



United States  
Department  
of Agriculture

Animal and  
Plant Health  
Inspection  
Service

**Veterinary  
Services**

# Part II:

## Reference of 1996 U.S. Catfish Management Practices

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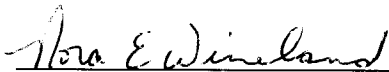
August 1997

## Acknowledgments

This report has been prepared from material received and analyzed by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS).

The Catfish '97 study was a cooperative effort between State and Federal agricultural statisticians, animal health officials, university researchers, and extension personnel. We want to thank the National Agricultural Statistics Service (NASS) enumerators who contacted the operations and collected the data for their hard work and dedication to the National Animal Health Monitoring System (NAHMS).

The roles of the producer and NASS enumerator were critical in providing quality data for Catfish '97 reports. All participants are to be commended for their efforts, particularly the producers whose voluntary efforts made the study possible.

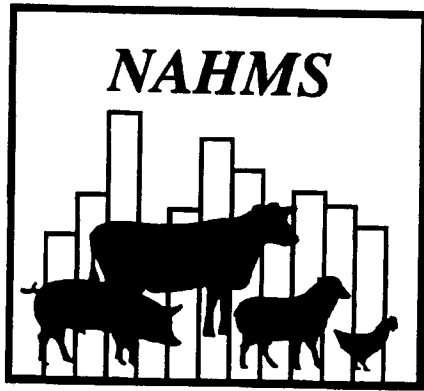


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# Introduction

The National Animal Health Monitoring System (NAHMS) undertook the Catfish '97 Study to provide the industry with information regarding catfish health and management practices at the national level. The information will be applied to education and research. This report is the second in a series of reports documenting Catfish '97 results.

Catfish '97 is the first NAHMS study of the catfish industry. Four states, Alabama, Arkansas, Louisiana, and Mississippi, were selected to be included in the study. These four states represented 95.9 percent of the total national catfish sales in 1996 and 93.5 percent of the water surface acres to be used for catfish production from January 1 through June 30, 1997. These four states accounted for 68.6 percent of all catfish operations on January 1, 1997.

NAHMS is sponsored by the USDA:APHIS:Veterinary Services (VS). VS collaborated with the USDA's National Agricultural Statistics Service (NASS) to implement a two-phase study of foodsize fish producers in the four selected states. During the first phase of the study, from January 1 through January 17, 1997, NASS enumerators attempted to contact all known producers either by phone or through a personal visit. There were 571 respondents from the four states surveyed (Alabama n=129, Arkansas n=117, Louisiana n=71, Mississippi n=254) with an overall response rate of 65.6 percent. *Part I: Reference of 1996 U.S. Catfish Health & Production Practices* was released in May 1997 and focused on aspects of disease and production of foodsize fish.

The second phase of the Catfish '97 Study took place in April 1997. NASS enumerators contacted a subsample (n=400) of responding foodsize fish producers from Phase I to participate in the second phase of the project. There were 301 respondents to the second phase of the study (Alabama= 46, Arkansas=55, Louisiana=60, and Mississippi=140) for a response rate of 75.3 percent. Phase II results are described in *Part II: Reference of 1996 U.S. Catfish Management Practices*. Data from both study phases will be linked to examine relationships between animal health and management practices.

For questions about this report or other Catfish '97 or NAHMS topics, please contact:

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## Terms Used in this Report

**ESC:** enteric septicemia of catfish (*Edwardsiella ictaluri*.)

**Fingerlings:** fish 2-6 inches in length or 2-60 lbs. per 1,000 fish.

**Foodfish:** any fish ultimately directed to processing.

**Foodsize:** fish weighing over 3/4 lb., excluding broodstock.

**Operation average:** the average value for all operations; a single value for each operation is summed over all operations reporting divided by the number of operations reporting.

**Operation size:** each reporting operation was classified into one of four size groups based on water surface acres to be used for foodsize fish production from January 1 through June 30, 1997.

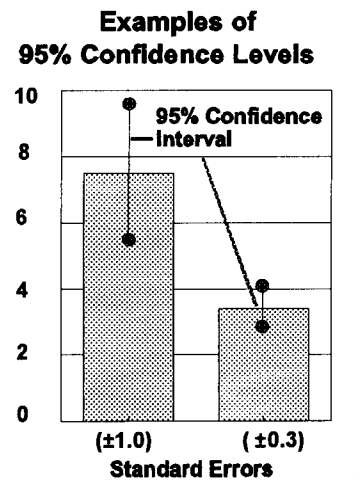
**Population estimates:** averages and proportions are weighted to represent the population. Most of the estimates in this report are provided with a measure of variability called the *standard error* and denoted by ( $\pm$ ). In graph #999a at right, chances are 95 out of 100 that the interval created by the estimate plus or minus two standard errors will contain the true population value. In the example at right, an estimate of 7.5 with a standard error of  $\pm 1.0$  results in a range 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  $\pm 0.3$  and results with a range of 2.8 and 4.0.

**Romet:** registered product, sulfadimethoxine ormetoprim.

**Sample profile:** information that describes characteristics of the reporting operations from which Catfish '97 data were collected.

**Standard error:** see population estimates above.

**Stockers:** fish between 60 lbs. and 750 lbs. per 1,000 fish.



<sup>1</sup> Identification numbers are assigned to each graph in this report for public reference.

## Section 1: Highlights

- A majority (65.1 percent) of operations regularly tested water quality. A higher percentage (81.3 percent) of operations with 150 or more acres tested regularly compared to operations with less than 20 acres (40.5 percent). (Page 5)
- On operations that tested water quality, nitrates/nitrites were tested most frequently (3.2 times per month), followed by ammonia (2.8 times per month), and pH (2.7 times per month). (Page 7)
- Levee ponds were the predominant pond type (91.2 percent of all ponds). On operations with 50 to 149 surface acres, only 68.4 percent of the ponds were levee type. (Page 9)
- On average, producers drained ponds less often (every 6.4 years) on operations where 90 percent or more of the ponds were levee ponds than on operations with a smaller percent of levee ponds (every 4.7 years). Smaller operations drained ponds more often regardless of predominant pond type. (Page 10)
- Slightly less than half of all fingerlings were purchased (44.7 percent). The percent of fingerlings purchased was greatly influenced by the largest producers who purchased only 39.5 percent of their fingerlings. (Page 11)
- Producer's reputation was cited as the most important factor in selection of fish for stocking in ponds by 34.9 percent of all operations. Fish size (25.3 percent) and price (19.1 percent) were the next most frequently cited as important factors. (Page 12)
- Fingerling stocking rates averaged 7,327 fish per acre and showed a consistently increasing rate with increasing size of operation. Stocking rates for stocker sized fish averaged 6,177 fish per acre and the percentages increased with increasing operation size. Stocking rates increased over the last 3 years on one-fourth (25.1 percent) of the operations. (Pages 14 and 15)
- The average pounds of feed fed per fish (feed conversion) reported by producers, adjusted by estimated 1996 foodfish sold, was 2.35. The feed conversion was highest in largest operations (2.42 pounds fed per pound of fish). Gross pounds of feed fed per fish, based on reported tons of feed fed and pounds of fish sold in 1996, were close to operation reported averages. (Page 17)
- Feeding rates have increased in 28.8 percent of the operations over the last 3 years. A higher percentage of larger operations increased their feeding rates than did the smaller operations. Average tons of feed fed per acre in 1996 was 4.9, and the tons per acre increased with increasing operation size. (Page 18)
- A majority of operations with fish on hand during winter fed their foodfish during winter (87.5 percent) with most feeding 3 or more days per month (62.8 percent). Water temperature and levee

