CONCLUSIONS

1. White catfish were more difficult to catch than channel catfish, but fishing success for white catfish was quite satisfactory.
2. The presence of white catfish in combination with channel catfish appeared desirable and might extend the period of good fishing since they are less readily caught.
3. Although most fishermen agreed that the white catfish tastes as good as the channel catfish, a majority preferred the latter since it bites better, fights harder, and gives about 5 per cent higher dressed weight because of its smaller head.
4. Effective baits for white catfish included large pinkworms, chicken and beef liver, catalpa worms, live minnows and cut fish, plus commercially prepared blood and cheese bait. Artificial lures were seldom used and appeared ineffective in these waters that were highly colored with plankton as a result of daily feeding.

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TRENDS IN COMMERCIAL FISH FARMING PRACTICES IN ARKANSAS*

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ABSTRACT

If trout farms are excluded, commercial fish farming, per se, in Arkansas, is only about fifteen years old. This neophyte industry has already progressed through several phases of development to the more mature and studied practices found today, from the haphazard period when many thought they could get rich quickly without much work and with little management. Each farmer or reservoir owner tends to analyze his own resources and follows the practices which will make him the most profit. Although there is no "patented medicine practice," current fish farming activity can be classed under several headings, i.e., bait minnows, channel catfish production, controlled food fish reservoirs, multiple purpose reservoirs and surface water storage reservoirs.

INTRODUCTION

For all practical purposes, warm water commercial fish farming did not get started in Arkansas until after World War II. It began essen-

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1 Nomenclature recommended by the committee on common and scientific names of fishes, Spl. Publ. No. 2, American Fisheries Society, 1960.

2 Most wells vary from 75 to 175 feet deep and pump from 500 to about 1,500 gallons of water per minute. The average well probably is 125 feet deep and pumps 1,000 gallons of water per minute.

tially in the hill lands and concerned itself primarily with the propagation of bait fishes: fathead minnows,[1] *Pimephales promelas*; golden shiners, *Notemigonus crysoleucas*; and goldfish, *Carassius auratus*.

However, suitable sites for fish hatcheries or rearing ponds are scarce in the hills due to water supply, topography and soils. An ample volume of ground water is limited in the highlands of Northern and Western Arkansas and it is uneconomical to attempt to pump water out of the ground for fish propagation purposes. Surface water courses are less than desirable due to contamination with wild fishes. Therefore, most fish hatcheries in the hills are located below large, ever flowing springs and are necessarily small in area due to the terrain of the land and the amount of water available. Rocky, gravelly and/or sandy soils sometimes eliminate the possibility of constructing ponds in the hills that will hold water.

Within a few years, it was soon discovered that cheaper ponds could be constructed in the flat, heavy lands of Eastern Arkansas where ample underground water was available. In the rice, *Oryza sativa*, growing areas, hundreds of wells were already present.[2] Therefore, by 1952 several bait minnow projects were in operation in the rice growing area.

It wasn't long before it became evident to the farmers, that food and game fishes[3] could also be produced in their private reservoirs.[4] At this stage in the industry, there was almost no technical help and advice available to the food fish farmers from their usual "conventional" sources of agricultural information and in many cases, the farmers failed to avail themselves of, or heed the advice and information that was available from the "unconventional" sources. However, several hundred people, more or less, "struck out on their own" in an almost frantic attempt to "get into the fish business."

Six main factors contributed to the intense interest in fish farming in the flat farm lands of Eastern Arkansas:

1. A tremendous amount of surplus lands due to crop acreage controls on rice and cotton, *Gossypium* species.
2. A large acreage of submarginal, mostly low lying, timbered lands, that could be used for reservoirs.
3. The creation of thousands of acres of surface water storage reservoirs for crop irrigation.
4. The creation of thousands of acres of surface water storage reservoirs for flooding green timber duck shooting areas.[5]
5. The relatively high market price for buffalo fishes, *Ictiobus* species (approximately 20 cents per pound for fish over six pounds in weight).
6. The need and search for a better crop rotational system in rice culture.[6]

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3 "Game fishes" are those native and exotic fishes which the Arkansas Game and Fish Commission has so designated. "Food fishes" are fishes that are more or less prized for human food, but have not been classified as game fishes. Food fishes are also called "commercial" fishes. "Trash fishes" are fishes taht are not considered desirable as human food and are not considered game fishes.

