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National Animal Health Monitoring System

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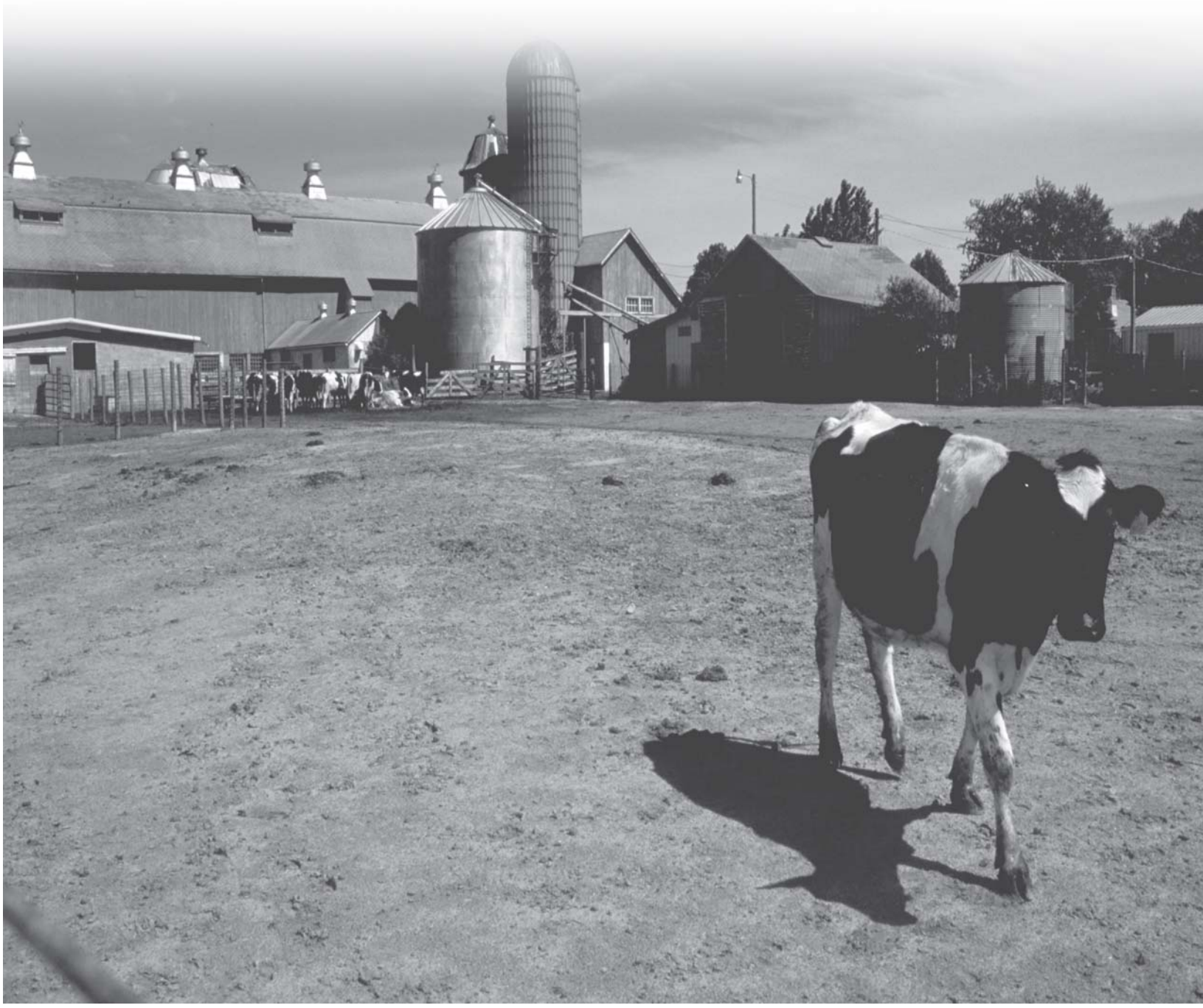
Dairy 2002

Nutrient Management and the U.S. Dairy Industry in 2002



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Introduction

In 2002, the National Animal Health Monitoring System (NAHMS) conducted a study of dairy operations in the United States. NAHMS Dairy 2002 was conducted in 21 major dairy States (see map) and was designed to provide information to both participants and industry from operations representing 83.0 percent of U.S. dairy operations and 85.7 percent of U.S. dairy cows. Phase I data were collected from December 31, 2001, through February 12, 2002, from 2,461 operations. For Phase II of the Dairy 2002 study, data were collected from 1,013 operations with 30 or more dairy cows. State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) collected the data from February 25 through April 30, 2002. Data from both phases of collection are presented in this report. The methods used and a profile of responding operations can be found at the end of this report.

Policies in the 2002 Farm Bill and subsequent regulations in the U.S. Environmental Protection Agency's (EPA) Concentrated Animal Feeding Operation (CAFO) rule require various measures for managing livestock-facility manure and nutrients. There are two main, widely divergent characteristics of livestock manure: 1) manure provides valuable organic material and nutrients for crops and pastures; 2) nutrients from manure can be sources of water pollution. Proper nutrient management can help livestock operations enhance the benefits manure provides while lessening its impact on the environment.

The value placed on manure produced in livestock production has changed in recent years. Once thought of as only a liability, manure is now often considered a favorable asset, particularly as a plant nutrient resource. Nitrogen, phosphorus, and potassium, the most

Dairy 2002 Participating States

Shaded States = Participating States

common and abundant nutrients found in manure, promote the growth of plants and crops. However, nutrient content of manure can vary from operation to operation, affecting the eventual uptake of nutrients by plants. Management practices such as monitoring the composition of rations fed to livestock, methods of waste collection and storage, and the manner and timing of land application can greatly affect manure's nutrient content. With careful management, manure can reduce the need for commercial fertilizers.

Pollution from nutrients is a leading cause of water quality impairment in lakes, rivers, and estuaries. Nutrients such as nitrogen and phosphorus accelerate the growth of algae or aquatic weeds, often resulting in clogged pipelines and fish deaths due to hypoxia. Nutrients in water originate from a number of sources, including livestock operations. The impact on the environment depends on many factors including the level of nutrient in the water, whether or not manure nutrients leave the operation by leeching or other means, the management practices of the operation, the proximity to and vulnerability of water supplies, and the agro-ecological conditions, such as soil type and climate.

With the increase in the last decade of larger scale, more industrialized livestock operations, many States have implemented stricter regulations regarding nutrient management on dairy operations. The EPA in February 2003 published revisions to its Clean Water Act regulations for Concentrated Animal Feeding Operations (CAFOs). The revised regulations focus on CAFOs that pose the greatest risk to environmental and water quality (EPA 821-R-03-010; http://www.epa.gov/npdes/cafo/producersguide) and include: the National Pollutant Discharge Elimination System (NPDES) Permit Regulation; and the Effluent Limitations Guidelines (ELGs) and Standards for CAFOs. The goal of the NPDES program is to protect and improve water quality by regulating point-source dischargers. The revised NPDES CAFO regulations require all CAFOs to apply for a permit. This permit identifies affected waters and sets mandatory requirements designed to protect them.

Further information on NAHMS studies and reports is available online at:
www.aphis.usda.gov/vs/ceah/ncahs

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Terms Used in This Report

Bulk Tank Somatic Cell Count (BTSCC): Internationally accepted measure of the quality and suitablility of milk sold from the farm for human consumption. It is used by regulatory agencies to permit or exclude milk from interstate or international trade.

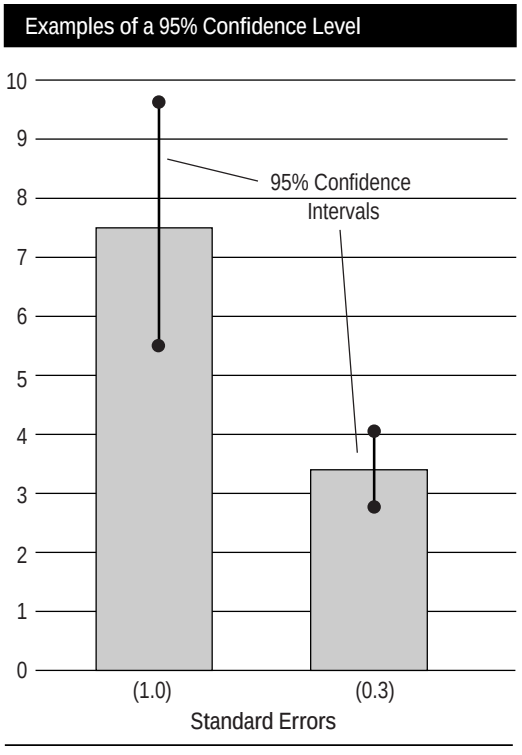
Concentrated Animal Feeding Operation (CAFO): Specific details about CAFOs can be found in the "Producers Compliance Guide for CAFOs" (EPA 821-R-03-010). A series of factsheets describing the regulations for producers and consultants is available at www.lpes.org/cafo.html. There are two types of animal feeding operations as defined in the regulations. Animal feeding operations (AFOs) are operations where 1) animals are confined for at least 45 days during any 12-month period and 2) crops, forage growth, and other vegetation are not grown in the area where the animals are confined. Operations that are defined as AFOs may be further classified as CAFOs based on the number of animals on the operation (large CAFOs) or the number of animals and the potential for manure to contaminate surface water (medium and small CAFOs).

Cow: Female dairy bovine that has calved at least once.

