APHIS Info Sheet

Veterinary Services
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Feeding Protocols for U.S. Catfish Operations, 2002–09

Proper feeding of catfish follows general guidelines but is often termed as much an art as a science (Tucker and Robinson, 1991). Feeding costs are usually the largest component of the total cost of raising catfish. These costs can be at least partially controlled by careful feed selection, tailoring feeding practices to catfish production type, and monitoring feed consumption. Feeding practices can be tailored not only to stage of production but also to farm infrastructure such as pond type (e.g., levee or watershed ponds), mechanization level, and staffing.

Background

Floating feed pellets, which allow producers to monitor feed consumption, are usually used to feed broodfish, foodsize fish, and larger fingerlings. Fry often get meal, while older fry and small fingerlings are fed "crumbles." Feeding rates depend on many factors, including pond fish density and water temperature. Feeding activity declines during cold periods and peak during the warm summer months.

The USDA's National Animal Health Monitoring System (NAHMS) conducted its third national study of the U.S. catfish industry, Catfish 2010. There were 424 participating producers in Catfish 2010. The study focused on four States, which were divided into two regions. The East region was defined as Alabama and Eastern Mississippi; the West region was defined as Arkansas, Louisiana, and western Mississippi. Results from Catfish 2010 related to feeding practices are presented here. In addition, Catfish 2010 results are compared with results from the NAHMS Catfish 2003 study.

Breeding operations

Feeding protocols for foodfish (adult breeding stock) are based on three seasons which represent reproductive phases (prespawning or spring/early summer, spawning or midsummer/fall, postspawning or winter). In 2009, most breeding operations fed broodfish at least every third day from spring to fall and then switched to less-frequent feedings in the winter (table 1). Feeding frequencies from 2002 to 2009 were similar in the midsummer, fall, and winter, with the exception of the "other" category, which included feeding as weather permitted in 2002 and no feeding at all in 2009.

Table 1. Percentage of breeding operations by how often broodfish were usually fed during the following seasons, and by study

	Percent Operations					
	Season					
	Spring/early summer		Midsummer/ fall		Winter	
Fed . . .	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010
Daily	23.5	35.2	28.9	29.8	4.3	2.7
Every other day	35.7	35.1	28.9	32.4	3.4	8.1
Every third day	33.1	18.9	29.7	27.0	5.6	10.8
Less often than every third day	6.2	5.4	8.5	8.1	44.7	43.3
Other	1.5	5.4	4.0	2.7	42.0	35.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

On nearly 7 of 10 breeding operations in 2009 (69.4 percent), broodfish were primarily fed feed consisting of 32 percent protein, an increase from 59.3 percent of operations in 2002. In contrast, the percentage of operations that fed 35 percent protein feed declined from 13.3 percent of operations in 2009 to 5.6 percent of operations in 2009. The percentage of breeding operations that stocked forage fish in broodfish ponds as a supplemental food source for broodfish also increased from 32.5 percent in 2002 to 48.7 percent in 2009. Tilapia was stocked by the highest percentage of breeding operations in 2009 (27.0 percent) [data not shown].

Hatcheries and fry/fingerling operations

Fry that have absorbed their yolk sacs require frequent feedings. Most hatcheries in 2009 (46.2 percent) fed fry in fry troughs seven or more times per day. Feeding frequency of fry in fry troughs was unchanged from 2002 to 2009. In 2009, catfish starter or salmon/trout starter was the primary feed fed to fry (51.7 and 35.4 percent of hatcheries, respectively). In 2002, however, a higher percentage of hatcheries primarily fed fry catfish starter (68.3 percent), and a smaller percentage fed salmon/trout starter (11.1 percent).

Feeding protocols for fry and fingerlings in ponds are reflective of temperature ranges that match those in the four seasons. A higher percentage of fry/fingerling operations fed fry/fingerlings at least twice daily in spring and fall in 2009 compared with 2002 (table 2). A lower percentage of fry/fingerling operations fed fry/fingerlings at least twice daily in summer in 2009 compared with 2002. In both study years, a majority of fry/fingerling operations fed at least once a day in all seasons but winter. In winter, most operations adopted an “other” feeding frequency. In 2009, most operations using the “other” feeding frequency in winter fed irregularly, as needed, or did not feed, while about one-third fed between one time per week and one time per month. Similar to feeding of broodfish, “other” included when weather and pond levee conditions permitted in 2002.

Table 2. Percentage of fingerling operations by how often fry/fingerlings were usually fed during the following seasons, and by study year

	Percent Operations							
	Season							
	Spring		Summer		Fall		Winter	
Fed . . .	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010
At least twice daily	37.3	46.2	33.6	26.9	9.9	15.4	2.3	1.9
Once a day	40.8	38.4	60.7	57.7	49.1	53.9	4.3	5.8
Every other day	12.5	9.6	3.3	9.6	20.4	25.0	5.8	11.5
Every third day*	4.0	NA	1.3	NA	16.7	NA	13.6	NA
Other	5.4	5.8	1.1	5.8	3.9	5.7	74.0	80.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Not asked in Catfish 2010.