condition were identified as being very important criteria in determining winter feeding schedule by 67.4 and 39.7 percent of the operations, respectively. (Pages 19 and 20)

- The predominant production type was multi-batch harvesting (89.2 percent of foodfish harvest) followed by single-batch harvesting (10.8 percent of harvest). (Page 21)
- Enteric septicemia of catfish (ESC) was reported to be present in 1996 on over one-half (56 percent) of the operations. The percent of operations with ESC present in 1996 increased with operation size. Taking fish off of feed was the most common treatment used at least once for ESC (72.6 percent of operations with ESC present and 25.8 percent of ponds). Feeding Romet was the second most common treatment (41.4 percent of operations and 9.5 percent of ponds). (Pages 22 and 23)
- Adding salt was the most common general pond treatment (62.0 percent of operations, 74.7 percent of ponds) followed by copper sulfate (49.1 percent of operations, 24.1 percent of ponds) and potassium permanganate (26.1 percent of operations, 11.5 percent of ponds). (Pages 24 and 25)
- Extension Service/Universities (49.6 percent of operations) and other producers (41.4 percent of operations) were considered to be very important sources of information for making decisions on fish health. Magazines/journals (14.4 percent) and veterinarians (10.8 percent) were not frequently cited as being very important sources of information for making decisions on fish health. (Page 25)



# Section II: Population Estimates

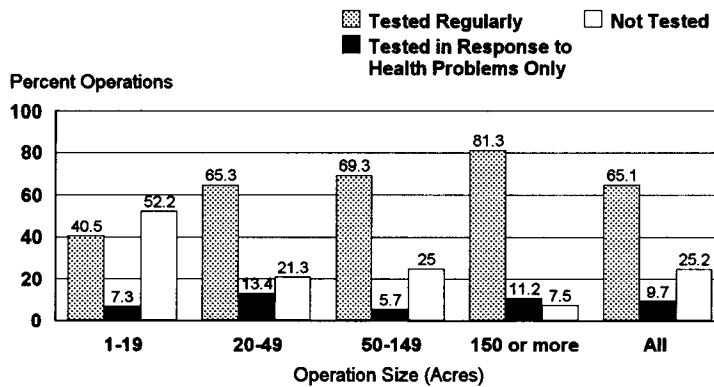
## A. Water quality management

### 1. Testing practices

a. Percent of operations by water quality testing practice during March through October 1996 and operation size:

Operation Size (Acres)	Percent Operations						Total
	Tested Regularly	Standard Error	Tested In Response to Health Problems Only	Standard Error	Not Tested	Standard Error	
1-19	40.5	(±7.1)	7.3	(±4.0)	52.2	(±7.2)	100.0
20 - 49	65.3	(±5.3)	13.4	(±4.1)	21.3	(±4.4)	100.0
50 - 149	69.3	(±4.2)	5.7	(±2.4)	25.0	(±3.8)	100.0
150 or more	81.3	(±3.1)	11.2	(±2.5)	7.5	(±2.0)	100.0
All	65.1	(±2.5)	9.7	(±1.7)	25.2	(±2.2)	100.0

**Percent of Operations by Water Quality Testing Practices\* and Operation Size**



\* March through October 1996.

#3598

## 2. Water quality parameters tested

a. Percent of operations that tested for specific water quality parameters\* during March through October 1996 by operation size:

Water Quality Parameter	Percent Operations									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Ammonia	34.2	(±6.7)	54.0	(±5.5)	64.0	(±4.5)	70.8	(±3.4)	56.5	(±2.5)
Chlorides	29.8	(±6.2)	56.2	(±5.5)	62.5	(±4.5)	74.2	(±3.3)	56.8	(±2.4)
Nitrites/Nitrates	33.1	(±6.5)	56.1	(±5.5)	65.4	(±4.4)	71.7	(±3.4)	57.5	(±2.4)
pH	33.1	(±6.5)	56.0	(±5.6)	62.3	(±4.5)	54.7	(±3.8)	52.3	(±2.5)
Alkalinity	33.1	(±6.5)	53.4	(±5.5)	54.6	(±4.7)	53.8	(±3.8)	49.5	(±2.5)
Other	4.4	(±3.2)	15.2	(±4.3)	4.5	(±2.1)	4.2	(±1.3)	7.5	(±1.6)

\* Frequency of testing for dissolved oxygen was not determined in this study.

b. For all operations, percent of operations that tested by the number of times per month ponds were tested for specific water quality parameters during March through October 1996:

Water Quality Parameter	Percent Operations										
	Number Times Tested per Month										All
	0	Standard Error	1-2	Standard Error	3-4	Standard Error	5-7	Standard Error	8 or More	Standard Error	
Ammonia	43.5	(±2.5)	24.4	(±2.1)	28.3	(±2.2)	1.4	(±0.7)	2.4	(±0.6)	100.0
Chlorides	43.2	(±2.4)	29.6	(±2.2)	24.4	(±2.1)	1.1	(±0.7)	1.7	(±0.6)	100.0
Nitrites/Nitrates	42.5	(±2.4)	23.0	(±2.0)	27.7	(±2.2)	2.5	(±1.0)	4.3	(±0.8)	100.0
pH	47.7	(±2.5)	25.8	(±2.2)	23.2	(±2.0)	0.9	(±0.7)	2.4	(±0.7)	100.0
Alkalinity	50.5	(±2.5)	26.1	(±2.2)	20.8	(±2.0)	0.9	(±0.7)	1.7	(±0.6)	100.0
Other	92.5	(±1.6)	3.5	(±1.0)	1.3	(±0.4)	0.0	(±0.0)	2.7	(±1.1)	100.0

c. For operations that regularly tested water, operation average number of times per month ponds were tested for specific water quality parameters during March through October 1996 by operation size:

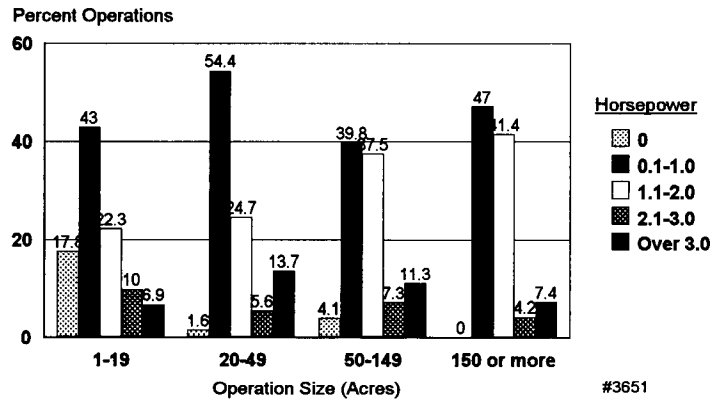
Water Quality Parameter	Operation Average Number Times Tested Per Month									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Ammonia	2.3	(±0.3)	2.1	(±0.3)	3.1	(±0.2)	3.5	(±0.2)	2.8	(±0.1)
Chlorides	1.9	(±0.4)	1.9	(±0.2)	2.7	(±0.2)	3.1	(±0.2)	2.5	(±0.1)
Nitrites/Nitrates	2.3	(±0.4)	2.4	(±0.3)	3.3	(±0.2)	4.4	(±0.5)	3.2	(±0.2)
pH	1.9	(±0.3)	2.6	(±0.7)	3.3	(±0.5)	2.7	(±0.3)	2.7	(±0.3)
Alkalinity	1.8	(±0.3)	1.8	(±0.2)	3.0	(±0.6)	2.5	(±0.2)	2.3	(±0.2)
Other	0.7	(±0.6)	2.0	(±1.1)	0.1	(±0.1)	0.3	(±0.1)	0.8	(±0.3)

### 3. Aeration horsepower

a. Percent of operations by horsepower of fixed aeration used per surface acre and operation size:

Operation Size (Acres)	Percent Operations										
	Horsepower										
	0	Standard Error	0.1-1.0	Standard Error	1.1-2.0	Standard Error	2.1-3.0	Standard Error	Over 3.0	Standard Error	Total
1-19	17.8	(±5.9)	43.0	(±7.1)	22.3	(±6.1)	10.0	(±5.1)	6.9	(±3.9)	100.0
20 - 49	1.6	(±1.5)	54.4	(±5.9)	24.7	(±5.2)	5.6	(±2.9)	13.7	(±3.5)	100.0
50 - 149	4.1	(±2.0)	39.8	(±4.8)	37.5	(±4.7)	7.3	(±3.4)	11.3	(±2.8)	100.0
150 or more	0.0	(±0.0)	47.0	(±3.9)	41.4	(±3.9)	4.2	(±1.6)	7.4	(±2.0)	100.0
All	5.2	(±1.5)	46.7	(±2.8)	31.5	(±2.4)	6.6	(±1.6)	10.0	(±1.5)	100.0

**Percent Operations by Horsepower of Fixed Aeration Used per Acre and Operation Size**



b. Operation average horsepower and weighted average of horsepower of fixed aeration used per surface acre by operation size:

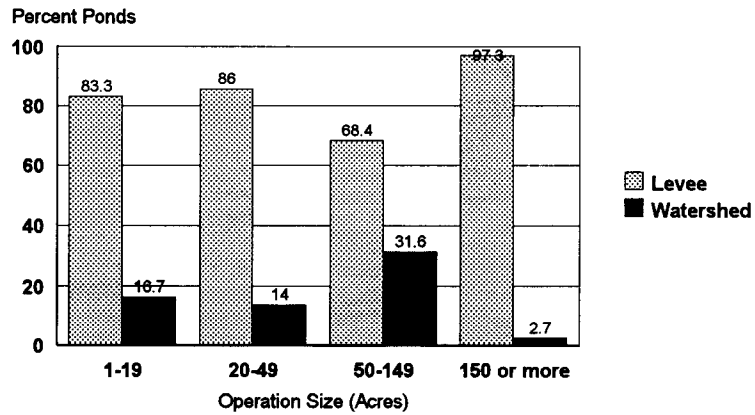
Operation Size (Acres)	Horsepower of Fixed Aeration Per Surface Acre			
	Operation Average	Standard Error	Weighted Average (Weight is Number of Foodsize Acres)	Standard Error
1-19	1.9	(±0.4)	1.9	(±0.5)
20 - 49	2.6	(±0.3)	2.8	(±0.4)
50 - 149	2.4	(±0.2)	2.5	(±0.2)
150 or more	2.5	(±0.3)	2.0	(±0.2)
All	2.4	(±0.1)	2.1	(±0.1)

4. Pond types and draining practices

a. Percent of ponds by pond type and operation size:

Operation Size (Acres)	Percent Ponds				
	Pond Type				
	Levee	Standard Error	Watershed	Standard Error	Total
1-19	83.3	(±5.0)	16.7	(±5.0)	100.0
20 - 49	86.0	(±4.0)	14.0	(±4.0)	100.0
50 - 149	68.4	(±10.0)	31.6	(±10.0)	100.0
150 or more	97.3	(±1.1)	2.7	(±1.1)	100.0
All	91.2	(±2.1)	8.8	(±2.1)	100.0

**Percent of Ponds  
by Pond Type and Operation Size**



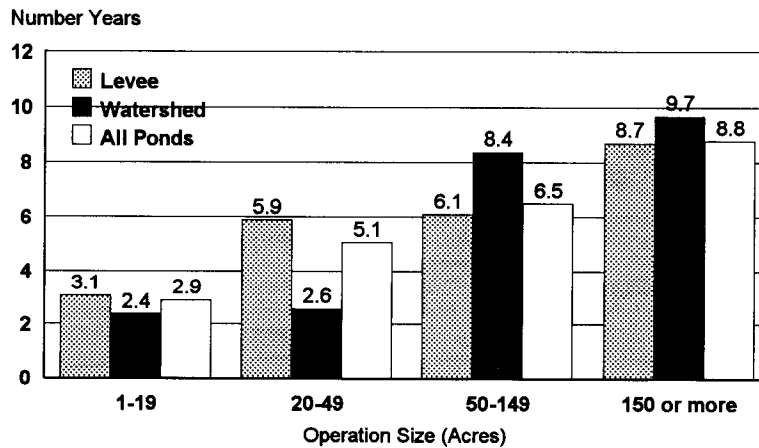
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b. Operation average number of years typically between pond drainings by operation size and pond type\*:

Operation Size (Acres)	Operation Average Years Between Drainings					
	Pond Type					
	Levee Ponds	Standard Error	Watershed/Mixture Ponds	Standard Error	All	Standard Error
1-19	3.1	(±0.4)	2.4	(±0.5)	2.9	(±0.3)
20 - 49	5.9	(±0.5)	2.6	(±0.8)	5.1	(±0.5)
50 - 149	6.1	(±0.3)	8.4	(±1.7)	6.5	(±0.4)
150 or more	8.7	(±0.4)	9.7	(±0.7)	8.8	(±0.4)
All	6.4	(±0.2)	4.7	(±0.8)	6.1	(±0.2)

\*Pond type for the operation was classified levee if at least 90 percent of the operation's ponds were reported as levee ponds. Otherwise the pond type was classified as "Watershed/Mixture".

### Number Years Between Drainings by Pond Type and Operation Size



#3600

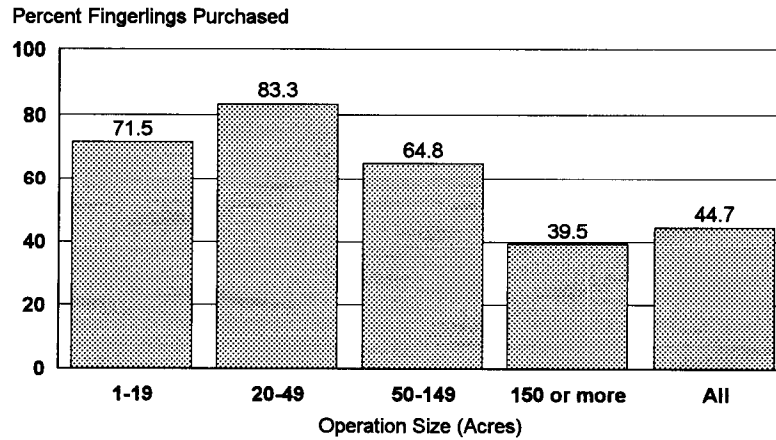
## B. Stocking practices

### 1. Source of fingerlings

#### a. Percent of fingerlings purchased by operation size:

Operation Size (Acres)	Percent Fingerlings Purchased			
	Operation Average		Weighted Average (Weight Is Number of Fingerlings Stocked)	
	Purchased	Standard Error	Purchased	Standard Error
1-19	66.5	(±6.6)	71.5	(±9.3)
20 - 49	84.9	(±4.0)	83.3	(±4.6)
50 - 149	66.4	(±4.4)	64.8	(±4.9)
150 or more	61.0	(±3.2)	39.5	(±4.1)
All	70.3	(±2.3)	44.7	(±3.7)

### Percent Fingerlings Purchased by Operation Size\*



\*Weight is number of fingerlings stocked.

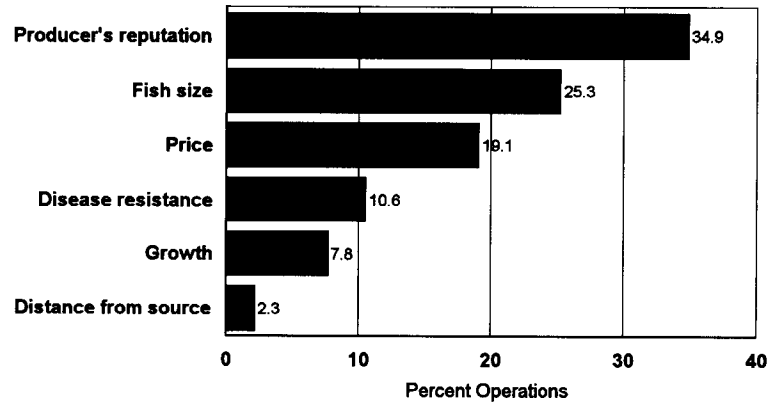
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2. Factors affecting selection of fish for stocking

a. Percent of operations (and percent of fingerlings stocked on those operations) by the most important factor in selection of fish for stocking:

Factor	Percent Operations	Standard Error	Percent Fingerlings Stocked on Those Operations	Standard Error
Price	19.1	(±2.1)	20.1	(±3.3)
Growth	7.8	(±1.5)	4.8	(±0.9)
Disease resistance	10.6	(±1.9)	4.3	(±1.0)
Fish size	25.3	(±2.2)	40.2	(±4.8)
Distance from source (supplier)	2.3	(±0.9)	1.4	(±0.7)
Producer's reputation	34.9	(±2.7)	29.2	(±3.5)
Total	100.0		100.0	

**Percent Operations by Most Important Factor in Selection of Fish for Stocking in Ponds**



#3602



b. Percent of operations by the most important factor in selection of fish for stocking and operation size:

Factor	Percent Operations									
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error	All Operations	Standard Error
Price	15.8	(±4.9)	20.2	(±4.4)	21.1	(±4.1)	19.1	(±3.1)	19.1	(±2.1)
Growth	4.9	(±3.1)	9.2	(±3.4)	11.7	(±3.4)	5.4	(±1.2)	7.8	(±1.5)
Disease resistance	21.9	(±6.2)	7.8	(±3.5)	6.5	(±2.2)	7.3	(±2.1)	10.6	(±1.9)
Fish size	19.7	(±5.6)	27.0	(±4.8)	24.1	(±4.6)	29.1	(±3.4)	25.3	(±2.2)
Distance from source (supplier)	4.3	(±2.6)	3.3	(±2.4)	1.1	(±0.8)	0.7	(±0.4)	2.3	(±0.9)
Producer's reputation	33.4	(±6.9)	32.5	(±5.5)	35.5	(±5.3)	38.4	(±3.8)	34.9	(±2.7)
Total	100.0		100.0		100.0		100.0		100.0	

c. Percent of operations where any of the fish stocked were vaccinated or exposed to enteric septicemia of catfish (ESC) by operation size:

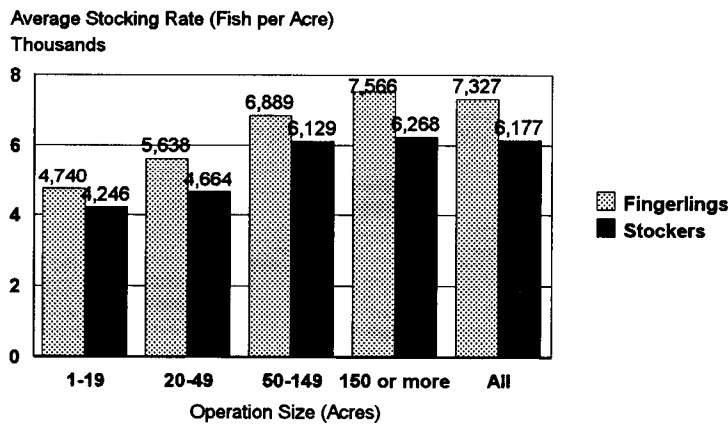
Status	Percent Operations									
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error	All Operations	Standard Error
Vaccinated for ESC	4.4	(±3.2)	15.8	(±4.4)	13.3	(±4.0)	10.2	(±2.3)	11.3	(±1.9)
Exposed at origin	4.6	(±3.3)	15.0	(±4.0)	26.7	(±4.5)	31.3	(±3.5)	19.8	(±1.9)
ESC-free source	9.4	(±4.1)	22.5	(±5.1)	14.2	(±4.2)	13.4	(±2.8)	15.2	(±2.1)
Unknown ESC status at origin	12.1	(±4.7)	30.2	(±5.4)	17.2	(±3.8)	23.9	(±3.6)	21.7	(±2.2)

3. Stocking rate

a. Operation average and weighted average normal stocking rate (fish per surface acre) for foodfish ponds by operation size and fish size:

Operation Size (Acres)	Average Stocking Rate (Fish per Acre)							
	Fingerlings				Stockers			
	Operation Average	Standard Error	Weighted Average (Weight is Acreage)	Standard Error	Operation Average	Standard Error	Weighted Average (Weight is Acreage)	Standard Error
1-19	4,145	(±321)	4,740	(±373)	3,480	(±402)	4,246	(±426)
20 - 49	5,514	(±264)	5,638	(±274)	4,615	(±336)	4,664	(±334)
50 - 149	6,651	(±349)	6,889	(±425)	6,014	(±188)	6,129	(±167)
150 or more	7,716	(±372)	7,566	(±282)	6,081	(±168)	6,268	(±265)
All	6,069	(±166)	7,327	(±235)	5,285	(±123)	6,177	(±225)

**Weighted\* Average Stocking Rate by Operation Size and Fish Size**



\*Weight is acreage.

#3603

b. Percent of operations by change in stocking rate over the previous 3 years and operation size:

Operation size (acres)	Percent Operations						
	Change in Stocking Rate						
	Increased	Standard Error	Decreased	Standard Error	Stayed the Same	Standard Error	Total
1-19	17.2	(±4.8)	20.0	(±5.8)	62.8	(±6.8)	100.0
20 - 49	29.8	(±5.2)	5.7	(±2.7)	64.5	(±5.5)	100.0
50 - 149	30.2	(±4.6)	9.3	(±2.9)	60.5	(±4.9)	100.0
150 or more	21.8	(±3.1)	11.1	(±2.3)	67.1	(±3.5)	100.0
All	25.1	(±2.2)	11.0	(±1.7)	63.9	(±2.6)	100.0

c. Percent of operations by change in average size of fish stocked over the previous 3 years and operation size:

Operation Size (Acres)	Percent Operations						
	Change in Average Size of Fish Stocked						
	Increased	Standard Error	Decreased	Standard Error	Stayed the Same	Standard Error	Total
1-19	29.6	(±6.8)	6.3	(±2.9)	64.1	(±7.1)	100.0
20 - 49	20.4	(±4.9)	6.1	(±3.2)	73.5	(±5.4)	100.0
50 - 149	25.2	(±4.3)	6.1	(±2.2)	68.7	(±4.6)	100.0
150 or more	19.5	(±2.9)	9.8	(±2.1)	70.7	(±3.3)	100.0
All	23.3	(±2.4)	7.1	(±1.4)	69.6	(±2.6)	100.0

## C. General feeding practices

### 1. Feeding methods

a. Percent of operations (and percent of all foodsize fish acres on those operations) by feeding method most commonly used during March through October, 1996:

Feeding Method	Percent Operations	Standard Error	Percent of All Food-size Fish Acres on Those Operations	Standard Error
Feed until feeding activity stops	18.1	(±2.2)	14.4	(±2.0)
Feed until feeding activity slows	21.7	(±2.2)	29.2	(±3.5)
Feed as much as will be consumed in a specified time	34.3	(±2.7)	28.8	(±4.4)
Feed according to estimate of fish weight in pond	21.0	(±2.1)	22.9	(±3.1)
Other	4.9	(±1.2)	4.7	(±1.3)
Total	100.0		100.0	

b. Percent of operations by daily feeding schedules and season:

Season	Percent Operations						
	Daily Feeding Schedule						
	Twice Daily	Standard Error	Once Daily Before Noon	Standard Error	Once Daily Noon or Later	Standard Error	Total
March - June 1996	10.9	(±1.8)	32.3	(±2.6)	56.8	(±2.8)	100.0
July - October 1996	16.3	(±2.0)	39.7	(±2.6)	44.0	(±2.8)	100.0

## 2. Amount fed

a. Operation average total tons of feed fed (and tons per acre fed) to foodfish during 1996, by operation size:

Operation Size (Acres)	Tons Feed Fed			
	Average Tons Fed	Standard Error	Average Tons Fed Per Acre	Standard Error
1-19	31.3	(±5.6)	3.4	(±0.5)
20 - 49	128.8	(±16.3)	4.2	(±0.5)
50 - 149	383.0	(±53.3)	4.6	(±0.6)
150 or more	2126.8	(±161.9)	5.0	(±0.2)
All	715.6	(±50.1)	4.9	(±0.2)

b. Average pounds of feed fed per pound of fish harvested during 1996 by operation size:

Operation Size (Acres)	Average Pounds Feed Fed Per Pound of Fish Harvested					
	Operation Average	Standard Error	Weighted Average (Weight is Foodfish Sold)	Standard Error	Gross Average (Annual Feed Fed Divided by Foodfish Pounds Sold)	Standard Error
1-19	1.71	(±0.09)	2.12	(±0.13)	2.04	(±0.25)
20 - 49	1.84	(±0.05)	1.84	(±0.08)	2.29	(±0.33)
50 - 149	2.01	(±0.05)	2.01	(±0.05)	2.20	(±0.10)
150 or more	2.35	(±0.05)	2.42	(±0.06)	2.35	(±0.10)
All	2.01	(±0.03)	2.35	(±0.06)	2.33	(±0.09)