Heifer: Female dairy bovine that has not yet calved.

Herd Size: Herd size is based on January 1, 2002, dairy cow inventory. Small herds are those with less than 100 head; medium herds are those with 100 to 499 head; and large herds are those with 500 or more head.

Population Estimates: Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate, plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example below, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3 and results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest



tenth. If rounded to 0, the standard error was reported. If there were no reports of the event, no standard error was reported.

Regions:
West: California, Colorado, Idaho, New Mexico, Texas, Washington
Midwest: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin
Northeast: New York, Pennsylvania, Vermont
Southeast: Florida, Kentucky, Tennessee, Virginia

Rolling Herd Average: An indication of the the average milk production for the last 365 days.

Sample profile: Information that describes characteristics of the sites from which Dairy 2002 data were collected.

Total inventory: All dairy cattle present on the site on January 1, 2002.

Section I: Population Estimates

A. Nutrient Management

1. Housing facilities

Housing type, facility age, and climate influence manure collection systems. The most common *inside* housing type used for unweaned dairy heifers was individual animal areas (58.1 percent of operations), followed by multiple animal areas (30.3 percent of operations). "None" was reported as the primary type of inside housing on 9.5 percent of operations, indicating that these unweaned heifers typically lived outside or were sent off-site to be raised. The primary inside housing type for weaned dairy heifers was multiple animal areas (78.7 percent of operations). Tie stall or stanchion barns were the most common inside housing type for lactating dairy cows on 52.5 percent of operations, followed by freestall (30.8 percent) and multiple animal areas (11.2 percent). For housing maternity cows inside, 32.0 percent of operations reported using individual animal areas; multiple animal areas were used for inside maternity housing* on 29.3 percent of operations.

a. Percentage of operations by primary type of housing facility used during 2001

	Unweaned Dairy Heifers		Weaned Dairy Heifers		Lactating Dairy Cows		Maternity Housing*	
Housing Type	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Freestall	2.1	(0.4)	5.8	(0.6)	30.8	(1.0)	6.9	(0.7)
Individual animal area (pen)	58.1	(1.4)	4.9	(0.6)	0.6	(0.2)	32.0	(1.3)
Multiple animal area	30.3	(1.3)	78.7	(1.1)	11.2	(0.8)	29.3	(1.1)
Tie stall or stanchion	NA	NA	6.8	(0.7)	52.5	(1.1)	16.5	(1.1)
None	9.5	(0.8)	3.8	(0.4)	4.9	(0.4)	15.3	(1.0)
Total	100.0		100.0		100.0		100.0	

*Maternity housing refers to facilities or outside areas used for dairy cows about to calve that are separate from facilities used by lactating cows.

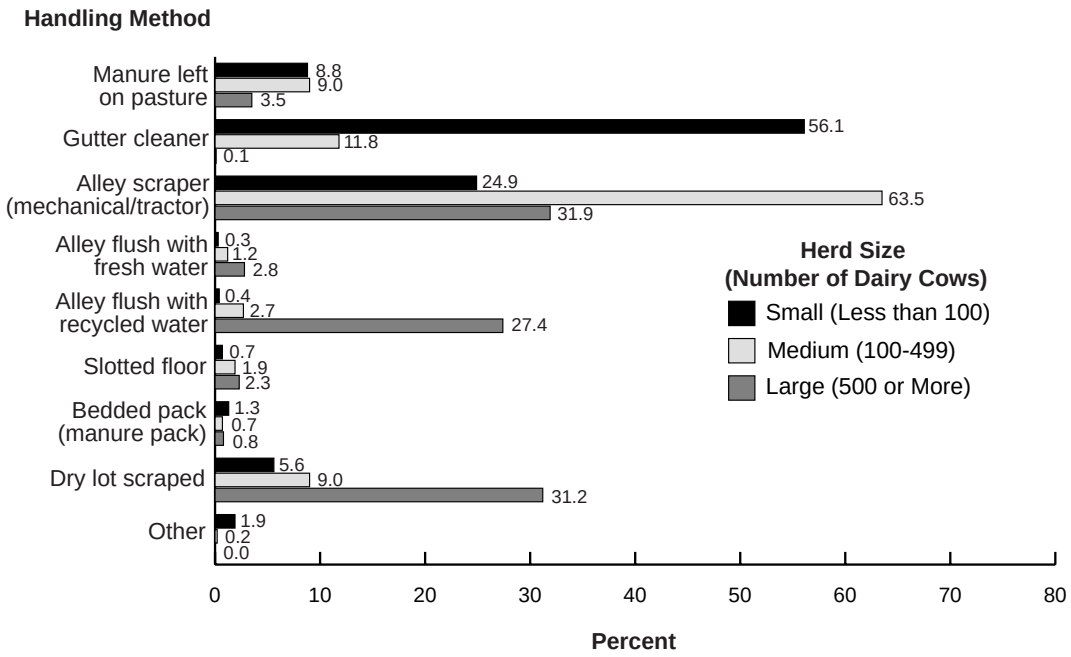
2. Primary manure handling methods in cow housing areas

The majority of small operations (56.1 percent) used primarily gutter cleaners, while the majority of medium operations (63.5 percent) reported alley scraper as their primary manure handling method. There was more variability in the primary manure handling methods used on large operations, with 31.9 percent using alley scraper, 27.4 percent using alley flush with recycled water, and 31.2 percent using dry lot scraped as primary manure handling methods.

a. Percentage of operations by primary manure handling method used in cow housing areas and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	8.8	(1.5)	9.0	(1.9)	3.5	(1.4)	8.6	(1.2)
Gutter cleaner	56.1	(2.6)	11.8	(2.1)	0.1	(0.1)	43.4	(2.0)
Alley scraper (mechanical or tractor)	24.9	(2.3)	63.5	(2.8)	31.9	(3.1)	34.2	(1.9)
Alley flush with fresh water	0.3	(0.3)	1.2	(0.8)	2.8	(1.4)	0.6	(0.3)
Alley flush with recycled water	0.4	(0.2)	2.7	(0.8)	27.4	(3.8)	2.1	(0.3)
Slotted floor	0.7	(0.4)	1.9	(0.8)	2.3	(1.4)	1.1	(0.4)
Bedded Pack (manure pack)	1.3	(0.6)	0.7	(0.5)	0.8	(0.5)	1.1	(0.5)
Dry lot scraped	5.6	(1.2)	9.0	(1.9)	31.2	(4.0)	7.5	(1.0)
Other	1.9	(0.8)	0.2	(0.2)	0.0	(--)	1.4	(0.6)
Total	100.0		100.0		100.0		100.0	

Percent of Operations by Primary Manure Handling Method Used in Cow Housing Areas and by Herd Size

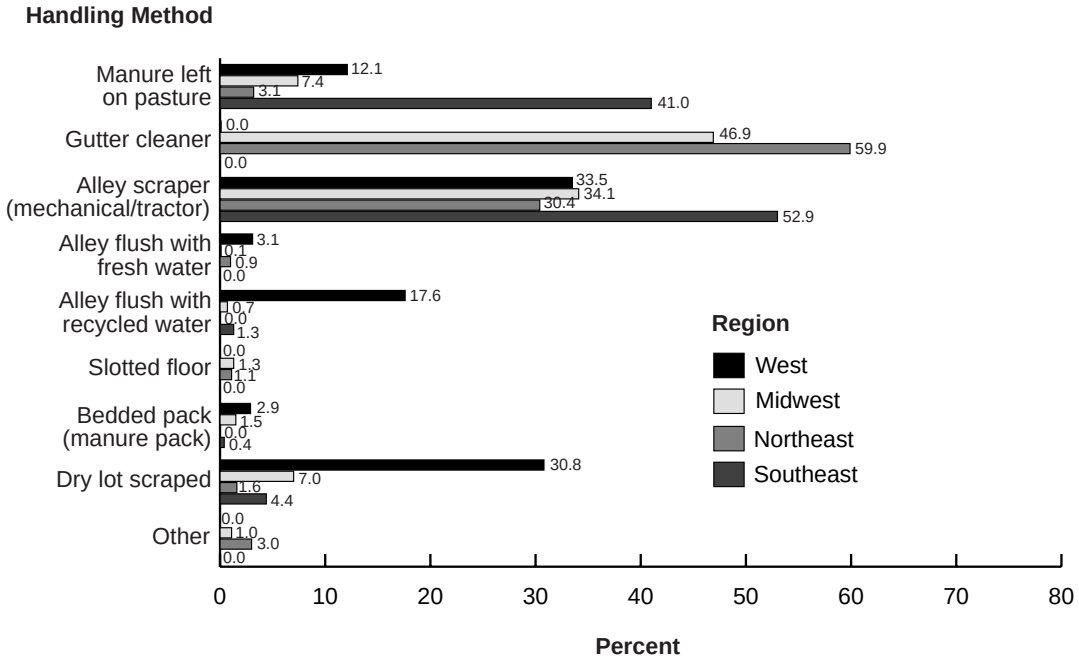


In the West region, the highest percentage of operations (33.5 percent) reported alley scraper as their primary manure handling method, followed by dry lot scraped (30.8 percent of operations). The majority of operations in the Midwest and Northeast regions reported gutter cleaner as the primary method, 46.9 percent and 59.9 percent of operations, respectively. Alley scraper and manure left on pasture were reported by the highest percentage of operations in the Southeast region, 52.9 percent and 41.0 percent of operations, respectively.

b. Percentage of operations by primary manure handling method used in cow housing areas and by region

