Catfish Farming

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Introduction

A successful catfish farm takes time and careful planning to develop. If you are a good farm manager and would like the challenge of learning an entirely new kind of agriculture, catfish farming may be for you. It is similar to any type of feedlot operation, such as cattle, swine or poultry, in that you must provide a complete feed and avoid any unnecessary stress of the animals. There is one important difference between catfish farming and other feedlot operations. Catfish live in a water environment that is not only their source of oxygen, but also their waste dumping ground. Because of this problem, intensive commercial catfish farming requires that many hours be spent checking water quality, especially at night.

Systems for Growing Catfish

Three systems for growing channel catfish have proven economical. Levee ponds are constructed by building earthen levees on all four sides of a relatively flat area to hold from 4 to 6 feet of water. Water is usually supplied from a well and the ponds are built to be self-draining. Up to 4,500 fish per surface acre of levee pond can be grown if aeration equipment is used
and fish are harvested at the 1 to 11/2 pound size.

Watershed ponds are constructed on steeper slopes by building a dam across a draw or ravine to catch runoff water. If built with a fairly flat bottom they can be used for commercial catfish farming. To avoid weed problems, water depth should be a minimum of 4 feet. A disadvantage to most watershed ponds is the lack of control over refill. One way around this is to build a series of ponds, one above the other. The lowest pond is harvested first, so as higher ponds are drained they fill the one below.

Deep ponds are likely to experience low oxygen problems in the fall when oxygen poor bottom water mixes with upper water. Because of this problem, ponds with an average depth of more than 6 feet should not be stocked with more than 2000 catfish per surface acre, unless special equipment is used to keep top and bottom waters mixed.

Cages are used to grow catfish in existing ponds and lakes where harvesting loose stocked fish would be difficult or impossible. Catfish can be stocked into cages at eight to ten fish per cubic foot and grown to a size of 1 to 1 1/2 pounds. Catfish do well in cages provided that they are not disturbed, the cage mesh does not become clogged with algae ("moss") and no more than 1,000 pounds of fish per surface acre of pond are grown. The pounds grown per surface acre must be kept low to reduce the chance of low oxygen conditions. Catfish crowded in cages will die at low oxygen levels that do not seriously affect loose stocked catfish.

Other systems for growing catfish are being developed. Currently these systems are recommended only for those willing to accept a higher level of risk, or those planning only a small scale operation. Raceways are tanks or channels in which large volumes of flowing water supply oxygen and carry away wastes, allowing fish to be produced very densely. Given ideal water temperatures, they still use about 4 times as much water to raise catfish as ponds. Recirculating systems filter and recycle water allowing fish to be grown year round indoors where growing temperatures can be maintained. Potential for fish kills in these systems is high due to unreliable filtration systems.

Land

The first step in evaluating the suitability of a site for pond construction is to consider the lay of the land. Levee ponds are built in areas with less than 5 percent slope. Watershed ponds are usually the best option for steeper areas. Generally, the area collecting rainfall above a watershed pond needs to be 10 to 15 times the size of the pond area. Your county Soil Conservation Service office is an excellent place to get advice on pond construction on your site.

The suitability of soils for pond construction can usually be determined by your county Soil Conservation Service office from a published soil survey. Soils should contain 30 percent or more clay and have low permeability rates. Soils that are almost pure clay may not be suited to pond construction due to their poor compaction properties and high shrink-swell potential.

Situations to avoid in selecting pond sites include:

1. Areas that are subject to frequent flooding.
2. Areas with rock outcroppings.
3. Soils that may contain persistent pesticides or other toxic substances present in the soil. Past use of the site for cotton farming, cattle dips or waste dumps are warning signals. Persistent pesticides that have made newly built ponds unfit for catfish include Endrin and Toxaphene.
4. Locations that are too isolated to allow good security. Fish farmers are always in danger of losing fish to midnight poachers.

5. Sites for which water discharge permits can not be obtained. See the section on laws and regulations below.
6. Locations with access roads that are inadequate for the size of hauling trucks that are anticipated.

Water

Fish farms require large volumes of good quality water. The water required for levee ponds can be estimated as either a minimum of 13 gallons per minute of flow for each surface acre of pond or 3 times the pond volume per year. Flow rates from existing wells and springs can be estimated using the methods outlined in OSU Extension Fact Sheet F-1502, "Irrigation Water Management." When considering other sources, such as streams and watershed reservoirs, get the advice of a Soil Conservation Service engineer.