4 In the fish farming areas of Eastern Arkansas most farmers refer to their artificial ponds as reservoirs, probably because they average much larger than what is commonly thought of as a pond.

5 A green timber duck shooting area is a track of live, mast producing timber which is shallowly flooded each fall in order to make the mast available to wild ducks, (family Anatidae, order Anseriformes). The ducks are shot for sport by the hunters. The water is drained off each spring after the duck hunting season is over.

6 It should be understood that fish are not raised simultaneously with rice in Arkansas. Evidently many people have been under this impression, especially foreigners from the rice growing areas of the world. Rice in Arkansas is grown so thick that there is not sufficient space between the rice plants for a fish to maneuver. The water is also maintained very shallow, about four (4) inches.

THE PROBLEM OF REGULATIONS

In Arkansas, the State Game and Fish Commission is the agency charged with the responsibility for the conservation, propagation and management of the fish and wildlife resources. Regulations of the Game and Fish Commission did not permit the commercial propagation of game fishes. As a consequence, there began a long period of negotiation between representatives of the fish farming industry and the Commission, which finally resulted in regulations being passed which permit nearly any and all types and kinds of commercial fish farming practices, on private lands, using both game and commercial species of fishes.

The hassel over regulations "waxed hot and humid" for several years. More than anything else, this one thing served to unite the fish farmers and bring them close together. Newspaper coverage was excellent, which further served to "publicize" fish farming. Due to the unorthodox and interesting nature of fish farming, newspaper and magazine people were anxious to run articles concerned with novel aspects of fish raising.

By 1957, the stage was set, the production well publicizer, the actors eager and the show was on. What was the outcome?

CONSTRUCTION AGGRAVATES POOR PRODUCTION

As we stated previously, the farmers had little experience in fish farming and very little factual information was available. It can be seen now that most of the reservoirs constructed were poorly engineered from a fisheries standpoint:

1. Side slopes were too steep and crown width too narrow. This made proper maintenance of the levees almost impossible.
2. Water depths were too shallow, which brought on problems with both submerged and emergent aquatic vegetation and made fertilization impractical.
3. Proper seining or harvesting basins were not constructed, which made the actual act of harvesting the fishes that were produced uneconomical.
4. Proper drains and water control structures were not installed.

When it came to stocking and managing the reservoirs, the farmers were also at a disadvantage:

1. Very little was known about the production of fingerling buffalo fishes and channel catfish, therefore, in the early days, stocking fish were in short supply.
2. Lack of know-how in seining and handling the fingerlings resulted in terrific mortalities.
3. Due to the lack of knowledge and experience with stocking rates and combinations, many reservoirs were haphazardly stocked.
4. Lack of "know-how" on how to control wild fishes resulted in tremendous poundages of trash fishes being produced for which there was no market.

Therefore, during the early years of the game and food fish farming phase, the farmers were faced with problems resulting from poor plant design as well as biological production; however, the die was cast and by 1960,[7] in reality, just ten years from its earliest beginning, the warm water food fish farmers ran into another problem, that of marketing their fish.

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7 It is estimated that by 1960 one hundred thousand (100,000) acres of private water areas were available for commercial fish farming of one type or another.