	Region							
	West		Midwest		Northeast		Southeast	
Handling Method	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	12.1	(4.2)	7.4	(1.5)	3.1	(1.3)	41.0	(9.2)
Gutter cleaner	0.0	(0.0)	46.9	(2.9)	59.9	(3.6)	0.0	(--)
Alley scraper (mechanical or tractor)	33.5	(3.4)	34.1	(2.6)	30.4	(3.2)	52.9	(9.1)
Alley flush with fresh water	3.1	(1.9)	0.1	(0.1)	0.9	(0.8)	0.0	(--)
Alley flush with recycled water	17.6	(2.8)	0.7	(0.2)	0.0	(0.0)	1.3	(0.7)
Slotted floor	0.0	(--)	1.3	(0.6)	1.1	(0.5)	0.0	(--)
Bedded pack (manure pack)	2.9	(2.1)	1.5	(0.7)	0.0	(--)	0.4	(0.4)
Dry lot scraped	30.8	(4.4)	7.0	(1.4)	1.6	(0.8)	4.4	(2.2)
Other	0.0	(--)	1.0	(0.6)	3.0	(1.5)	0.0	(--)
Total	100.0		100.0		100.0		100.0	

Percent of Operations by Primary Manure Handling Method Used in Cow Housing Areas and by Region



3. Primary manure handling methods in heifer housing areas

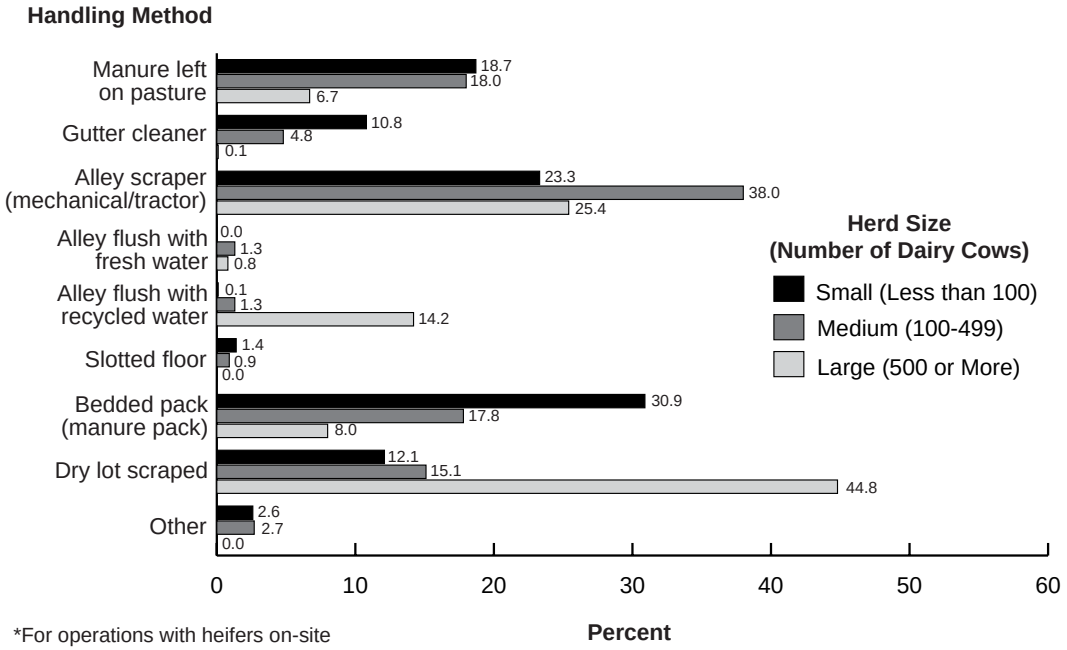
On small operations, primary methods used for handling manure from heifer housing areas included bedded pack (30.9 percent of operations) and alley scraper (23.3 percent of operations). Nearly 4 out of 10 medium operations (38.0 percent) used alley scraper as their primary method, while the majority of large operations (44.8 percent) reported dry lot scraped as their primary method.

a. Percentage of operations by primary manure handling method used in heifer housing areas* and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Handling Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Manure left on pasture	18.7	(2.2)	18.0	(2.4)	6.7	(1.8)	18.1	(1.7)
Gutter cleaner	10.8	(1.8)	4.8	(1.3)	0.1	(0.1)	9.1	(1.4)
Alley scraper (mechanical or tractor)	23.3	(2.4)	38.0	(3.0)	25.4	(3.5)	26.7	(1.9)
Alley flush with fresh water	0.0	(--)	1.3	(0.9)	0.8	(0.8)	0.3	(0.2)
Alley flush with recycled water	0.1	(0.1)	1.3	(0.6)	14.2	(3.6)	0.9	(0.2)
Slotted floor	1.5	(0.7)	0.9	(0.4)	0.0	(--)	1.3	(0.5)
Bedded pack (manure pack)	30.9	(2.7)	17.8	(2.4)	8.0	(2.5)	27.1	(2.0)
Dry lot scraped	12.1	(1.9)	15.1	(2.6)	44.8	(4.5)	14.0	(1.5)
Other	2.6	(0.9)	2.8	(1.2)	0.0	(--)	2.5	(0.7)
Total	100.0		100.0		100.0		100.0	

*For operations with heifers on-site

Percent of Operations by Primary Manure Handling Method Used in Heifer Housing Areas* and by Herd Size



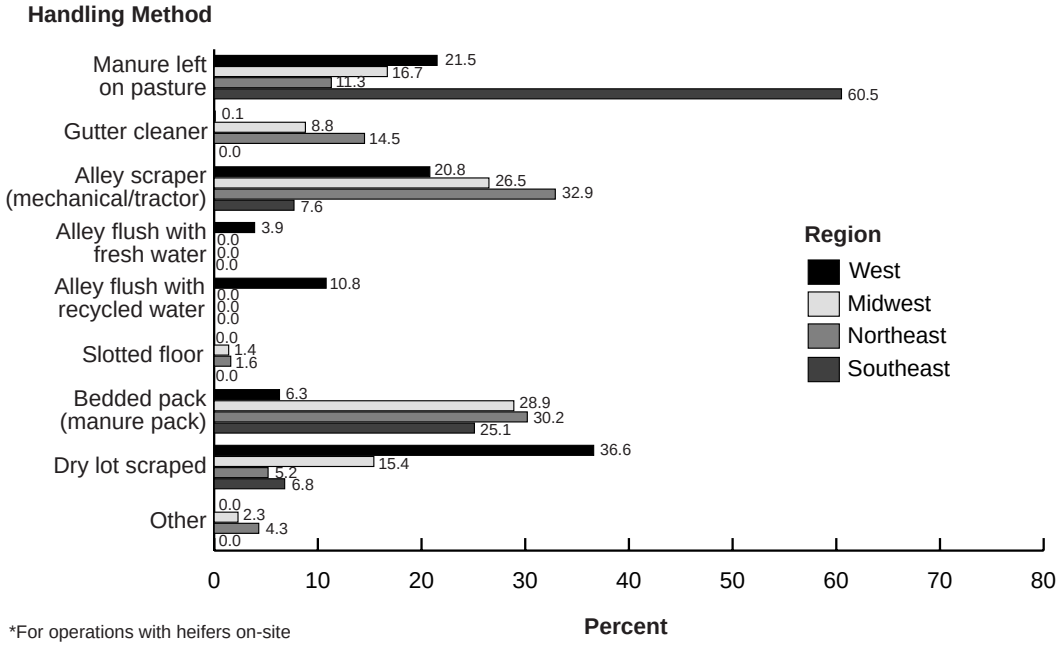
*For operations with heifers on-site

Operations in the West region reported dry lot scraped as the primary manure handling method for 36.6 percent of operations. Bedded pack and alley scraper were the methods reported most often in the Midwest region, 28.9 percent and 26.5 percent of operations, respectively. The highest percentages of operations in the Northeast region used alley scraper (32.9 percent of operations) and bedded pack (30.2 percent of operations) as primary manure handling methods, while the majority of operations in the Southeast region (60.5 percent) used manure left on pasture. Only the West region reported using alley flush or recycled water as manure handling methods.

b. Percentage of operations by primary manure handling method used in heifer housing areas and by region

	Region							
	West		Midwest		Northeast		Southeast	
Handling Method	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	21.5	(4.9)	16.7	(2.2)	11.3	(3.3)	60.5	(9.9)
Gutter cleaner	0.1	(0.1)	8.8	(1.9)	14.5	(2.9)	0.0	(--)
Alley scraper (mechanical or tractor)	20.8	(3.4)	26.5	(2.7)	32.9	(3.6)	7.6	(3.5)
Alley flush with fresh water	3.9	(2.5)	0.0	(--)	0.0	(--)	0.0	(--)
Alley flush with recycled water	10.8	(2.6)	0.0	(--)	0.0	(--)	0.0	(--)
Slotted floor	0.0	(--)	1.4	(0.7)	1.6	(0.9)	0.0	(--)
Bedded pack (manure pack)	6.3	(2.6)	28.9	(2.8)	30.2	(3.8)	25.1	(9.3)
Dry lot scraped	36.6	(4.8)	15.4	(2.2)	5.2	(2.5)	6.8	(3.2)
Other	0.0	(--)	2.3	(0.9)	4.3	(1.7)	0.0	(--)
Total	100.0		100.0		100.0		100.0	

Percent of Operations by Primary Manure Handling Method Used in Heifer Housing Areas* and by Region