Wells or springs are the preferred source of water for catfish ponds. Run well and spring water over screening or splash boards to increase oxygen content. Water from streams and lakes must be screened to keep out wild fish, which would otherwise reproduce and compete with the catfish for feed and space.

It is not practical to analyze every possible water quality variable and contaminant that might make water unfit for fish farming. The best way to evaluate water is to grow a few catfish in an aquarium filled with the water or in a cage suspended in the water. Laboratory tests for total alkalinity, total hardness, total iron, nitrate and salinity can also be useful. Table 1 gives recommended ranges for these water quality variables. Seek further advice if water quality values are outside of the recommended range.

Situations to avoid in selecting a water source include:

1. Surface water sources subject to pesticide pollution. Streams and lakes bordering agricultural land may receive pesticides in the form of runoff or spray drift.
2. Deep wells or other water sources with high pumping costs. Estimate annual pumping costs before committing yourself to use a water source.
3. Watershed impoundments that are too fertile. A heavy growth of microscopic plants (phytoplankton) giving water a dense green or brown color is an indication of this problem. Fish kills due to low oxygen are more likely in such water.

The key to maintaining good water quality is to measure the surface acreage of each pond exactly and not stock more than the recommended number of fish per surface acre. Extra fish mean extra nutrients going into the pond in the form of feed. This leads to heavy growth of microscopic plants (phytoplankton) which die and decay leading to lack of oxygen and sudden large fish kills. To maintain water quality over the long term, many farmers drain their ponds every 5 to 10 years, allow them to dry and then scrape out the organic material that has built up on the bottom.

Table 1. Suggested water quality standards for water sources to be used in the production of food fish size channel catfish. Other standards apply to production of fingerlings.

Variable	*Recommended Range*
Total Alkalinity	50 - 400 ppm
Total Hardness	50 - 400 ppm
Total Iron	0 - 0.5 ppm
Nitrate	0 - 3.0 ppm
Salinity	0 - 8 ppm

Managing A Fish Farm

It takes know-how and long hours to manage a fish farm. A good farming background that includes operation and maintenance of equipment is important. Fish farmers must also be comfortable with the close attention and stress that goes along with managing an intensive agricultural operation. Like any other animal in a crowded feedlot situation, catfish are susceptible to sickness and poor production if poorly managed. The manager must closely watch how the fish are feeding and the condition of the water both by test equipment and color. During summer, nightly rounds to monitor oxygen levels and aerate ponds are the norm, not the exception. On the positive side, catfish farmers have the satisfaction of watching the fish grow from fingerling to harvest size and knowing that it is directly due to their management.

Management Tips

- Stocking Rates - Measure your ponds exactly and do not exceed recommended stocking rates.
- Healthy Large Fingeriings - Six to eight inch long fingerlings must be purchased if marketable catfish are to be produced in one growing season. Good quality 6 to 8 inch fingerlings are 11 or fewer fish per pound. Visit your fingerling supplier's farm to inspect your order before it is loaded. Be sure no wild fish are mixed with your order.
- Good Feed - Buy a high quality complete feed made for catfish with at least 32% crude protein. Many cheap catfish feeds are intended for use in recreational fishing ponds where fish are stocked lightly and can obtain natural food to make up for anything missing in the feed. Floating type feed is preferred during spring, summer, and fall.

Economics

Starting a catfish farm requires sound economic planning. Pond construction is a major expense, and once ponds are built, there is little else that can be done with the land if fish farming should prove unprofitable. Consider the return from alternate uses of the land before committing your resources to catfish production.

A rough idea of the investment and return involved in different size catfish farms using different marketing outlets can be obtained from the budgets given in Tables 2 through 5. An initial investment of about $5,000 per water surface acre is required if pond construction work is hired done. Startup costs can be greatly reduced if you are able to build your own ponds. Some producers are able to further reduce their fixed costs by sharing equipment with neighboring catfish farmers. Further assistance in preparing a catfish farming budget for your farm situation is available through your county Extension office.

The factors that most influence profitability from year to year are feed costs and market price. Catfish feed costs have varied from $220 up to $440 per ton. The price paid by

Table 2. Enterprise budget for 80 acres of levee pond production of food fish size channel catfish. All fish are sold to a processing plant.