EARLY MARKETING PROBLEMS

By 1960, the buffalo fishes were more plentiful from the wild public waters and the price was down, especially for fish under six pounds in size. Most of the buffalo fishes the fish farmers had to sell (for diverse reasons) were under six pounds in weight. Also, the established fresh fish market outlets were unable to handle the entire production of a large reservoir in a period of a day or two. The farmers were, to say the least, depressed and confused. They had been used to harvesting their cotton or rice as quickly as possible and taking it to the drier or gin; they wanted to do their fish the same way, however, the fresh, fresh-water food fish market does not operate this way.

About 1960 or 1961 was the peak harvest period for farm grown game and food fishes. Many farmers had a miserable experience. Due to contamination with wild fishes, thousands of tons of gizzard shad, *Dorosoma cepedianum*; carp, *Cyprinus carpio*; green sunfish, *Lepomis cyanellus;* and bullhead catfish, *Ictalurus melas* and *Ictalurus natalis*, had been produced for which there was no market. Survival and production of the buffalo fishes, channel catfish, *Ictalurus punctatus*, and largemouth bass, *Micropterus salmoides*, was, in most cases, below what had been expected. The average size of the buffalo fishes was disappointing. In addition, the cost of harvesting the reservoirs was excessive. These heart breaking failures could be traced back primarily to four things:

1. Improperly engineered reservoirs.
2. High initial mortality in the fingerlings that were stocked.
3. Failure to stock enough largemouth bass.
4. Failure to control wild fish.

RESULTS

Not withstanding the fact that the vast majority of the food fish farming efforts failed, there were instances of success. Several dozen people, that had the "feel" for the fish business and had acquired knowledge and understanding of the many variables with which they were dealing, had actually become "fish men." These entrepreneurs raised and marketed satisfactory crops of fish and made a profit for their efforts.

About the time that most "would be" fish farmers were in despair over their failures, the price of soybeans, *Glycine soja*, became favorable. For the past three or four years many thousands of acres of reservoirs have been planted in soybeans. However, there had evolved a hard core of fish men in the State of Arkansas. As these fish men learned the fish business, many have gradually turned to the production of bait fishes, because of the higher return per acre. Several have gone into a channel catfish feeding program which is a relatively new devolepment and which also can give a high return per acre.

It can be said that warm water fish farming in Arkansas has had severe growing pains, however, much has been accomplished:

1. We have acquired a better understanding of proper reservoir design for fish production and harvest.
2. We have acquired a backlog of know-how on the propagation of various kinds of fingerling fishes.
3. We have developed several satisfactory management schemes or fish farming practices that fit fairly well the needs and capabilities of our farmers.
4. We have obtained a fish farming experimental station located at Stuttgart, Arkansas. This station is operated by the U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and should serve as a catalyst to the fish farming industry.

5. We have developed an efficient multimillion dollar bait fish industry.
6. We have the beginnings of an important channel catfish industry.

PREVALENT FISH FARMING PRACTICES

1. SURFACE WATER STORAGE RESERVOIRS

a. Type of reservoir—either timbered or open field

Most of the reservoirs built for this purpose are timbered and in many cases occupy what otherwise would be considered waste or non-agricultural land. During the construction period, little or no thought is given to fish production, internal drainage and seining basins. As a result, whenever the reservoir is periodically drained, the fish cannot be efficiently harvested. Conventional commercial fishing gear (mostly gill and trammel nets) is used in the borrow ditches and old stream channels.

The primary purpose of these reservoirs is to store surface water for crop irrigation.

Commercial fish production and sport fishing is of minor concern to the owner and usually as it develops is of minor importance because provision for fish management was not engineered into the construction plans (sufficient depth, internal drainage, seining basins, proper drain valves, provision for screening the water, etc.).

b. Water supply

Surface water—(Deep wells are sometimes on hand as an emergency water supply during extreme drought conditions.)

c. Stocking

Little effort is made to properly stock these reservoirs. Some farmers will get all the game fishes they can (free of charge) from the state hatcheries or the federal hatcheries. Fish populations develop and are primarily determined by those pumped into the reservoir with the surface waters.

d. Weed control

Very little weed control is practiced. Weed control with chemicals in these non-fertilized reservoirs is not practical, however, deep water, muddy surface water, wind action and the activities of rough fish sometime effectively control aquatic weeds. The farmers are more concerned with the weeds, because of water loss through transpiration and the clogging of drains and canals than they are for fish production.

e. Major management problems

(All concerned with holding water—not raising fish.)