*For operations with heifers on-site

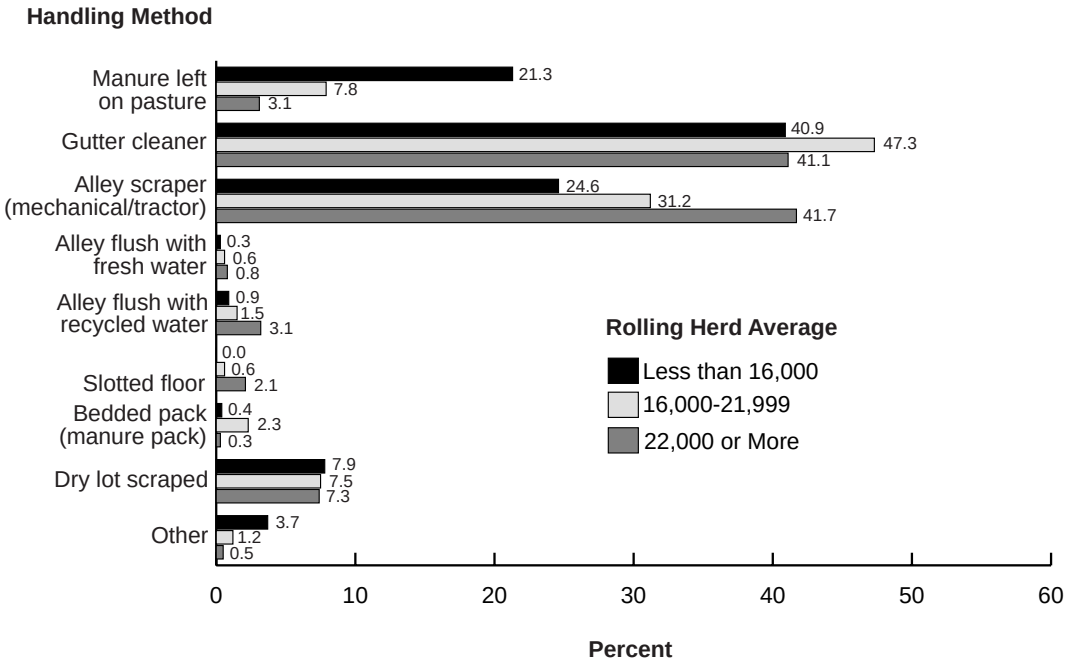
4. Primary manure handling methods and rolling herd average milk production

Primary manure handling methods in cow areas did not differ significantly between operations when analyzed by rolling herd average (RHA) milk production. The majority of operations (40.9 percent) with an RHA of less than 16,000 pounds used gutter cleaner as their primary manure handling method in cow housing areas, as did the majority of operations (47.3 percent) with RHAs between 16,000 and 21,999 pounds. For operations with RHAs of 22,000 pounds or more, 41.7 percent used alley scraper and 41.1 percent used gutter cleaner as their primary manure handling method.

a. Percentage of operations by primary manure handling method used in cow housing areas and by RHA milk production

	Rolling Herd Average Milk Production (Pounds)					
	Less than 16,000		**16,000-21,999**		**22,000 or More**	
Handling Method	**Percent**	**Standard Error**	**Percent**	**Standard Error**	**Percent**	**Standard Error**
Manure left on pasture	21.3	(4.0)	7.8	(1.8)	3.1	(1.3)
Gutter cleaner	40.9	(5.1)	47.3	(3.6)	41.1	(3.0)
Alley scraper (mechanical or tractor)	24.6	(4.6)	31.2	(3.0)	41.7	(2.9)
Alley flush with fresh water	0.3	(0.3)	0.6	(0.5)	0.8	(0.4)
Alley flush with recycled water	0.9	(0.6)	1.5	(0.4)	3.1	(0.5)
Slotted floor	0.0	(--)	0.6	(0.4)	2.1	(0.8)
Bedded pack (manure pack)	0.4	(0.4)	2.3	(1.1)	0.3	(0.3)
Dry lot scraped	7.9	(2.4)	7.5	(1.7)	7.3	(1.3)
Other	3.7	(2.2)	1.2	(0.8)	0.5	(0.4)
Total	100.0		100.0		100.0	

Percent of Operations by Primary Manure Handling Method Used in Cow Housing Areas and by Rolling Herd Average Milk Production



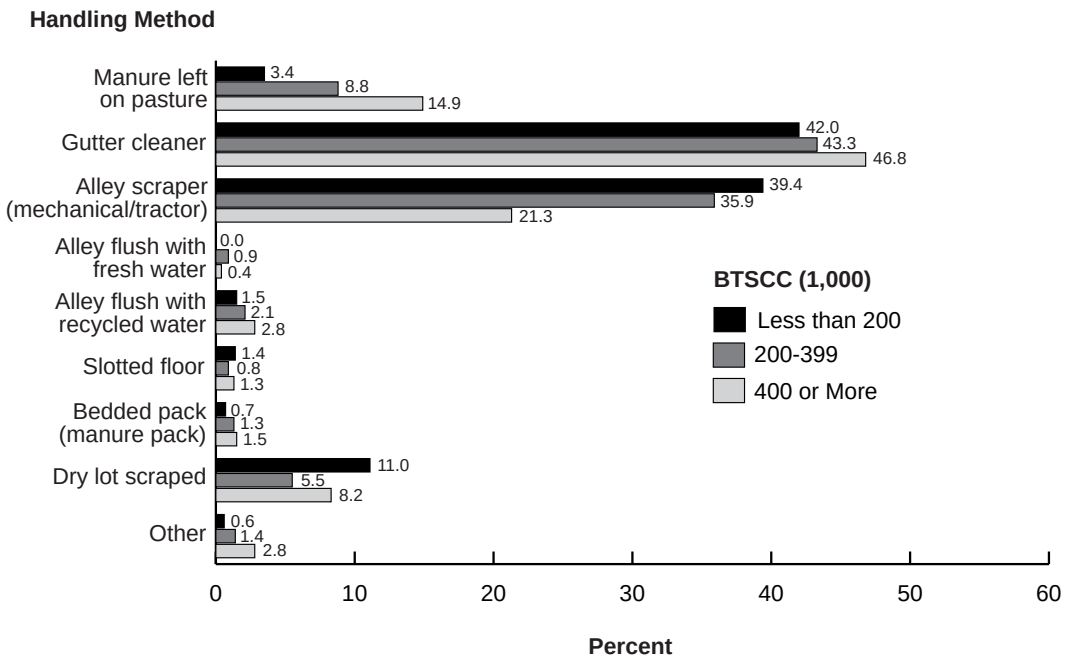
5. Primary manure handling methods and bulk tank somatic cell count

Bulk tank somatic cell counts (BTSCCs) are commonly used to ascertain the overall udder health of a dairy herd. There does not appear to be a correlation between manure handling methods and overall udder health, as measured by BTSCCs. Operations reporting BTSCCs of less than 400,000 used gutter cleaner and alley scraper as primary manure handling methods. Gutter cleaner was the primary manure handling method for the majority (46.8 percent) of operations with BTSCCs of 400,000 or more.

a. Percentage of operations by primary manure handling methods used in cow housing areas and by bulk tank somatic cell count

	Bulk Tank Somatic Cell Count (1,000)					
	Less than 200		**200-399**		**400 or More**	
Handling Method	**Percent**	**Standard Error**	**Percent**	**Standard Error**	**Percent**	**Standard Error**
Manure left on pasture	3.4	(1.4)	8.8	(1.5)	14.9	(3.7)
Gutter cleaner	42.0	(4.4)	43.3	(2.8)	46.8	(5.3)
Alley scraper (mechanical or tractor)	39.4	(4.0)	35.9	(2.6)	21.3	(3.7)
Alley flush with fresh water	0.0	(--)	0.9	(0.5)	0.4	(0.3)
Alley flush with recycled water	1.5	(0.5)	2.1	(0.4)	2.8	(0.9)
Slotted floor	1.4	(0.8)	0.8	(0.4)	1.3	(1.3)
Bedded pack (manure pack)	0.7	(0.7)	1.3	(0.7)	1.5	(1.0)
Dry lot scraped	11.0	(2.8)	5.5	(1.0)	8.2	(2.1)
Other	0.6	(0.4)	1.4	(0.7)	2.8	(2.1)
Total	100.0		100.0		100.0	

Percent of Operations by Primary Manure Handling Method Used in Cow Housing Areas, and by Bulk Tank Somatic Cell Count



6. Handling methods and morbidity

NOTE: The following table presents data by primary manure handling method and by producer-identified morbidity. Due to the large number of categories for handling methods and morbidity, the sample size for each respective cell in the table may be very small, which often results in a large standard error. Therefore, caution should be used when interpreting the table's data.