Conditions: Ponds stocked with 4500 fish/acre and harvested at 1 1/4 lb Death loss of 6%
Feed conversion: 1 3/4 lbs feed per lb of fish produced
All labor except harvesting help provided by operator
Financing at 12% interest

		Your Estimate
Income:		
A. 423,000 lbs catfish at $0.70 per pound	$296,100	
Variable Costs:		
B. Fingerlings at $0.14 each	$50,400	
C. Floating Feed $300/ton X (423,000 X 1.75) ÷ 2000	111,038	
D. Chemicals	5,600	
E. Electricity—Pump	8,000	
F. Fuel, Oil, and Lube	1,600	
G. Equipment Repair	1,000	
H. Preharvest Labor	-0-	
I. Harvest Labor at $3.50 per hour	1,200	
J. Transport by Processor at $0.03 per pound	12,690[1]	
K. Miscellaneous	500	
L. Interest on Operating Capital 8 mo	14,347	
M. Total Variable Costs	$206,375	
N. Income Above Variable Costs (A-M)	$ 89,725	
Fixed Costs[2]		
O. Interest on $299,425 at 12% annual rate	$35,931	
P. Depreciation, straight line	19,094	
Q. Total Fixed Costs	$55,025	
R. Estimated Returns (A-M-Q)	$34,700	
S. Breakeven to cover variable costs (M ÷ 423,000)	$0.49/lb live wt.	
T. Breakeven to cover all costs (M + Q) ÷ 423,000	$0.62/lb live wt.	

[1] not financed
[2] See Table 3

processors for catfish between 1983 and 1988 ranged from $0.55 to $0.80 per lb live weight. It is prudent to have enough funds on hand to meet operating expenses for the first three years of operation in case of unusually high feed prices, low processor prices, delays in pond construction, or high fish mortality due to operator inexperience.

In addition to commercial banks, several other sources of financing for catfish farming exist. The Farmers Home Administration (FmHA) makes loans to family farms that are economically viable but unable to secure credit from other sources. FmHA does not differentiate between traditional and non-traditional agriculture. Up to $300,000 in loans can be secured through guaranteed and insured FmHA loans. Production Credit Associations (PCAs) generally specialize in short and intermediate term loans to agricultural producers. Catfish farmers are eligible for PCA loans (PCA, Cir. 37, April 1973). At the time of publication, the Oklahoma Ag-Link Deposit Program was another source of low interest financing for alternative enterprises such as catfish farming. Lenders are impressed by loan applicants who have some history of successful operation. Because of this fact, many fish farmers find it best to start a small operation using their own money before approaching a lender for funds to expand.

Marketing

No one makes any money growing channel catfish. They only make money when they sell them. Talk with potential buyers about their needs before you stock your first fingerling. Buyers have different requirements for pounds per order, frequency of orders, size of fish and price. Successful catfish farmers plan their production around the needs of their buyers. It is much easier to increase profits by getting a higher price for the fish than by cutting production costs.

Catfish farms that are only a few acres in size and where the operator has plenty of time will usually earn the highest return by selling fish direct to the consumer. Larger farms

Table 3. Fixed costs for 80 acres of levee pond production of food fish size channel catfish.

Fixed Cost	*New Cost*	*Units*	*No. of Cost*	*Total of Life*	*Years Depreciation*	*Yearly Your Cost*	*Your Estimate Yearly Depreciation*
Pond	$240,000	1.0	$240.000	20	$12,000	_____	_____
Well	10,000	1.0	10,000	20	500	_____	_____
Storage Shed	3,200	1.0	1,725	10	173	_____	_____
Mower	1,725	1.0	1,725	10	173	_____	_____
Truck (1/2 ton)	13,000	1.0	13,000	5	2,600	_____	_____
Oxygen Meter	700	2.0	1,400	5	2,600	_____	_____
Used Tracotr (40 H.P.)	4,500	2.0	9,000	10	900	_____	_____
Feed Blower	4,700	1.0	4,700	10	470	_____	_____
Feed Bin	2,500	1.0	2,500	10	250	_____	_____
Paddlewheel Aerator	2,800	2.0	5,600	10	560	_____	_____
Jon Boat	750	1.0	750	10	75	_____	_____
Boat Motor	300	1.0	300	10	30	_____	_____
Seine	2,500	1.0	2,500	5	500	_____	_____
Seine Reel	2,500	1.0	2,500	10	250	_____	_____
Live Hauling Tank	1,500	1.0	1,500	10	150	_____	_____
Live Car	500	1.0	500	5	100	_____	_____
Harvesting Equipment	250	1.0	250	3	83	_____	_____
						Your Estimate	
Total Investment			$299,425			_____	
Total Yearly Depreciation (Straight Line)					$19,094	_____	

will sell most of their fish to processors, but can still increase their profits by selling some of their fish to buyers that pay a higher price such as fee-fishing pond operators.