\*Reported number of pounds fed on the operation in 1996 divided by pounds sold as reported for 1996.

c. Percent of operations by change in feeding rate in foodfish ponds over the previous 3 years and operation size:

Operation Size (Acres)	Percent Operations						
	Change in Feeding Rate						
	Increased	Standard Error	Decreased	Standard Error	Stayed the Same	Standard Error	Total
1-19	18.2	(±6.0)	9.9	(±4.3)	71.9	(±6.9)	100.0
20 - 49	28.5	(±5.0)	10.8	(±4.0)	60.7	(±5.7)	100.0
50 - 149	32.7	(±4.8)	10.1	(±3.1)	57.2	(±5.1)	100.0
150 or more	34.1	(±3.7)	6.5	(±2.4)	59.4	(±3.8)	100.0
All	28.8	(±2.4)	9.3	(±1.8)	61.9	(±2.7)	100.0

## D. Winter feeding practices

### 1. Days fed per month

a. For operations that had foodfish on hand over winter, percent of operations by number of days per month during winter that foodfish were fed and operation size:

Days Per Month	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20 - 49	Standard Error	50 - 149	Standard Error	150 or More	Standard Error		
0	6.9	(±4.7)	15.8	(±5.0)	12.6	(±3.7)	13.5	(±2.8)	12.5	(±2.0)
1-2	18.6	(±6.2)	27.2	(±6.2)	27.3	(±5.2)	24.8	(±3.6)	24.7	(±2.7)
3-4	34.8	(±8.0)	37.4	(±6.6)	27.5	(±4.7)	24.6	(±3.7)	30.8	(±2.9)
5	39.7	(±8.3)	19.6	(±5.1)	32.6	(±5.7)	37.1	(±4.1)	32.0	(±2.9)
All	100.0		100.0		100.0		100.0		100.0	

b. For operations that had foodfish on hand over winter, operation average number of days per month during winter that foodfish were fed by size of operation:

Operation Average Days Fed Per Month									
Operation Size (Acres)									
1-19	Standard Error	20 - 49	Standard Error	50 - 149	Standard Error	150 or More	Standard Error	All	Standard Error
6.1	(±1.0)	3.2	(±0.3)	4.0	(±0.4)	4.2	(±0.3)	4.3	(±0.3)

## 2. Criteria for determining winter feeding schedule

### a. Percent of operations by importance of criteria in determining the winter feeding schedule:

Scheduling Criteria	Percent Operations						Total
	Very Important	Standard Error	Somewhat Important	Standard Error	Not Important	Standard Error	
Feed cost	18.7	(±2.4)	21.7	(±2.4)	59.6	(±3.0)	100.0
Labor availability	7.5	(±1.7)	14.7	(±2.2)	77.8	(±2.6)	100.0
Levee condition	39.7	(±2.8)	25.2	(±2.3)	35.1	(±2.8)	100.0
Water temperature	67.4	(±2.8)	17.4	(±2.4)	15.2	(±2.3)	100.0
Other	8.2	(±1.8)	1.4	(±0.7)	90.4	(±1.9)	100.0

## E. Harvesting practices

### 1. Production systems

#### a. Operation average percent of 1996 foodfish pounds harvested by type of production system and operation size:

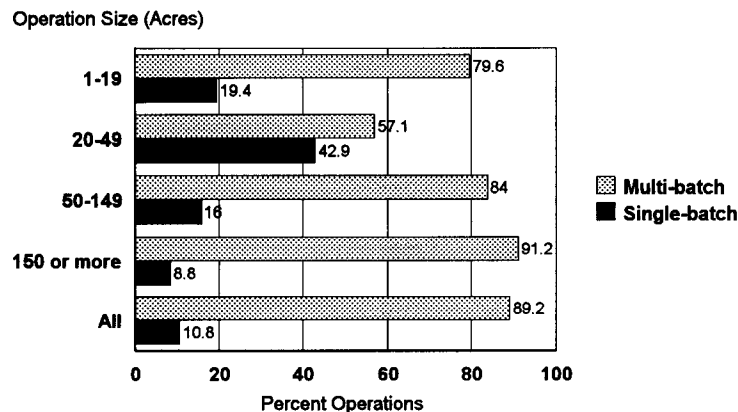
Operation Size (Acres)	Operation Average Percent Foodfish Pounds Harvested								
	Type of Production System								
	Multi-batch	Standard Error	Single-batch	Standard Error	Cages	Standard Error	Other	Standard Error	Total
1-19	64.6	(±7.3)	28.7	(±7.1)	6.7	(±3.8)	0.0	(±0.0)	100.0
20 - 49	69.4	(±5.5)	30.6	(±5.5)	0.0	(±0.0)	0.0	(±0.0)	100.0
50 - 149	82.2	(±4.1)	17.8	(±4.1)	0.0	(±0.0)	0.0	(±0.0)	100.0
150 or more	90.8	(±2.6)	9.2	(±2.6)	0.0	(±0.0)	0.0	(±0.0)	100.0
All	77.3	(±2.4)	21.3	(±2.4)	1.4	(±0.8)	0.0	(±0.0)	100.0



b. Percent of 1996 foodfish pounds harvested (weighted by pounds foodsize fish sold) by type of production system and operation size:

Operation Size (Acres)	Percent Foodfish Pounds Harvested						
	Type of Production System						
	Multi-batch	Standard Error	Single-batch	Standard Error	Cages	Standard Error	Total
1-19	79.6	(±11.1)	19.4	(±11.0)	1.0	(±0.9)	100.0
20 - 49	57.1	(±9.6)	42.9	(±9.6)	0.0	(±0.0)	100.0
50 - 149	84.0	(±4.1)	16.0	(±4.1)	0.0	(±0.0)	100.0
150 or more	91.2	(±3.3)	8.8	(±3.3)	0.0	(±0.0)	100.0
All	89.2	(±2.9)	10.8	(±2.9)	0.0	(±0.0)	100.0

### Percent 1996 Foodfish Pounds Harvested\* in Multi- and Single-batches by Operation Size



\*Weighted by pounds foodsize fish sold.