Improper or inadequate nutrient management has the potential to affect cattle health and increase the risks of certain diseases. Operations that used bedded pack as their primary manure handling method reported 33.6 percent of cows had clinical mastitis. Bedded packs can expose a cow's teat ends to high numbers of bacteria (Zehner 1986). Operations that used slotted floors as the primary manure handling method reported 22.3 percent of cows were lame. The rough walking surface of slotted floors may be associated with lameness and increase its prevalence (Faye 1989). Primary manure handling methods did not have an impact on the other, lesser reported causes of morbidity.

a. Percentage of dairy cows* by producer-identified morbidity and by primary manure handling method used in cow housing areas

	Handling Method								
	Manure Left on Pasture	Gutter Cleaner	Alley Scraper (Mechan-ical or Tractor)	Alley Flush with Fresh Water	Alley Flush with Recycled Water	Slotted Floor	Bedded Pack (Manure Pack)	Dry Lot Scraped	Other
Condition	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.	Pct. Std. Err.
Clinical mastitis	14.4 (2.3)	15.1 (0.8)	15.7 (0.7)	14.3 (3.5)	14.0 (1.5)	17.2 (1.6)	33.6 (9.5)	15.4 (1.7)	16.7 (3.3)
Lameness	8.0 (1.1)	12.5 (1.0)	15.4 (0.8)	11.8 (3.2)	10.3 (1.1)	22.3 (6.0)	13.0 (2.3)	9.5 (1.2)	12.7 (7.3)
Respiratory problems	1.4 (0.3)	2.7 (0.3)	3.0 (2.6)	4.2 (1.9)	1.5 (0.2)	1.8 (0.5)	4.3 (2.1)	3.1 (0.6)	1.3 (0.4)
Retained placenta	6.2 (0.8)	10.2 (0.6)	9.2 (0.4)	4.1 (1.2)	6.5 (0.9)	11.6 (1.8)	12.5 (1.7)	7.4 (1.7)	17.7 (8.2)
Infertility problems	10.6 (1.4)	14.0 (0.8)	13.8 (0.6)	5.5 (0.8)	17.6 (2.2)	8.6 (1.7)	8.8 (3.1)	12.6 (1.6)	13.0 (3.3)
Other reproductive problems	2.7 (0.7)	3.1 (0.4)	5.4 (0.4)	2.7 (0.6)	5.1 (1.3)	3.1 (1.1)	2.9 (1.5)	4.0 (1.0)	7.7 (4.1)
Diarrhea	1.6 (0.3)	5.0 (0.9)	3.0 (0.4)	1.7 (0.5)	2.1 (0.5)	2.9 (0.8)	1.1 (0.6)	1.9 (0.2)	5.7 (3.5)
Milk fever	5.6 (0.7)	8.2 (0.6)	5.1 (0.3)	6.8 (1.7)	3.6 (0.5)	3.4 (0.6)	3.1 (1.2)	4.3 (0.6)	2.6 (0.8)
Displaced abomasum	2.1 (0.6)	5.0 (0.4)	4.8 (0.2)	2.8 (0.9)	2.5 (0.3)	5.0 (1.0)	4.1 (1.4)	2.5 (0.4)	6.0 (3.2)
Neurological problems	0.2 (0.1)	0.5 (0.1)	0.4 (0.1)	0.4 (0.2)	0.1 (0.1)	0.3 (0.1)	0.2 (0.1)	0.3 (0.1)	0.1 (0.1)
Other	1.4 (0.7)	1.7 (0.5)	1.3 (0.3)	0.0 (--)	0.7 (0.3)	0.2 (0.1)	0.0 (0.0)	0.4 (0.2)	0.9 (0.8)

*As a percentage of January 1, 2002, cow inventory

B. Waste Storage or Treatment Systems

1. Primary systems used

Studies comparing the nitrogen content of freshly excreted manure versus handled and stored manure found a greater loss of nutrients when manure was stored in an open-lot environment than when a manure pack or liquid system with above- or below-ground storage was used. The majority of small operations (49.3 percent) stored manure as a solid in a manure spreader. The majority of the medium operations (35.8 percent) stored manure in liquid form as slurry or liquid manure stored in an earth basin and not treated. For large operations, 28.8 percent stored manure in liquid form as slurry or liquid manure stored in an earth basin and not treated, and 24.2 percent used a treatment lagoon as a waste storage system.

a. Percentage of operations by primary manure storage or treatment system used and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
System	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Stored in manure spreader	49.3	(2.7)	21.0	(2.5)	1.0	(0.5)	40.8	(2.1)
Below floor slurry or deep pit	4.8	(1.1)	10.6	(2.1)	2.8	(1.4)	6.1	(1.0)
Slurry stored in tank	6.3	(1.3)	11.7	(2.0)	6.4	(2.6)	7.6	(1.1)
Slurry or liquid manure stored in earth basin and not treated	17.9	(2.1)	35.8	(2.8)	28.8	(3.6)	22.5	(1.7)
Treatment lagoon	2.4	(0.7)	8.3	(1.6)	24.2	(3.7)	4.6	(0.7)
Manure pack (inside barn)	2.3	(0.8)	1.4	(0.9)	0.0	(--)	2.0	(0.6)
Outside storage for solid manure not in dry lot or pen	11.1	(1.7)	4.8	(1.2)	16.9	(3.2)	9.9	(1.3)
Outside storage for solid manure within dry lot or pen	3.1	(0.9)	5.0	(1.7)	15.8	(3.4)	4.0	(0.8)
Stored solid manure in a building without cattle access	1.2	(0.5)	0.0	(--)	0.0	(--)	0.9	(0.4)
Stored solid manure with picket dam	1.5	(0.7)	0.8	(0.5)	0.0	(--)	1.3	(0.5)
Composted	0.1	(0.1)	0.6	(0.3)	3.5	(1.1)	0.3	(0.1)
Collection of methane/biogas	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Other	0.0	(0.0)	0.0	(--)	0.6	(0.4)	0.0	(--)
Total	100.0		100.0		100.0		100.0	

In the Midwest and Northeast regions, where small operations predominate, the majority of operations stored waste in manure spreaders.

b. Percentage of operations by primary manure storage or treatment system used and by region

	Region							
	West		Midwest		Northeast		Southeast	
System	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Stored in manure spreader	4.2	(2.9)	43.1	(3.0)	54.2	(3.8)	10.9	(4.2)
Below floor slurry or deep pit	5.2	(3.3)	7.1	(1.4)	4.8	(1.3)	3.5	(2.6)
Slurry stored in tank	4.3	(2.1)	5.3	(1.2)	11.0	(2.3)	18.5	(7.9)
Slurry or liquid manure stored in earth basin and not treated	22.7	(3.4)	23.0	(2.4)	20.2	(2.8)	28.0	(8.6)
Treatment lagoon	21.3	(3.5)	2.4	(0.8)	0.6	(0.3)	19.3	(5.6)
Manure pack (inside barn)	0.0	(--)	2.7	(0.9)	0.6	(0.6)	4.8	(3.6)
Outside storage for solid manure not in dry lot or pen	18.4	(3.3)	10.9	(2.0)	6.0	(2.0)	4.7	(2.7)
Outside storage for solid manure within dry lot or pen	21.4	(4.7)	3.5	(1.1)	0.0	(--)	2.1	(1.7)
Stored solid manure in a building without cattle access	0.0	(--)	0.0	(--)	2.2	(1.0)	5.2	(3.7)
Stored solid manure with picket dam	0.0	(--)	2.0	(0.8)	0.2	(0.2)	1.7	(1.7)
Composted	2.4	(0.9)	0.0	(--)	0.2	(0.2)	1.1	(0.8)
Collection of methane/biogas	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Other	0.1	(0.1)	0.0	(--)	0.0	(--)	0.2	(0.2)
Total	100.0		100.0		100.0		100.0	

2. Maximum manure storage capacity

There was a direct correlation between operation size and maximum manure storage capacity. The majority of small operations (37.9 percent) reported a manure storage capacity of less than 7 days, while the majority of medium and large operations, 34.5 percent and 54.7 percent, respectively, reported maximum storage capacities of 180 to 364 days.

a. Percentage of operations by maximum manure storage capacity and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Capacity (Days)	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Less than 7	37.9	(2.8)	16.8	(2.2)	0.5	(0.4)	31.4	(2.1)
7 to 29	7.5	(1.4)	7.6	(1.7)	3.6	(1.8)	7.4	(1.1)
30 to 59	6.8	(1.5)	7.3	(1.9)	2.3	(0.8)	6.7	(1.2)
60 to 89	5.5	(1.3)	4.6	(1.2)	3.0	(1.1)	5.2	(1.0)
90 to 179	9.3	(1.6)	13.8	(2.1)	16.3	(3.1)	10.7	(1.2)
180 to 364	20.2	(2.1)	34.5	(2.8)	54.7	(4.4)	24.9	(1.7)
365 or more	12.8	(1.8)	15.4	(2.4)	19.6	(3.4)	13.7	(1.4)
Total	100.0		100.0		100.0		100.0	

In the Midwest and Northeast regions, where small operations predominate, the majority of operations (30.1 percent and 49.1 percent, respectively) reported maximum manure storage capacities of less than 7 days. The majority of operations in the Southeast region (47.2 percent) reported a maximum storage capacity of 180 to 364 days, as did the highest percentage of operations in the West region (42.0 percent).

b. Percentage of operations by maximum manure storage capacity and by region

	Region							
	West		Midwest		Northeast		Southeast	
Capacity (Days)	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Less than 7 days	0.0	(--)	30.1	(3.0)	49.1	(4.0)	9.6	(3.9)
7 to 29 days	4.1	(3.0)	9.9	(1.7)	3.4	(1.4)	7.0	(3.3)
30 to 59 days	8.4	(3.6)	7.8	(1.8)	5.4	(1.8)	0.0	(--)
60 to 89 days	4.6	(2.1)	5.5	(1.3)	4.7	(1.9)	5.1	(2.4)
90 to 179 days	12.1	(2.9)	10.5	(1.8)	9.7	(1.9)	14.3	(5.4)
180 to 364 days	42.0	(4.3)	20.9	(2.3)	22.9	(3.0)	47.2	(6.3)
365 days or more	28.8	(4.8)	15.3	(2.2)	4.8	(1.2)	16.8	(5.1)
Total	100.0		100.0		100.0		100.0	