Protein is a key component to the growth of fingerlings and is the most expensive component of any feed. In 2009, nearly one-half of fry/fingerling operations (49.1 percent) primarily fed feed consisting of 32 percent protein. This is a shift from 2002, in which the highest percentage of fry/fingerling operations (41.3 percent) primarily fed feed consisting of 35 percent protein. Only 17.6 percent of fry/fingerling operations fed feed with 35 percent protein in 2009. The decrease in the percentage of fry/fingerling operations that fed 35-percent protein feed might reflect producers’ efforts to reduce costs.

Foodsize-fish operations

Protein requirements for foodsize fish differ from those for fry/fingerlings. In 2009, a majority of foodsize fish operations (57.3 percent) primarily fed foodsize fish feed consisting of 28 percent protein, while 40.4 percent of operations primarily fed feed consisting of 32 percent protein. However, in 2002 most foodsize fish operations (62.3 percent) primarily fed a 32-percent protein feed, while 35.2 percent of foodsize fish operations primarily fed a 28-percent protein feed. Although a protein level of 32 percent was considered standard for foodsize

fish in the past, a level of 28 percent has been shown to be adequate. In 2009, price (which is related to protein level) and past performance were the most important reasons for choosing which feed to purchase by the highest percentage of foodsize-fish operations (41.3 and 23.1 percent, respectively).

The feeding regimen for foodsize fish generally followed a seasonal pattern. In 2009, the highest percentage of foodsize fish (48.1 percent) were fed to satiation on alternate days in spring, every day to satiation in summer (46.1 percent of operations), and alternate days in fall (58.9 percent of operations for satiation and maximum feeding limit combined) [table 3]. In spring, fewer operations in 2009 fed every day (to satiation or with a maximum feeding limit) compared with operations in 2002. In summer, a higher percentage of foodsize fish operations fed every day to satiation in 2009 than in 2002 (46.1 and 39.9 percent, respectively). In both study years in the fall, a similar percentage of operations used alternate-day feeding.

Table 3. Percentage of foodsize-fish operations by how often foodsize fish were usually fed during the following seasons, and by study

	Percent Operations					
	Season*					
	Spring		Summer		Fall	
Fed . . .	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010	Catfish 2003	Catfish 2010
Every day to satiation	12.5	7.9	39.9	46.1	17.1	18.8
Every day but with a maximum feeding limit	13.7	8.9	31.4	25.0	18.5	12.1
Alternate days to satiation	37.8	48.1	16.5	16.2	35.0	38.1
Alternate days with a maximum feeding limit	22.8	19.5	9.2	8.2	19.0	20.8
Other	13.2	15.6	3.0	4.5	10.4	10.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Originally in questionnaire listed as: March–April, May–August and September–October.

For operations that kept foodsize fish, there was a shift in winter feeding frequency from 2002 to 2009. In 2009, the majority of foodsize fish operations averaged fewer than four feedings per week, while in 2002 the majority of foodsize fish operations averaged four or more feedings per week (table 4).

Table 4. Percentage of foodsize-fish operations by average number of days per week foodsize fish were fed from December through February, and by study

	Percent Operations	
Average number days per week	Catfish 2003	Catfish 2010
0	30.1	56.8
1 to 3	9.7	37.3
4 or more	53.1	0.8
No foodfish on hand in winter	7.1	5.1
Total	100.0	100.0

The greatest amount of feed is fed during summer, when the feeding activity of the fish increases. In 2009, during the peak feeding month for each operation, foodsize fish operations averaged 120 pounds of feed/acre/day for all growout ponds while the average highest daily rate for any single growout pond was 161.1 pounds of feed fed/acre. During the peak month of feeding, all operations averaged 11.6 pounds of feed fed/acre/day more in 2009 than in 2002. The average highest daily rate between operations was 17.1 pounds of feed fed/acre more in 2009 than in 2002.

Fish other than catfish are stocked in ponds to supplement feed but also to consume undesirable vegetation, zooplankton, phytoplankton, or other underutilized pond resources. Some of the fish stocked, such as threadfin shad and fathead minnows, are intended to become food for catfish. In 2009, 29.6 and 7.8 percent of foodsize fish operations stocked threadfin shad and fathead minnows, respectively. Only 13.1 percent of foodsize fish operations stocked threadfin shad in 2002, whereas 10.9 percent of operations stocked fathead minnows.

Conclusions

Breeding, fry/fingerling and foodsize-fish operations appear to be shifting to lower protein feeds. In contrast, a higher percentage of broodstock operations used higher protein feed in 2009 compared with 2002. The feeding frequency of fry/fingerlings by season has remained nearly unchanged. Since 2002, a lower percentage of producers fed foodsize fish every day in spring, perhaps adopting a fall-like frequency of feeding to lower feed costs. However, the frequency of feeding in winter has increased, perhaps in response to evidence that catfish will consume food at lower temperatures and that winter feeding better prepares fish for the spring. In summer months, more feed was fed on a per-acre basis to foodsize fish in 2009 compared with 2002, and supplemental food sources in the form of other species of fish also increased in those years.

Reference

Tucker CS, Robinson EH. 1951. Channel Catfish Farming Handbook, Chapman & Hall, New York, NY.

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