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2. Percent of fish harvested

a. Number of fish harvested in 1996 as a percent of the estimated number of fish stocked by operation size (estimated number stocked is the average stocking rate for fingerlings and stockers multiplied by foodsize fish acres):

Percent Fish Harvested									
Operation Size (Acres)									
1-19	Standard Error	20 - 49	Standard Error	50 - 149	Standard Error	150 or More	Standard Error	All	Standard Error
48.2	(±22.5)	39.6	(±11.8)	40.4	(±3.2)	38.7	(±2.1)	38.9	(±1.9)

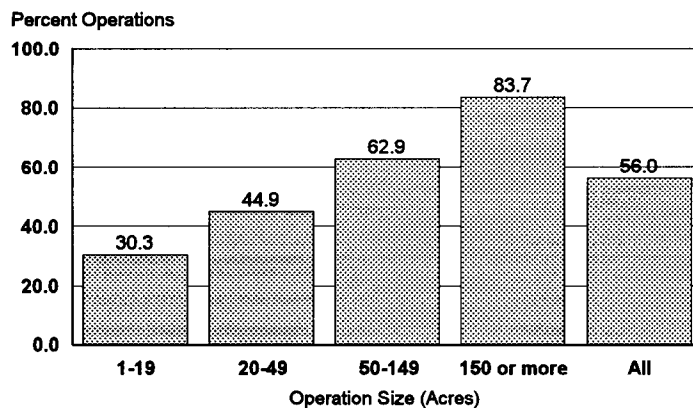
F. Health management

1. Presence and treatment of enteric septicemia of catfish (ESC)

a. Percent of operations with ESC present in 1996:

Percent Operations									
Operation Size (Acres)									
1-19	Standard Error	20 - 49	Standard Error	50 - 149	Standard Error	150 or More	Standard Error	All	Standard Error
30.3	(±6.5)	44.9	(±5.6)	62.9	(±4.7)	83.7	(±3.0)	56.0	(±2.4)

**Percent Operations with Enteric Septicemia of Catfish (ESC) Present by Operation Size**

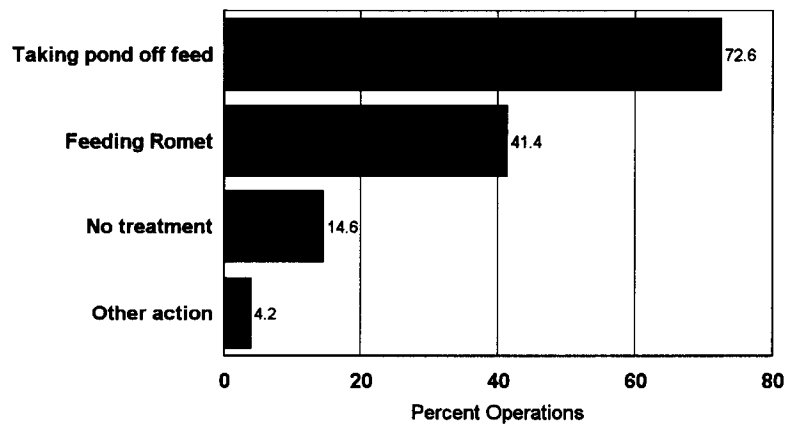


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b. For operations with ESC present in 1996, percent of operations by treatment for ESC and operation size:

Operation Size (Acres)	Percent Operations							
	ESC Treatment							
	Feeding Romet	Standard Error	Taking Pond Off Feed	Standard Error	Other Action	Standard Error	No Treatment	Standard Error
1-19	68.9	(±13.0)	74.6	(±12.4)	9.1	(±8.1)	0.0	(±0.0)
20 - 49	39.7	(±8.2)	72.4	(±8.2)	1.8	(±1.4)	16.5	(±7.3)
50 - 149	35.9	(±6.6)	75.0	(±6.3)	5.0	(±3.1)	19.5	(±6.0)
150 or more	37.8	(±4.2)	70.4	(±4.3)	3.5	(±1.6)	14.6	(±3.5)
All	41.4	(±3.4)	72.6	(±3.3)	4.2	(±1.5)	14.6	(±2.7)

**Percent Operations\* by Treatment for Enteric Septicemia of Catfish (ESC)**



\*For operations with ESC present.

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c. Percent of all ponds on operations with ESC in 1996 that were treated for ESC by treatment and operation size:

Operation Size (Acres)	Percent Ponds					
	ESC Treatment					
	Feeding Romet	Standard Error	Taking Pond Off Feed	Standard Error	Other Action	Standard Error
1-19	36.2	(±8.5)	36.9	(±16.2)	6.0	(±5.9)
20 - 49	21.4	(±5.7)	74.3	(±21.5)	1.0	(±0.8)
50 - 149	11.6	(±2.8)	32.8	(±4.2)	2.0	(±1.3)
150 or more	7.9	(±1.5)	21.7	(±2.9)	0.9	(±0.5)
All	9.5	(±1.4)	25.8	(±2.7)	1.1	(±0.5)

2. General treatments for ponds

a. Percent of operations that treated ponds at least once during 1996 by treatment and operation size:

Treatment	Percent Operations									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Copper sulfate	39.4	(±6.8)	56.7	(±5.4)	53.2	(±4.9)	44.8	(±3.9)	49.1	(±2.5)
Salt	35.7	(±6.6)	60.0	(±5.4)	66.9	(±4.7)	82.4	(±2.9)	62.0	(±2.3)
Potassium permanganate	11.7	(±4.6)	21.2	(±4.9)	27.7	(±4.7)	42.4	(±4.0)	26.1	(±2.4)
Formalin	2.7	(±2.4)	8.3	(±3.5)	6.3	(±2.6)	2.7	(±1.3)	5.2	(±1.4)
Other	13.8	(±5.0)	6.9	(±3.0)	9.6	(±3.1)	1.2	(±1.0)	7.6	(±1.6)

b. Percent of ponds that were treated at least once during 1996 by treatment and operation size:

Treatment	Percent Ponds									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Copper sulfate	21.5	(±8.4)	40.5	(±5.2)	34.8	(±4.8)	20.3	(±4.5)	24.1	(±3.4)
Salt	21.7	(±8.1)	71.2	(±12.9)	53.8	(±6.0)	82.6	(±5.5)	74.7	(±4.5)
Potassium permanganate	6.6	(±2.9)	20.3	(±9.5)	10.4	(±2.6)	11.0	(±3.9)	11.5	(±3.0)
Formalin	8.3	(±7.4)	5.8	(±2.4)	3.2	(±1.8)	0.7	(±0.5)	1.8	(±0.6)
Other	8.4	(±4.2)	3.6	(±1.7)	6.1	(±2.4)	0.6	(±0.5)	2.1	(±0.6)

3. Sources of fish health information

a. Percent of operations by importance of information sources in making decisions about fish health:

Information Source	Percent Operations						
	Very Important	Standard Error	Somewhat Important	Standard Error	Not Important	Standard Error	Total
Extension Service/ Universities	49.6	(±2.9)	34.8	(±2.7)	15.6	(±2.1)	100.0
Producer associations	28.5	(±2.6)	40.3	(±2.7)	31.2	(±2.6)	100.0
Magazines/Journals	14.4	(±2.1)	45.7	(±2.8)	39.9	(±2.7)	100.0
Other producers	41.4	(±2.7)	39.7	(±2.7)	18.9	(±2.2)	100.0
Consultants/ Service providers	31.1	(±2.5)	28.7	(±2.4)	40.2	(±2.7)	100.0
Veterinarians	10.8	(±1.7)	17.7	(±2.0)	71.5	(±2.4)	100.0
Other	1.3	(±0.6)	0.0	(±0.0)	98.7	(±0.6)	100.0

b. Percent of operations by source of information for making decisions about fish health that was considered very important and operation size:

Information Source	Percent Operations									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Extension Service/ Universities	56.7	(±7.1)	51.6	(±5.8)	47.1	(±5.0)	43.7	(±3.9)	49.6	(±2.9)
Producer associations	40.0	(±7.2)	25.9	(±5.1)	24.2	(±3.8)	25.6	(±3.3)	28.5	(±2.6)
Magazines/ Journals	31.6	(±7.0)	11.8	(±3.3)	9.0	(±2.2)	8.1	(±2.0)	14.4	(±2.1)
Other producers	49.5	(±7.1)	41.6	(±5.6)	44.7	(±5.0)	31.8	(±3.5)	41.4	(±2.7)
Consultants/ Service providers	21.8	(±5.5)	37.5	(±5.6)	30.6	(±4.8)	32.0	(±3.5)	31.1	(±2.5)
Veterinarians	14.5	(±5.0)	10.7	(±3.1)	8.4	(±2.6)	9.7	(±2.1)	10.8	(±1.7)
Other	2.7	(±2.4)	0.0	(±0.0)	2.1	(±1.1)	1.0	(±0.5)	1.3	(±0.6)

#### 4. Records kept

a. Percent of operations keeping the following records by operation size:

Records Kept	Percent Operations									
	Operation Size (Acres)								All	Standard Error
	1-19	Standard Error	20-49	Standard Error	50-149	Standard Error	150 or More	Standard Error		
Feed use	73.2	(±6.0)	83.2	(±4.2)	90.3	(±3.2)	95.7	(±1.8)	86.0	(±1.8)
Mortality	56.8	(±7.0)	47.3	(±5.9)	48.7	(±5.2)	50.9	(±3.8)	50.6	(±2.8)
Water quality	51.4	(±7.4)	74.1	(±5.1)	73.8	(±4.7)	83.9	(±3.0)	71.7	(±2.6)
Fish growth	43.9	(±7.3)	42.2	(±5.8)	56.5	(±5.1)	74.9	(±3.6)	54.5	(±2.8)
Number stocked	82.0	(±4.6)	87.7	(±3.8)	90.9	(±3.0)	98.8	(±0.9)	90.2	(±1.5)
Disease treatments	51.1	(±7.2)	53.2	(±5.8)	63.8	(±5.1)	66.9	(±3.7)	58.8	(±2.7)
Other	12.7	(±4.9)	3.9	(±2.1)	9.5	(±2.8)	8.6	(±2.1)	8.3	(±1.5)
Any records	87.3	(±4.2)	88.4	(±3.6)	95.1	(±2.4)	100.0	(±0.0)	92.8	(±1.4)

## Section III: Sample Profile

### A. Catfish '97 respondents

1. Respondents by study phase and operation size:

Operation Size (Acres)	Phase I		Phase II	
	Number Respondents	Percent Respondents	Number Respondents	Percent Respondents
1-19	118	20.7	47	15.6
20 to 49	140	24.5	72	23.9
50 to 149	142	24.9	77	25.6
150 or more	171	29.9	105	34.9
Total	571	100.0	301	100.0

## National Animal Health Monitoring System (NAHMS): Background

The Animal Industry Act of 1884 directed the Animal and Plant Health Inspection Services' (APHIS) predecessor, the Bureau of Animal Industry, to "collect such information...as shall be valuable to the agricultural and commercial interests of the country." The Bureau effected this mandate to eradicate diseases such as bovine contagious pleuropneumonia. Hog cholera, bovine brucellosis, tuberculosis, and pseudorabies were more recent targets.

In the mid 1970's, the National Academy of Science sparked APHIS to reassess its responsibilities toward the industry's information needs in light of the modern food animal industry that is affected by such issues as world trade, product safety, and product quality. APHIS identified the need for proactive information to become even more timely, accurate, and user-friendly in the latter quarter of the 20th century than it had been in 1884. The Agency recognized its responsibility to collect and provide information beyond the existing level. Veterinary Services' (VS) network of federal veterinarians; their knowledge, training, and locations across the U.S.; and their collaboration with State animal health officials brought the monitoring program to VS.

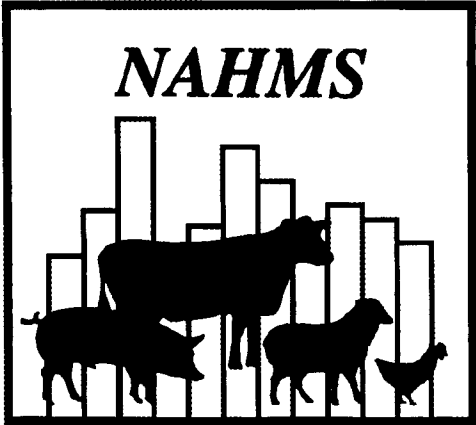
NAHMS makes use of existing data by compiling statistics and information and serves as the impetus for federal, state, industry, and university collaboration to gather fresh information to fill data gaps. Through national studies such as the Catfish '97, these multidisciplinary resources gather data and generate descriptive statistics on animal health, productivity, and management. By 1997, a total of 41 states had participated in at least one of NAHMS national studies with on-farm data collection:

Date/Study Name	# Producers	U.S. Population Represented by Core Data
1989-90 National Swine Survey	1,661	95% swine
1990-91 National Dairy Heifer Evaluation Project (NDHEP)	1,811	78% milk cows
1993-94 Cow/Calf Health & Productivity Audit (CHAPA)	2,539	100% cow/calf operations
1994-95 Cattle on Feed Evaluation (COFE)	3,214	85.8% cattle on feed
Swine '95: Grower/Finisher	1,661	91% hogs
Dairy '96	2,542	83% milk cows
Sheep '96	5,174	100% sheep in 48 states
Beef '97	2,713	86% beef cows
Catfish '97	571	96% foodfish sales

For more information about Catfish '97 or other NAHMS projects, please contact:

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