C. Nutrient Management

1. Manure use

Regardless of herd size, the majority of operations applied manure to land either owned or rented. Large operations were more likely to give manure away than small operations. Nearly 3 out of 10 large operations (26.2 percent) sold manure or received other compensation, while only 8.5 percent and 2.4 percent of medium and small operations, respectively, sold manure or received other compensation.

a. Percentage of operations by method of manure use and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Applied manure to land either owned or rented	99.3	(0.4)	97.8	(0.8)	84.3	(3.2)	98.3	(0.4)
Sold or received other compensation	2.4	(0.7)	8.5	(2.0)	26.2	(3.5)	4.8	(0.7)
Gave away	13.6	(1.9)	20.9	(2.5)	36.7	(4.0)	16.2	(1.5)
Used composted manure as bedding	0.0	(--)	3.0	(1.0)	27.1	(4.0)	1.8	(0.3)
Other	0.0	(--)	0.3	(0.3)	0.9	(0.6)	0.1	(0.1)

More operations in the West region (29.7 percent) reported giving away manure than operations in the Midwest, Northeast, and Southeast regions, 15.2 percent, 15.2 percent and 10.6 percent, respectively.

b. Percentage of operations by method of manure use and by region

	Region							
	West		**Midwest**		**Northeast**		**Southeast**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Applied manure to land either owned or rented	88.2	(2.5)	99.3	(0.5)	99.8	(0.2)	96.8	(1.6)
Sold or received other compensation	17.7	(4.0)	3.2	(0.9)	4.3	(1.4)	3.4	(1.4)
Gave away	29.7	(3.8)	15.2	(2.1)	15.2	(2.9)	10.6	(3.3)
Used composted manure as bedding	16.5	(2.7)	0.5	(0.3)	0.2	(0.2)	0.1	(0.1)
Other	0.0	(--)	0.0	(0.0)	0.1	(0.1)	1.5	(1.3)

2. Manure application

The majority of all operations, regardless of size or region, used a broadcast/solid spreader to distribute some manure to land either owned or rented. In addition, 23.7 percent of small operations, 49.9 percent of medium operations and 33.4 percent of large operations reported using surface application by tank wagon or truck to distribute some manure. A substantial percentage of large operations (58.6 percent) used irrigation/sprinkler to distribute a portion of their manure.

a. Percentage of operations by manure application methods used and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Method	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Broadcast/solid spreader	91.5	(1.5)	85.3	(2.2)	88.6	(2.7)	90.0	(1.2)
Surface application by tank wagon or tank truck	23.7	(2.2)	49.9	(3.0)	33.4	(3.8)	30.1	(1.8)
Subsurface injection by tank wagon, tank truck, or tractor	3.7	(0.9)	12.1	(1.9)	15.8	(2.7)	6.1	(0.8)
Irrigation/ sprinkler	2.1	(0.6)	16.9	(2.1)	58.6	(4.2)	7.5	(0.7)
Other	0.3	(0.2)	0.3	(0.3)	0.0	(--)	0.3	(0.2)

Nine out of 10 operations used a broadcast/solid spreader to distribute some manure.

b. Percentage of operations by manure application methods used and by region

	Region							
	West		Midwest		Northeast		Southeast	
Method	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Broadcast/solid spreader	84.4	(4.4)	92.7	(1.5)	90.4	(1.9)	69.2	(9.0)
Surface application by tank wagon or tank truck	20.1	(3.6)	27.7	(2.6)	34.5	(3.3)	46.4	(6.2)
Subsurface injection by tank wagon, tank truck, or tractor	9.2	(2.1)	8.1	(1.3)	2.2	(0.9)	0.2	(0.2)
Irrigation/sprinkler	58.4	(5.4)	2.7	(0.6)	0.4	(0.2)	20.5	(4.6)
Other	0.0	(--)	0.2	(0.2)	0.0	(--)	2.8	(2.0)

Nearly one in two operations in the Southeast region (46.4 percent) applied manure via surface application by tank wagon or tank truck.

3. Manure nutrient content

The value of manure as a plant-nutrient resource is optimized when the nutrient content of manure is matched with the nutrient requirements of crops. To obtain this balance, the nutrient content of manure should be analyzed. More than 5 out of 10 large operations analyzed manure for nutrient content, compared to approximately 4 out of 10 medium operations and less than 2 out of 10 small operations.

a. Percentage of operations that analyzed manure for the following nutrient contents in the 12 months prior to the interview, by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Nutrient	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Nitrogen	13.4	(1.9)	39.4	(2.9)	54.9	(4.5)	20.9	(1.6)
Phosphorus	13.1	(1.9)	38.4	(2.9)	53.1	(4.5)	20.4	(1.6)
Potassium	13.1	(1.9)	37.9	(2.9)	53.1	(4.5)	20.3	(1.6)

There were no regional differences in the percentages of operations that analyzed manure for nutrient content.

b. Percentage of operations that analyzed manure for the following nutrient contents in the 12 months prior to the interview, by region

	Region							
	West		**Midwest**		**Northeast**		**Southeast**	
Nutrient	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Nitrogen	28.8	(3.7)	19.1	(2.1)	21.2	(3.2)	26.5	(5.9)
Phosphorus	26.6	(3.6)	18.9	(2.1)	20.4	(3.1)	26.5	(5.9)
Potassium	26.6	(3.6)	18.9	(2.1)	20.0	(3.1)	26.5	(5.9)

The percentage of nutrients from manure utilized by crops depends on crop type, the yield potential of the crop, and the amount of land being used. If applied manure contains more nutrients than a crop can utilize, an imbalance occurs and the risk of environmental pollution increases. For all herd sizes, an operation's manure volume and acreage available were the major criteria for determining manure application rates. A higher percentage of large operations (67.0 percent) used crop nitrogen requirement to determine application rates than medium operations (51.9 percent) and small operations (41.5 percent).

c. Percentage of operations by criteria for determining manure application rates, either amount or frequency of application, and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Criteria	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Crop nitrogen requirement	41.5	(2.7)	51.9	(3.0)	67.0	(4.4)	44.8	(2.1)
Crop phosphorus requirement	34.7	(2.7)	47.7	(3.0)	57.0	(4.5)	38.5	(2.1)
Manure volume/acreage available	65.5	(2.7)	76.0	(2.6)	74.2	(3.8)	68.3	(2.1)
Other reasons	6.2	(1.3)	7.4	(1.7)	8.0	(2.6)	6.5	(1.0)

Across all regions, manure volume and acreage available were the major criteria for determining application rates.

d. Percentage of operations by criteria for determining manure application rates, either amount or frequency of application, and by region

	Region							
	West		**Midwest**		**Northeast**		**Southeast**	
Criteria	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Crop nitrogen requirement	40.2	(4.5)	50.1	(3.0)	36.1	(3.7)	39.5	(9.4)
Crop phosphorus requirement	27.5	(3.8)	42.9	(2.9)	32.7	(3.7)	35.8	(9.3)
Manure volume/acreage available	71.7	(4.5)	68.1	(2.9)	69.3	(4.1)	60.3	(6.6)
Other reasons	6.8	(2.3)	5.7	(1.3)	8.6	(2.1)	4.9	(2.7)

4. Proximity of manure use to bodies of water

New Federal regulations for CAFOs (see p. 3 Terms Used in This Report for more information on CAFOs) require that manure not be applied within 100 feet of surface water. The majority of large operations (52.9 percent) reported that the minimum distance manure was applied from a body of water was 1,000 feet or more. Medium operations reported a minimum distance of less than 100 feet (28.9 percent of operations) and a similar percentage (29.4 percent) reported a minimum distance of 100 to 499 feet and 1,000 feet or more (35.3 percent).

a. Percentage of operations by minimum distance (in feet) between application of manure and a body of water (such as a lake, pond, stream, or river) and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Distance (Feet)	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Less than 100	23.2	(2.3)	28.9	(2.9)	16.6	(3.1)	24.3	(1.8)
100 to 499	32.1	(2.7)	29.4	(2.8)	23.7	(3.7)	31.2	(2.1)
500 to 999	7.5	(1.5)	6.4	(1.3)	6.8	(2.4)	7.2	(1.1)
1,000 or more	37.2	(2.7)	35.3	(3.1)	52.9	(4.4)	37.3	(2.1)
Total	100.0		100.0		100.0		100.0	

Approximately one out of three operations in the Northeast region (36.3 percent) and Southeast region (33.1 percent) reported that the minimum distance manure was applied from a body of water was less than 100 feet, while the majority of operations in the West region (56.3 percent) and the Midwest region (44.0 percent) reported a minimum distance of 1,000 or more feet.

b. Percentage of operations by minimum distance (in feet) between application of manure and a body of water (such as a lake, pond, stream, or river) and by region

	Region							
	West		**Midwest**		**Northeast**		**Southeast**	
Distance (Feet)	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Less than 100	19.6	(4.5)	18.3	(2.2)	36.3	(4.0)	33.1	(5.6)
100 to 499	17.4	(3.9)	30.1	(2.1)	37.1	(4.0)	32.7	(5.5)
500 to 999	6.7	(3.6)	7.6	(1.6)	5.9	(1.8)	10.9	(4.0)
1,000 or more	56.3	(5.3)	44.0	(3.0)	20.7	(3.4)	23.3	(6.4)
Total	100.0		100.0		100.0		100.0	