1. Wind action on the levees.
2. Muskrat damage to the levees.

f. Expected production

Actually very little is expected in fish production. Periodically a harvest of 25-100 pounds of salable fish per acre is effected. The main problem is that most of the fish harvested are low value carp or unmarketable species or sizes.

g. Expected gross income per acre per year

Actually little income is expected. In some of the larger reservoirs, several hundred to several thousand acres in size, the fish populations become established as they would in a natural lake and sport and commercial fishing privileges are sold and the income, however low per acre, is important.

h. Recommendations

These reservoirs should be designed and operated as multiple purpose reservoirs.

2. MULTIPLE PURPOSE RESERVOIRS

Reservoirs falling under this heading are probably more heterogeneous in purpose and operation than any of the others.

a. Type of reservoir—either timbered or open field

Most of the reservoirs built for multiple purpose are timbered and in many cases occupy, at least in part, what formerly was considered waste or nonagricultural land. These reservoirs were originally engineered with multiple purpose operation in mind or they have been modified to perform their multiple function. Commercial fish production, sport fishing, duck hunting and crop irrigation may all be major objectives.

The most common multiple purpose reservoir is probably one used to store water for flooding "green timber" duck shooting areas in the fall and for sport fishing. In recent years, more of these reservoirs have been supplementally stocked with yearling bigmouth buffalo and Israeli carp. Periodically, during the drawdowns (to flood the duck woods), a commercial harvest of food fish is made. In fact, a portion of the game fish population is sometimes harvested and sold.

b. Water supply

Surface water—(Deep wells are nearly always on hand as an emergency water supply.)

c. Stocking

Usually adult, yearling and fingerling game fish will be stocked in adequate numbers so that they will dominate the fish population from the very beginning. These fish will be obtained from state and federal hatcheries and will also be purchased outright from other fish farmers. Many fry and fingerling wild fish will also be pumped into the reservoir with the surface waters. Yearling or fingerling bigmouth buffalo and Israeli carp will sometimes be stocked at about 25 per acre for each species, these fish are purchased from commercial producers.

d. Weed control

In most non-fertilized reservoirs, chemical weed control is not practical; here we have to rely on natural control forces such as deep water, turbid surface waters pumped in and the feeding activities of Israeli carp.

In fertilized reservoirs, where the depth of the water is adequate, chemical weed control is used when necessary.

e. Major management problems

1. Getting started off with a desirable fish population. More people are aware of this problem than ever before.
2. Having adequate depth in the reservoir so that weed control and fertilization will be feasible.
3. Control of the fish population through proper screening of inlets and outlets, judicious harvesting of both the game fishes and the commercial food fishes, shad kills and supplemental stocking of channel catfish, bigmouth buffalo and Israeli carp.

3. CONTROLLED FOOD FISH RESERVOIRS

a. Type of reservoir—either timbered or open field

Most of the reservoirs being used for this purpose (or at least most of the successful ones) were constructed with fish production and harvest as the primary purpose. During the construction period attention was given to providing average depths of about four (4) feet, proper internal drainage and seining areas for efficient harvest. Normally these reservoirs are not used for irrigation purposes, however, in open field reservoirs fish crops are (or can be) rotated with rice or beans.

b. Water supply

Usually wells—If surface water is used the reservoir is first filled with water and then rotenoned (or poisoned with some other chemical) before being stocked with fish. However, some farmers depend upon heavy stocks of bass and selective shad kills to control undesirable fish where surface water is used.

