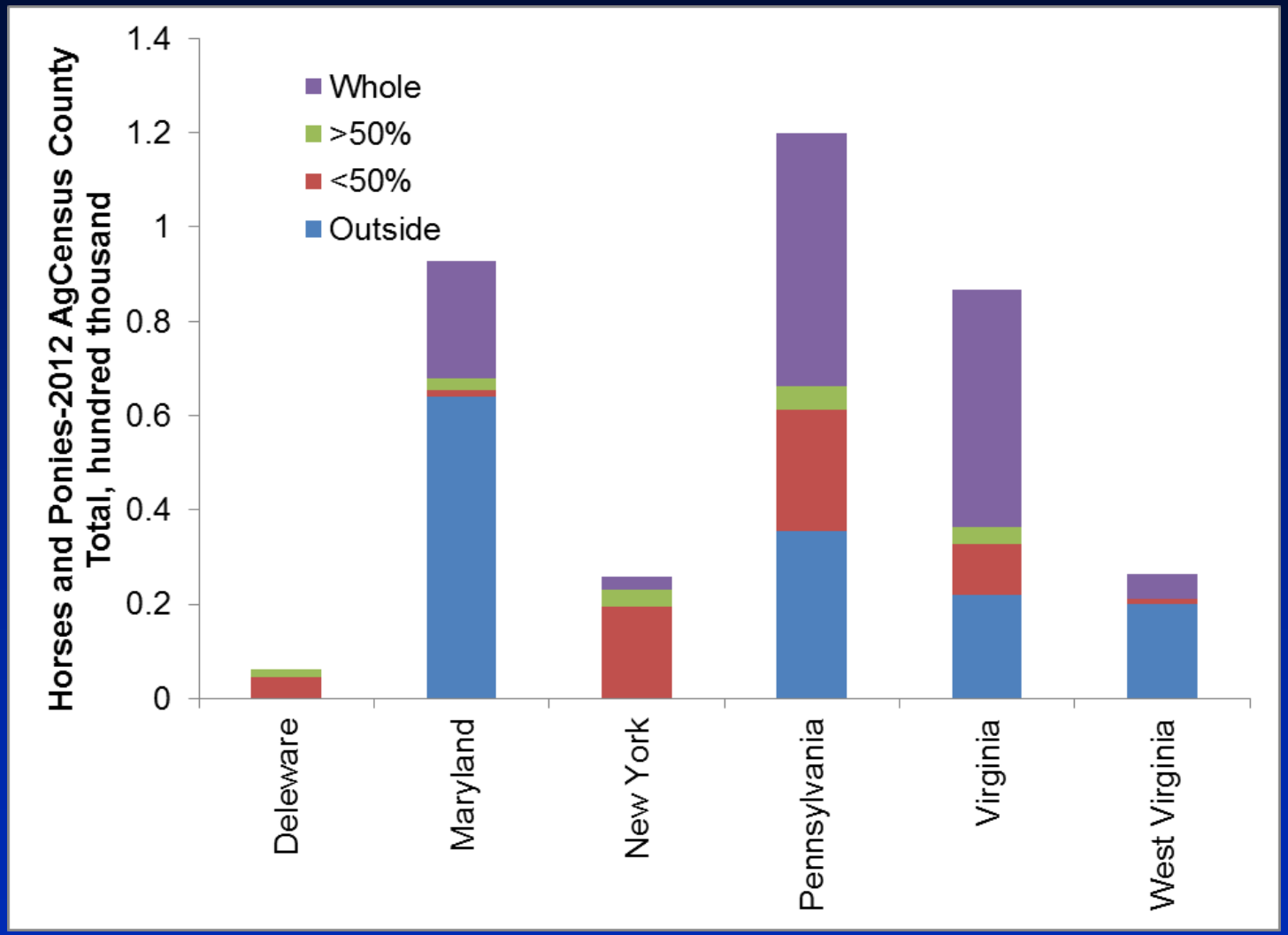
Confined Heifer Recoverability Factors

Cost Associated with Development and Implementation of CNMPs Part I							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
#1 Confined, bedded manure	70	65	85	70		85	
#2 Feedlot scrap, stack (PA,NY)	30	60	80	65		80	
#2 Feedlot scrap, stack (VA)	100	65	80	50		80	

1. No model farm basis.
2. Two different regions with different recoverability factors occur within CBW.
3. This data used also for Horses, Sheep/Lambs, and Goats.

Chesapeake Bay Model							
Model Farm	**% of Farms**	**% Manure Recovered**		**% N in recovered manure**		**% P in recovered manure**	
		Before	**After**	**Before**	**After**	**Before**	**After**
None used	100	62.5	82.5	?	?	?	?

Panel Research: 2012 AgCensus



Equine/small ruminant

- "Recoverable manure … was estimated using manure recoverability factors and nutrient recovery parameters for grass-fed beef cattle"
  - These factors do not apply to stabled horses
  - Pastured animals are excluded from our consideration?