D. Nutrient Management Plans

1. Written plans

Roughly half of large and medium operations (55.8 percent and 48.4 percent, respectively) had written nutrient management plans, compared to only 23.3 percent of small operations. For large and medium operations, the majority of written plans were developed in cooperation with the USDA Natural Resources Conservation Service (NRCS) and implemented to satisfy a State regulatory requirement. For small operations, the majority of written plans (84.9 percent) were developed in cooperation with the NRCS (table 1c).

a. Percentage of operations that had a written nutrient management plan, such as land-treatment practices or manure storage structures, by herd size

Herd Size (Number of Dairy Cows)							
Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Percent	**Std. Error**	**Percent**	**Std. Error**	**Percent**	**Std. Error**	**Percent**	**Std. Error**
23.3	(2.3)	48.4	(3.0)	55.8	(4.0)	30.6	(1.8)

Five of 10 operations in the West region (54.0 percent) and Southeast region (54.5 percent) had written nutrient management plans, and 80.0 percent of operations in the Midwest region and 90.1 percent in the Northeast region developed a written plan in cooperation with NRCS (table 1d).

b. Percentage of operations that had a written nutrient management plan, such as land-treatment practices or manure storage structures, by region

Region							
West		**Midwest**		**Northeast**		**Southeast**	
Percent	**Std. Error**	**Percent**	**Std. Error**	**Percent**	**Std. Error**	**Percent**	**Std. Error**
54.0	4.3	25.1	2.6	28.8	3.2	54.5	5.6

c. For operations that had a written nutrient management plan, percentage of operations by plan development, reason for plan, and by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Plan Development and/or Reason	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Developed in cooperation with USDA's NRCS or a local conservation district	84.9	(3.8)	78.7	(4.1)	64.0	(5.1)	81.0	(2.6)
Implemented to help satisfy a State regulatory requirement	43.5	(5.8)	67.0	(4.2)	77.5	(5.0)	54.9	(3.8)
Part of USDA voluntary cost share program	49.2	(5.6)	45.9	(4.3)	21.6	(4.0)	45.9	(3.5)

d. For operations that had a written nutrient management plan, percentage of operations by plan development, reason for plan, and by region

	Region							
	West		**Midwest**		**Northeast**		**Southeast**	
Plan Development and/or Reason	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Developed in cooperation with USDA's NRCS or a local conservation district	66.0	(6.3)	80.0	(4.4)	90.1	(3.5)	86.3	(6.3)
Implemented to help satisfy a State regulatory requirement	81.2	(5.7)	45.9	(5.8)	58.5	(6.3)	47.3	(14.2)
Part of USDA voluntary cost share program	43.9	(6.4)	50.6	(5.8)	47.9	(6.2)	23.3	(6.5)

2. Waste management consultations

The highest percentage of small operations (29.6 percent) consulted an agronomist/crop consultant about waste management during the 12 months prior to the interview. Nearly 5 out of 10 of medium operations (47.9 percent) consulted with an agronomist or crop consultant about waste management. A similar percentage of large operations consulted with either a private nutrient management consultant (48.5 percent) or an agronomist/crop consultant (47.7 percent) about waste management.

a. Percentage of operations that consulted with the following about waste management for their operation during the 12 months prior to the interview, by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Consult	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
University/ extension personnel	13.3	(2.0)	25.4	(2.5)	38.6	(4.1)	17.2	(1.6)
Private nutrient management consultant	10.1	(1.6)	28.5	(2.8)	48.5	(3.8)	16.0	(1.4)
NRCS personnel	16.8	(2.0)	35.5	(2.9)	34.9	(3.5)	21.9	(1.6)
State or local department of natural resources personnel	7.4	(1.5)	17.3	(2.3)	31.0	(3.7)	10.7	(1.3)
State or local department of agriculture personnel	8.2	(1.6)	15.3	(2.1)	25.6	(3.3)	10.6	(1.3)
Agronomist/ crop consultant	29.6	(2.5)	47.9	(2.9)	47.7	(4.1)	34.7	(2.0)
Private veterinary practitioner	4.7	(1.3)	7.7	(1.6)	7.1	(1.7)	5.5	(1.0)
Other	1.3	(0.6)	4.5	(1.3)	2.0	(1.2)	2.1	(0.5)

In general, operations in the West region were evenly distributed in six of the eight "consultant" categories. This equal distribution was not reported in the other regions.

b. Percentage of operations that consulted with the following about waste management for their operation during the 12 months prior to the interview, by region

	Region							
	West		Midwest		Northeast		Southeast	
Consult	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
University/extension personnel	25.6	(3.7)	15.0	(2.1)	19.0	(3.3)	17.7	(4.1)
Private nutrient management consultant	23.9	(3.4)	16.6	(2.1)	14.5	(2.1)	6.9	(2.5)
NRCS personnel	31.1	(3.6)	17.6	(2.2)	26.0	(3.2)	30.6	(6.0)
State or local department of natural resources personnel	27.6	(4.7)	8.2	(1.6)	11.0	(2.7)	8.8	(2.5)
State or local department of agriculture personnel	26.6	(4.5)	7.9	(1.5)	11.0	(2.8)	11.0	(2.9)
Agronomist/crop consultant	25.0	(3.3)	40.1	(2.9)	29.0	(3.3)	23.9	(7.4)
Private veterinary practitioner	6.7	(2.0)	5.3	(1.5)	5.8	(1.5)	4.7	(2.2)
Other	3.2	(1.4)	2.6	(0.9)	0.7	(0.3)	1.6	(1.1)

3. CAFO status

In February 2003, after the Dairy 2002 interviews were completed, the EPA revised regulations that defined feeding operations for livestock. Under the EPA's revised regulations, any operation designated a CAFO (see p. 3 Terms Used in This Report for more information on CAFOs) must develop and implement a nutrient management plan by December 31, 2006. During the Dairy 2002 study and prior to the EPA's revised CAFO regulations, the majority of large operations (55.3 percent) believed that their operations would be classified as a CAFO. In contrast, 28.4 percent of medium operations and 42.2 percent of small operations reported that they had never heard of a CAFO. In addition, 37.8 percent of medium operations and 33.4 percent of small operations believed that their operations would most likely not be classified as a CAFO.

a. Percentage of operations by classification category of their operations regarding concentrated animal feeding operations (CAFOs) under proposed* EPA regulations, by herd size

	Herd Size (Number of Dairy Cows)							
	Small (Less than 100)		**Medium** (100-499)		**Large** (500 or More)		**All Operations**	
Classification	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**	**Pct.**	**Std. Error**
Never heard of CAFO	42.2	(2.7)	28.4	(2.8)	22.7	(3.7)	38.1	(2.1)
Heard of CAFO, but unsure how operation will be classified	21.0	(2.3)	19.5	(2.5)	16.8	(3.1)	20.5	(1.8)
Most likely operation will not be classified as a CAFO	33.4	(2.6)	37.8	(3.0)	5.2	(2.1)	33.3	(2.0)
Most likely operation will be classified as a CAFO	3.4	(1.0)	14.3	(1.8)	55.3	(4.3)	8.1	(0.9)
Total	100.0		100.0		100.0		100.0	

*Regulations enacted since questionnaire administered

b. Percentage of operations by classification category of their operations regarding concentrated feeding operations (CAFOs) under proposed* EPA regulations, by region

	Region							
	West		Midwest		Northeast		Southeast	
Classification	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Never heard of CAFO	32.9	(5.0)	43.0	(3.0)	24.9	(3.5)	57.0	(6.3)
Heard of CAFO, but unsure how operation will be classified	22.7	(4.4)	19.9	(2.4)	23.5	(3.8)	10.0	(3.5)
Most likely operation will not be classified as a CAFO	19.9	(3.5)	32.8	(2.7)	39.6	(4.1)	29.8	(6.2)
Most likely operation will be classified as a CAFO	24.5	(3.1)	4.3	(1.1)	12.0	(2.1)	3.2	(1.0)
Total	100.0		100.0		100.0		100.0	

*Regulations enacted since questionnaire administered

References

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Section II: Methods

A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members about their informational needs and priorities during a needs assessment phase. The objective of the needs assessment for the NAHMS Dairy 2002 study was to conduct a national survey to collect information from U.S. dairy producers and other commodity specialists about what they perceived to be the most important dairy health and productivity issues. A driving force of the needs assessment was the desire of NAHMS researchers to receive as much input as possible from a variety of producers, as well as from industry experts and representatives, veterinarians, extension specialists, universities, and dairy organizations.

Focus-group meetings were held at various locations across the United States to help determine the focus of the study:

Birmingham, AL October 21, 2000
United States Animal Health Association (USAHA)

Kansas City, MO October 31, 2000
American Feed Industry Association (AFIA) Dairy Nutrition Committee

Teleconference December 15, 2000
Bovine Association of Management and Nutrition (BAMN)

San Antonio, TX February 4, 2001
American Farm Bureau Federation Dairy Advisory Committee

Riverdale, MD February 16, 2001
Government Perspective Meeting
APHIS, FSIS, FDA, and ARS

In addition, a short survey asking for rankings of major dairy issues was provided via multiple data collection modes. There were 155 surveys completed via the Web, 90 by hard copy, and 1 via telephone.

The focus-group meeting input was merged with survey results to determine Dairy 2002 study objectives.