c. Stocking—fertilized reservoirs (per acre)

100 yearling bigmouth or black buffalo

100 yearling channel catfish

100 yearling largemouth bass

25 yearling Israeli carp

Sometimes crappie and redear sunfish are added:

100 yearling crappie

100-200 yearling redear sunfish

Unfertilized reservoirs are stocked at one-half (½) to one-third (1/3) fertilized rates.

d. Weed control

Chemical weed control is used in fertilized reservoirs when necessary. In the past, it has been futile and uneconomical to try to control weeds with chemicals in most unfertilized reservoirs, especially where well water is used. Possibly, in the future, chemicals will be discovered that will make weed control in unfertilized reservoirs economical.

e. Major management problems

(that are presently recognized)

1. Obtaining healthy fingerlings (usually yearlings) and getting them stocked into the reservoir without killing them due to inexperience in proper handling techniques.
2. Weed control.
3. Control of undesirable fishes.
4. Effecting the harvest when the price is most favorable.
5. Oxygen depletions.

f. Expected production

(after two (2) growing seasons)

500-1,000 pounds per acre with fertilizer

250-500 pounds per acre without fertilizer

I have personally helped harvest several fertilized reservoirs having similar production to that listed below:

(Edible or salable fish on a per acre basis.)

600 pounds buffalo fish

100 pounds largemouth bass

200 pounds channel catfish

100 pounds Israeli carp

1,000 pounds—Total

g. Expected gross income per acre per year

Fifty dollars ($50.00) per acre per year would be a good substantial return. This means that if 1,000 pounds of fish are produced per acre in two years and the reservoir owner receives an average of 10 cents per pound that his gross income will be $50.00 per acre per year. Many people have exceeded this, however, in the early days most fell short (due to failure to control one or more of the production factors or failure to market their fish at a satisfactory price).

h. Recommendations

Greater depth, fertilization and weed control.

4. CHANNEL CATFISH FEEDING OPERATIONS

a. Type of reservoir—either timbered or open field (mostly open field).

Reservoirs used for this purpose are usually smaller in size, however, several 80-90 acre reservoirs have been used for feeding out channel catfish. Reservoirs used for feeding out channel catfish have, in most cases, been constructed with the idea in mind to raise fish. Therefore, internal drainage and seining basins were provided during the construction period. These reservoirs, or at least the successful ones, have been deeper than common, holding an average of four feet of water or more. These reservoirs are usually not used for irrigating crops, however, once the reservoirs are "bloomed" and submerged vegetation is under control the green "bloomed" water can (and is) used for crop irrigation if it is replaced with fresh well water. Commercial mineral fertilizers, usually superphosphate or ammonium phosphate fertilizers, are used to maintain the phytoplankton bloom to prevent submerged vegetation growth.[8] In open field reservoirs, fish crops are (or can be) rotated with rice or beans.

b. Water supply

Well water is used in most all cases, because competing and predator species must be excluded (it is not economical to feed carp, shall, and sunfish commercial feeds that cost approximately 5 cents per pound).

c. Stocking and feeding

The basic stocking rate is 1,000 "fingerlings" (usually yearlings 5-8 inches long) per acre. At a stocking of 1,000 per acre, supplemental feed is added at approximately 3% of body weight per day or approximately two (2) pounds of feed is fed for each one (1) pound of final product expected. Fish are usually stocked by April 1st and are usually harvested after October 1st, giving a growing season of six months.