Laws and Regulations

It is essential that anyone planning a fish farm obtain the necessary permits before a major investment is made. Water rights and water discharge permits are obtained through the Oklahoma Water Resources Board. The Oklahoma Department of Wildlife Conservation requires that any operation producing fish or other aquatic animals have an aquaculture permit. A visit to the farm by a local game ranger is usually part of the application process. In addition, ask local and county government officials about any local ordinances that may apply.

Getting Started

The most valuable advice contained in this publication is to start small and learn as your farm grows. Small for one person might be 1 acre and 100 acres for another person. The important factor is that you do not assume more risk than your personal or farm economic situation can stand. Likewise stock your ponds lightly the first year to allow a greater safety margin until you have some experience in monitoring oxygen levels and aerating ponds. Three thousand fish per surface acre is a good first year stocking rate for levee ponds.

Keep in contact with other fish farmers and Extension personnel experienced in fish farming, and do not hesitate to ask their advice. The first years of a fish farm are a critical time when the operator is learning both how to produce the fish and how to meet the demands of buyers. Starting small gives you the luxury of making affordable mistakes while you learn.

Table 4. Enterprise budget for 3 acres of levee pond production of food fish size channel catfish. All fish are sold live direct to local consumers.

Conditions: Ponds stocked with 4500 fish/acre and harvested at 1 1/4 lb Death loss of 6%
Feed conversion: 1 3/4 lbs feed per lb of fish produced
All labor except harvesting help provided by operator
Financing at 7% interest

			Your Estimate
Income:			
A.	15,863 lbs catfish at $1.25 per pound	$19,828	
Variable Costs:			
B.	Fingerlings at $0.18 each	$2,430	
C.	Floating Feed $320/ton X (15,863 X 1.75) ÷ 2000	4,442	
D.	Chemicals	210	
E.	Electricity—Pump	300	
F.	Fuel, Oil, and Lube	65	
G.	Equipment Repair	95	
H.	Preharvest Labor	-0-	
I.	Harvest Labor at $3.50 per hour	105	
J.	Marketing Labor	-0-	
K.	Miscellaneous	75	
L.	Interest on Operating Capital 8 mo	360	
M.	Total Variable Costs	$8,082	
N.	Income Above Variable Costs (A-M)	$ 11,746	
Fixed Costs[1]			
O.	Interest on $24,563 at 7% annual rate	$1,719	
P.	Depreciation, straight line	2,557	
Q.	Total Fixed Costs	$4,276	
R.	Estimated Returns (A-M-Q)	$7,470	
S.	Breakeven to cover variable costs (M ÷ 15,863)	$0.51/lb live wt.	
T.	Breakeven to cover all costs (M + Q) ÷ 15,863	$0.78/lb live wt.	

[1] See Table 5

Table 5. Fixed costs for 3 acres of levee pond production of food fish size channel catfish.

Fixed Cost	*New Cost*	*No. of Units*	*Total Cost*	*Years of Life*	*Yearly Depreciation*	*Your Cost*	*Your Estimate Yearly Depreciation*
Pond Construction	$9,000	1.0	$9.000	20	$450	_____	_____
Well	5,000	1.0	5,000	20	250	_____	_____
Storage Shed	3,200	1.0	640	20	32	_____	_____
Mower	1,725	1.0	173	10	17	_____	_____
Truck (1/2 ton)	13,000	1.0	1,300	5	780	_____	_____
Oxygen Meter	50	1.0	50	5	10	_____	_____
Used Tracotr (40 H.P.)	4,500	0.2	900	10	90	_____	_____
Paddlewheel Aerator	2,500	1.0	2,500	10	250	_____	_____
Jon Boat	750	1.0	750	10	75	_____	_____
Boat Motor	300	1.0	300	10	30	_____	_____
Seine	1,200	1.0	1,200	5	240	_____	_____
Seine Reel	2,500	1.0	2,500	10	250	_____	_____
Live Hauling Tank	1,500	1.0	1,500	10	150	_____	_____
Holding Tank	1000	1.0	1,000	10	100	_____	_____
Harvesting Equipment	250	1.0	250	3	83	_____	_____

			Your Estimate
Total Investment		$24,563	_____
Total Yearly Depreciation (Straight Line)		$2,557	_____

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