

# TECHNICAL NOTES

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The following information on fish farming is taken from an article by Walter Jones, Marketing Program Coordinator for the Bureau of Commercial Fisheries' Great Lakes and Central Region at Ann Arbor, Michigan. The article was published in the Commercial Fish Farming Magazine.

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## HOW TO GET STARTED IN FISH FARMING

The checklist that follows will assist the prospective fish farmer to systematically investigate the factors of importance to his proposed venture. The checklist is designed as a general guide primarily for the prospective commercial aquaculturist and investor but may also assist some of those now in the business to improve their present operations.

### INFORMATION SOURCES

#### Personal Contacts

1. Federal and state agencies.
2. Universities and colleges.
3. Fish farming associations (state and national).
4. Professional consultants, fish farmers, food distributors, merchandisers.
5. Feed company research departments.

#### Publications and Printed Materials

1. Federal, state, university and FAO publications and reports.
2. Industry journals and magazines.
3. Popular and professional books and pamphlets on pertinent subject matter
4. Research reports.

### ECONOMICS, MANAGEMENT AND MARKETING

#### Regulations and Laws on Aquaculture Production and Merchandising

1. Do your state laws and regulations permit introduction, commercial rearing and/or sale of the species of fish you are interested in?
2. What permits or licenses are required.

3. Are there other federal and state regulations which will affect your operations -- interstate shipments, predator control, water rights, processing and retailing?

#### Capitalization and Operating Costs

1. Develop a business prospectus detailing land or space costs, capital expenditure for fishstock, equipment, buildings, water impoundment construction, operating capital needed, labor requirements, costs of financing, production, harvesting and marketing, depreciation schedules and a profit and loss estimate. Such a prospectus is often necessary to obtain financing but, more important, it forces the prospective investor to take a hard look at the economic factors involved.
2. Do you have, or can you obtain, adequate financing for capital outlays and operating expenses through marketing the first harvest -- perhaps for a period of a year or more?
3. Are you psychologically and financially prepared to only break even or perhaps to take a loss for the first year of operation?
4. Can your fish in the water or warehouse be used as collateral for financing future operation or expansion costs?
5. Are you aware of all your production and/or processing costs in order to evaluate your ability to meet competition and make a profit?
  - a. Overhead as well as operating costs?
  - b. Percent of shrinkage or processing losses to expect from live harvest weight to processing plant or consumer product weight?
  - c. Have you figured fringe benefit costs in your labor expenses?

#### Management

1. Personnel
  - a. Are you or your production manager technically trained or have the experience to manage your operation at optimum efficiency? If not, have you arranged for management counseling and periodic checks on your operation by expert consultants?
  - b. Are you, or do you have available, a biologist or ichthyologist competent to make immediate diagnosis and proceed with proper chemical treatment of diseases, parasites, etc., for fishstocks and to deal with other biological problems of hatching and rearing?

- c. Do you have adequate skilled help to efficiently carry out all phases of your operation to maintain schedules and to meet emergencies?

2. Production Plant Facilities and Layout

- a. Are your ponds, tanks, hatcheries, processing and shipping areas, etc., laid out for optimum efficiency of labor and time?
- b. Are your facilities accessible during prolonged adverse weather conditions?
- c. Do you have, or can you arrange for on short notice, holding facilities for quarantining incoming or afflicted fishstock, for accumulating pay load shipments or for merchandise display?
- d. Have you accounted for expansion in your production plant layout?
- e. Are adequate utilities -- three-phase electrical power, potable water, sewage disposal -- available?
- f. What alternate production facilities should be considered -- static ponds, earthen or concrete raceways, pen confinement, aquariums?

3. Equipment

- a. What apparatus and laboratory equipment will you require for testing of oxygen levels, disease, and other diagnostic evaluation of your operation?
- b. What emergency power unit is available in the event of failure?
- c. Do you have adequate power equipment (tractors, lifts, conveyors, winches, etc.) to facilitate efficient operations?

4. Biological and Chemical Controls

- a. What is a safe margin of oxygen level that must be maintained? Do you have provisions for emergency oxygenation of water?
- b. What chemicals or other methods will be required, and in what amounts: (1) for control of algae or other oxygen-depleting plant life? (2) For undesirable fish and other aquatic creatures?
- c. What preventive control will be used for the eradication of parasitic infestations of your fish?

- d. Do you have special permits and the cooperation of state and federal wildlife agencies for control of predators?

Marketing

1. Have you studied your market outlets?
  - a. Do you have reasonably firm market commitments as to quantity, price, product form?
  - b. Do you have alternate market outlets?
  - c. Can you adjust your harvest time to take advantage of high points in seasonal demand and price fluctuations, if they exist?
  - d. Can you provide maximum product quality, type, form and weight of products and other services your market outlet requires?
  - e. Do you have, or can you arrange for, adequate distribution facilities and dependable supply sources to meet the time, quality and quantity demands of your markets?
  - f. Are you aware of trends in product forms, packaging, convenience and prices of yours and competing products in the market?
  - g. Do you have a market outlet for your processing scrap?
2. Have you planned for market promotion and education activities?
  - a. Scheduled an advertising budget to stimulate sales?
  - b. Participated in and contributed to industry association programs to create an appealing image of fish farming industry and products to consumers and merchandisers?
  - c. Cooperated with news media staffs to develop stories and programs to increase public awareness of the industry?