Channel Catfish Feeding Schedule

	Pounds of feed per day Stocked at 1,000 per acre		Pounds of feed per day Stocked at 1,500 per acre	
	Per Day	Per Period	Per Day	Per Period
May 1-15	3.0	45.0	4.5	67.5
May 15-31	4.0	64.0	5.0	80.0
June 1-15	5.0	75.0	7.5	112.5
June 15-30	7.5	112.5	10.0	150.0
July 1-15	10.0	150.0	12.5	187.5
July 15-31	12.5	200.0	15.0	240.0
August 1-15	15.0	225.0	17.5	262.5
August 15-31	17.5	280.0	20.0	320.0
September 1-15	20.0	300.0	22.5	337.5
September 15-30	22.5	337.5	25.0	375.0
October 1-15	25.0	375.0	27.5	412.5
October 15-31	27.5	440.0	30.0	480.0
Totals:		2,604.0		3,025.0

[8] Types and amounts of fertilizers used vary with the age of the pond, the amount of feed fed, the kind of water used and the soils of the pond bottom and/or watershed.

Some ponds are stocked with as high as 1,500 fingerlings per acre and some are stocked with 750 or 500 fingerlings per acre. Percentage wise, less feed is fed at the lower rates of stocking.

The above rate of feeding will produce a one to two pound (average about one and one-fourth pound) channel catfish, from a fingerling in April or May by November; a period of six or seven months. Fishing for one pound catfish can begin about the middle of August. These higher rates of stocking and higher rates of feeding bring on more management problems, such as diseases, parasites, predators, oxygen depletions, sour water, etc. Where fresh water is available, these rates of stocking and feeding will produce on the average over 1,000 pounds of edible size catfish each year, from an acre pond.

During the period November 1st to May 1st channel catfish will eat very little except during warm spells. Feeding should be done during warm spells when the water temperature is rising. Since this occurs only periodically, very little feed (in relation to what is fed during the warm months) is needed in the winter.

d. Weed control and fertilization

These ponds are fertilized to maintain a phytoplankton bloom. Chemical weed control is used when necessary.

e. Major management problems

(that are presently recognized)

1. Survival of the fingerlings--In the early days survival was usually poor. Recently, survival of 85% or more is expected. This has been brought about by:
   a. Stocking of larger fingerlings.
   b. Standard prophylactic disease and parasite treatments with various chemicals.
   c. Not stocking in the winter, but holding the fingerlings in the nursery pond all winter and not moving them to the growing reservoir before they begin feeding actively in the spring.
   d. Regardless of the season of the year, making sure there is plenty of natural food (aquatic invertebrates) in the reservoir before releasing the fingerlings. (In years past, fingerlings would be stocked, say in November or December, immediately after the start of reservoir filling, there would be no natural food and the fingerlings would not be fed until spring.)
2. Complete exclusion of all other fish (both predators and competitors).
   a. Poisoning of all residue waters.
   b. Well water.
   c. Clean fingerlings.
3. Control of aquatic vegetation (filamentous algae, chara, pondweeds, etc.).
   a. Maintenance of a phytoplankton bloom through judicious fertilization.
   b. Chemical weed killers.
4. Proper distribution of the supplemental feed.

   Most farmers try to have at least one feeding station per acre of water.
5. Oxygen depletions.

   After several years of experience, it appears that in order to feed out channel catfish to eating size (1¼ to 1 1/3 pound each) that a source of fresh water must be on hand for pumping through the growing reservoir. Feed residue build-up and fish waste concentrations cause oxygen deficiencies and also

evidently depress fish growth. Phytoplankton die-offs also cause oxygen deficiencies. Consequently, most producers periodically pump through their growing ponds. If the bloom is reduced too much, the pond will be refertilized. This waste water can and should be used for crop irrigation or for maintaining water levels in other reservoirs.

6. Effecting harvest when the fish are of marketable size at any time of the year.

Most anyone can harvest fish without loosing them during cold weather; however, in order to harvest during the summer months, detailed planning, as to location of seining basins in relation to available fresh water, is very important.

f. Expected production.

One thousand (1,000) pounds per acre or more when stocked with 1,000 or more fingerlings. Lesser rates of stocking will produce a larger fish, but will not usually produce as much poundage. Many producers have exceeded the 1,000 pounds per acre, especially in ponds stocked with 1,500 fingerlings per acre.

g. Costs and expected gross income per acre per year.