B. Sampling and Estimation

1. State selection

The preliminary selection of States to be included in the study was done in January 2001 using the National Agricultural Statistics Service (NASS), USDA January 28, 2000, Cattle Report. A goal for NAHMS national studies is to include States that account for at least 70 percent of the animal and producer populations in the United States. The initial review of States identified 20 major States with 84 percent of the milk cow inventory and 81 percent of the operations with milk cows (dairy herds). The States were: CA, FL, ID, IL, IN, IA, KY, MI, MN, MO, NM, NY, OH, PA, TN, TX, VT, VA, WA, and WI.

A memo identifying these 20 States was provided in February 2001 to the USDA:APHIS:VS CEAH Director and, in turn, the VS Regional Directors. Regional Directors sought input from their respective States about being included or excluded from the study. By midyear, Colorado was included, based on the State's interest.

2. Operation selection

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected. The size indicator was the number of milk cows for each operation. NASS selected a sample of dairy producers in each State for making the NASS January 1 cattle estimates. The list sample from the January 2001 survey was used as the screening sample. Producers reporting one or more milk cows on January 1, 2001, were included in the sample for contact in January 2002. Due to the predicted large workload, the sample was reduced in 2 States (KY and PA), for a final screening sample of 3,876 operations for Phase I data collection. For Phase II data collection, operations with 30 or more dairy cows on January 1, 2002, that participated in Phase I were invited to continue in the study.

3. Population inferences

Inferences for Phase I cover the population of dairy producers with at least 1 milk cow in the 21 participating States. As of January 1, 2002, these States accounted for 85.7 percent (7,799,000 head) of milk cows in the United States and 83.0 percent (80,910) of operations with milk cows in the United States. (see Appendix II for respective data on individual States.) All respondent data were statistically weighted to reflect the population from which they were selected. The inverse of the probability of selection for each operation was the initial selection weight. This selection weight was adjusted for nonresponse within each State and size group to allow for inferences back to the original population from which the sample was selected.

For operations eligible for Phase II data collection (those with 30 or more dairy cows) weights were adjusted for operations that did not want to continue to the study's second phase. This weight was adjusted again for nonresponse to Phase II data collection. The 21-State target population of operations with 30 or more dairy cows represented 97.3 percent of dairy cows and 74.3 percent of dairy operations in the 21 States (see Appendix II).

C. Data Collection

1. Phase I

General Dairy Management Report, December 31, 2001, to February 12, 2002. NASS enumerators administered the General Dairy Management Report. The interview took slightly over 1 hour.

2. Phase II

VS Initial Visit, February 25 to April 30, 2002. Federal and State veterinary medical officers (VMOs) or animal health technicians (AHTs) collected the data from producers during an interview lasting approximately 1 hour.

D. Data Analysis

1. Validation and estimation

a. Phase I: General Dairy Management Report

Initial data entry and validation for the General Dairy Management Report were performed in individual NASS State offices. Data were entered into a SAS data set. NAHMS national staff performed additional data validation on the entire data set after data from all States were combined.

b. Phase II: VS Initial Visit Questionnaires

After completing the VS initial-visit questionnaires, data collectors sent them to the State NAHMS coordinators, who manually reviewed them for accuracy and then sent them to CEAH. Data entry and validations were completed using SAS.

2. Response rates

a. Phase I: General Dairy Management Report – Screening Questionnaire

Of the 3,876 operations in the screening sample, 410 operations had no milk cows on January 1, 2002, and were therefore ineligible for the NAHMS Dairy 2002 study. Of these 3,466 dairy operations, 2,461 participated in the initial phase of the study. This phase occurred from December 31, 2001, to February 12, 2002, and included the administration of a questionnaire by NASS enumerators.

a. Phase I: General Dairy Management Report – Screening Questionnaire

Response Category	Number Operations	Percent Operations
No milk cows on Jan. 1, 2002	227	5.9
Out of business	183	4.7
Refusal	821	21.2
Survey complete and VMO consent	1,438	37.1
Survey complete, refused VMO consent	905	23.3
Survey complete, ineligible for VMO	118	3.0
Out of scope (prison, research farm, etc.)	45	1.2
Unknown (code 8)	2	0.1
Inaccessible	137	3.5
Total	3,876	100.0

b. Phase II

VS initial visit response categories are shown below for all 1,438 producers with 30 or more dairy cows turned over to VS . Of these, 1,013 producers participated.

b. Phase II: VS Initial Visit response categories are shown below for all 1,438 producers with 30 or more dairy cows turned over to VS. Of these, 1,013 producers participated.

Response Category	Number Operations	Percent Operations
Survey completed	1,013	70.4
Producer not contacted	76	5.3
Poor time of year or no time	161	11.2
Did not want anyone on operation	4	0.3
Bad experience with government veterinarians	0	0.0
Did not want to do another survey or divulge information	136	9.5
Told NASS they did not want to be contacted	6	0.4
Ineligible (no dairy cows)	14	1.0
Other reason	28	1.9
Total	1,438	100.0

Appendix I: Sample Profile

A. Responding Sites

1a. Number of responding operations, by herd size		
	Phase I: General Dairy Management Report	Phase II: VS Initial Visit
Herd Size (Dairy Cow Inventory, January 1, 2002)	Number of Responding Operations	Number of Responding Operations
Less than 100	1,131	400
100 to 499	820	392
500 or more	510	221
Total	2,461	1,013

1b. Number of responding operations, by region		
	Phase I: General Dairy Management Report	Phase II: VS Initial Visit
Region	Number of Responding Operations	Number of Responding Operations
West	525	208
Midwest	1,085	448
Northeast	596	278
Southeast	255	79
Total	2,461	1,013

Appendix II: U.S. Milk Cow Population and Operations

U.S. Milk Cow Population and Operations

		Number of Milk Cows on January 1, 2002[1] (Thousand Head)			Number of Operations 2001		
Region	State	Milk Cows on Operations with 1 or More Head	Milk Cows on Operations with 30 or More Head	30 or More Head Percent	Operations with 1 or More Head	Operations with 30 or More Head	30 or More Head Percent
West	California	1,620	1,618.4	99.9	2,500	2,200	88.0
	Colorado	93	92.0	98.9	800	220	27.5
	Idaho	377	375.5	99.6	1,000	770	77.0
	New Mexico	290	289.4	99.8	500	165	33.0
	Texas	315	311.9	99.0	2,100	1,150	54.8
	Washington	247	246.3	99.7	1,000	665	66.5
	Total	2,942	2,933.5	99.7	7,900	5,170	65.4
Midwest	Illinois	115	111.6	97.0	1,900	1,420	74.7
	Indiana	154	140.1	91.0	2,900	1,400	48.3
	Iowa	205	194.8	95.0	3,500	2,680	76.6
	Michigan	299	284.1	95.0	3,300	2,250	68.2
	Minnesota	500	480.0	96.0	7,800	6,700	85.9
	Missouri	140	133.0	95.0	3,700	2,100	56.8
	Ohio	260	234.0	90.0	5,200	2,800	53.8
	Wisconsin	1,280	1,232.6	96.3	19,100	15,950	83.5
	Total	2,953	2,810.2	95.2	47,400	35,300	74.5
Northeast	New York	675	661.5	98.0	7,300	6,000	82.2
	Pennsylvannia	588	564.5	96.0	10,300	8,500	82.5
	Vermont	154	150.9	98.0	1,600	1,410	88.1
	Total	1,417	1,376.9	97.3	19,200	15,910	82.9
Southeast	Florida	152	151.4	99.6	510	220	43.1
	Kentucky	125	115.0	92.0	2,900	1,600	55.2
	Tennessee	90	87.7	97.5	1,500	870	58.0
	Virginia	120	116.4	97.0	1,500	1,010	67.3
	Total	487	470.5	96.6	6,410	3,700	57.7
Total (21 States)		7,799.0 (85.7% of U.S.)	7,591.1 (85.7% of U.S.)	97.3	80,910 (83.0% of U.S.)	60,080 (86.9% of U.S.)	74.3
Total U.S. (50 States)		9,105.6	8,859.7	97.3	97,460	69,140	70.9

[1] Source: NASS April 2004 Cattle Final Estimates, 1999-2003—(revised January 1, 2002, number of milk cows and number of operations in 2001 with milk cows). An operation is any place having one or more head of milk cows, excluding cows used to nurse calves, on hand at anytime during the year.

Appendix III: Study Objectives and Related Outputs

1. Describe baseline dairy cattle health and management practices and trends in dairy farm health management.
   - Part I: Reference of Dairy Health and Management in the United States, 2002
   - Part II: Changes in the United States Dairy Industry, 1991-2002
   - Part III: Reference of Dairy Cattle Health and Health Management Practices in the United States, 2002
   - Colostrum and bST info sheets, December 2002
   - Mycoplasma and HBS info sheets, June 2003

2. Describe strategies to prevent and reduce Johne's disease.
   - Johne's Disease on United States Dairy Operations, 2002, expected fall 2004

3. Evaluate management factors associated with the presence of certain food safety pathogens.
   - Milking Procedures, *E. coli*, *Salmonella* and Campylobacter, and Food Safety Pathogens Bulk Tank info sheets, December 2004

4. Describe the preparedness of producers to respond to foreign animal diseases, such as foot-and-mouth disease.
   - Animal Disease Exclusion Practices on U.S. Dairy Operations, 2002, August 2004

5. Describe waste handling systems
   - **Nutrient Management and the U.S. Dairy Industry in 2002, August 2004**