$ 40.00	per acre pond rent.
25.00	per acre for water.
20.00	per acre for fertilizer.
15.00	per acre for chemical weed control.
$100.00	Sub Total
100.00	per acre for feed.
50.00	per acre cost of fingerlings.
$250.00	Total Costs, excluding labor.

With a yield of 1,000 pounds of eatable catfish per acre sold at 35c per pound, gross income would be $350.00 per acre, which leaves an income of $100.00 per acre for labor, management, and capital returns.

A $40.00 per acre per year pond rent is based on the fact that ponds rent for this amount in the Lonoke, Arkansas area for minnow production.

The 35c per pound is based on the fact that this is a common price where large quantities of live channel catfish are sold for stocking "pay to fish" lakes. These fish are mostly sold at the pond bank, loaded on large tank trucks that transport them out of state.[9]

The 1,000 pounds per acre production is a minimum acceptable yield.

5. BAIT MINNOWS.

The commercial production of bait minnows in private water areas essentially began in Arkansas after World War II. During the last ten years it has grown into a multimillion dollar industry in which Arkansas now leads the nation. Most

9 Channel catfish that are sold directly to local fresh fish markets usually bring a lower price (25 to 30 cents per pound). The fresh fish market requires a fish weighing 1¼ pounds or more while the fish sold for stocking purposes need not be *extremely uniform in size, nor extra large. Fish ranging in size from three-fourths* (¾) to one and one-half (1½) pounds are acceptable for fee fishing lakes. Many producers market their channel catfish directly to the consumers, thereby, by-passing the middle men and obtaining up to 50c per pound.

of Arkansas' production is exported to other states, mainly in the southwestern, southeastern and eastern direction.

The trend has been, that as a fish farmer acquired experience in the propagation of game and food fishes, he has gradually shifted to the bait minnow business. As a result, bait minnow farming has increased tremendously in the flat farm lands of eastern Arkansas.

a. Type of reservoir.

Reservoirs used for bait minnow production are nearly always cleared of all timber. Construction criteria for bait minnow reservoirs is also the most demanding as to adequate depth, internal drainage, seining basins and inlet and outlet structures.

b. Water supply.

Almost entirely well water in the flat lands and spring water in the hills.

c. Management.

There has been a lot of confusion concerning how bait fishes are grown in Arkansas. Many "outsiders" have been under the impression that, more or less, our bait fishes were grown under semi-wild conditions without much expense and management. Nothing could be further from the truth. Bait fish culture in Arkansas is an intense type of fish farming requiring constant supervision and know-how. It is an expensive operation, using considerable amounts of labor and capital. Chemicals, fertilizers, feeds and specialized equipment must be purchased in large amounts. Permanent holding and conditioning vats and distribution units, mounted on large trucks, must be constructed. The marketing of the minnows, hundreds and even thousands of miles away from their origin, requires additional expensive installations and specialized skills.

Essentially, the cultural practices used are those that are more or less "established" all over the United States and are already described in the literature. Probably the main difference between bait minnow production in Arkansas and most of the rest of the United States, is the extremely large size of the ponds. In eastern Arkansas, minnow ponds are called reservoirs. Forty, sixty, eighty and even one hundred acre reservoirs are not uncommon.

CONCLUSIONS

Arkansas now leads the nation in the commercial production of fresh water, warm water fishes in private water areas. This is not surprising when it is realized that all the factors for production are favorable:

1. Soil
2. Water
3. Topography
4. Climate
5. Know-how
6. Capital
7. Labor

Advancing to the present stage in private fish farming has not been without trial and tribulation. Nevertheless, fish farming is here to stay. As our nation grows and developes and as our need for farm raised

fishes increases, the delta lands in the lower Mississippi River valley now known as the cotton belt may also be thought of as the "fish belt."

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