PHYSICAL FEATURES OF PRODUCTION COMPLEX

1. Does your site possess natural elevations so that proper engineering will allow each pond to be drained independently and completely?
2. Does the land elevation permit biological supervision and general physical maintenance without excessive travel?

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3. Has analysis of the soils been made to determine physical qualities for water retainment and fish culture?
4. Have core drillings been made to determine impervious qualities of subterranean soils?
5. Are adjacent lands subject to aerial crop spraying for insects and weeds?
  - a. Are your production facilities protected by state law from aerial crop spraying on adjacent lands?
  - b. Have you tested your land for toxic chemical residue from previous years of crop spraying for insect and weed control?
6. Is the site free of all possible overflow by flooding?
7. Is drainage available to natural waterways without crossing other private lands?
8. Will your federal, state and local water management agencies permit drainage into existing streams?
9. Does the topographic elevation of your site make it possible to utilize the prevailing summer winds without creating excessive water erosion problems on levees?
10. Can you economically secure your production facilities from poaching and prevent straying or escape of amphibian stock?
11. Can you make or take delivery of fish regardless of weather conditions?

Water Supply

1. What is the source of your water supply -- reservoir, well (ground) water or running stream? Is it adequate for present and future needs? Is there an alternate source available in case of emergency?
2. Is it possible to secure the necessary water permits for the needed volume of water for your present and future needs?
3. What are the temperature variations of your water supply?
4. Has the water been tested for chemical adaptability to fish production? Have provisions been made for aerating well water? Are surface waters free of harmful chemicals?
5. Does the volume, depth and location of your well make it economically feasible to use?

6. Is your water supply adequate to replace evaporation and seepage?
7. Can you control predators and unwanted fish species if surface water is used?

#### SOURCE OF FINGERLING STOCK

##### Spawning and Raising Your Own Fingerlings

1. Brood stock procurement
  - a. What age brood stock should be purchased?
  - b. Where will brood stock be secured?
  - c. In the event selected wild brood stock are used, how many years adjustment are necessary in confinement, if any, before they will spawn?
  - d. At what age will a female reproduce?
  - e. At what size and age is the female most prolific?
  - f. How many brood pairs should be stocked per surface acre of water volume in spawning areas?
2. Care of brood stock prior to spawning
  - a. How long must the brood stock be placed in spawning surroundings prior to spawning?
  - b. How close must the male and female broodfish be selected as to size?
  - c. What special protein feeds must be fed and for what length of time prior to spawning?
  - d. What hormone injections (intramuscular or otherwise) or other treatment can be made to induce or suppress spawning?
  - e. What prespawning chemical treatment should the pond receive?
  - f. Does noise or physical activity have any effect on spawning? If so, what consideration should be given to location of spawning areas?

3. Spawning

- a. What water temperature must be maintained and for what length of time to induce spawning?
- b. What physical apparatus must be made available in the spawning areas?
- c. In what location and in what depth of water should such apparatus be placed?
- d. Is spawning apparatus compatible with size of brood stock?

4. Procedure to be followed with fry upon hatching

- a. What diseases can be encountered in fry? What is the chemical treatment for such diseases? Is it readily available?
- b. What measures should be taken to prevent cannibalism of the brood stock on their own young?
- c. What food (amount and form) should be fed the fry in nursery area until ready for placing in rearing pond? Where is the food available?
- d. How important are natural foods to the young and how can growth of natural foods be stimulated?

Purchasing Fingerlings From Other Producers

1. What price can you economically pay for fingerling stock?
2. What size fingerling should you stock to produce a marketable fish in a minimum feeding period?
3. What chemical treatment for disease control should the fingerlings be given before planting in rearing areas?
4. What water preparation is necessary before the planting of fingerlings?
5. How will your fingerlings be graded to size prior to planting in order to produce maximum uniformity at harvest?
6. How many fingerlings or other young stock should be stocked per surface acre or volume of water?
7. How many fry per unit of water can be feasibly carried through the growing season to produce feeder fish for the following year?

8. What maximum temperature change will the fingerlings withstand in transporting, treating or planting without experiencing thermal shock?
  - a. Is permanent damage caused by thermal shock and what treatment is effective if shock is experienced?
  - b. What equipment is necessary in hauling fingerlings to overcome thermal shock?

### FEEDING

#### Feed Source

1. Is feed readily available in quantities needed and constant supply?
2. Have your feed rations been proven through experimentation to achieve optimum growth or maintenance for the stock you are feeding?
3. Are the ingredients of your feed supply dependable and relatively constant from batch to batch?
4. Do you have laboratory facilities available for periodic feed analysis?
5. What kinds and amounts of fertilizers are needed to induce plant and plankton growth for natural feeds?

#### Feeding Procedure

1. What special equipment will be needed for an efficient feeding system?
2. How will you determine daily feeding rates? What factors will determine the rate of increasing feed to maintain maximum consumption and growth?
3. At what water temperature do you plan to begin and to cease or reduce feeding?
  - a. If you continued feeding, what amount of feed would you feed during cold weather?
  - b. What system will you use for control of ice cover in winter? Will clear or cloudy ice cover create any problems?
4. What physical apparatus or observation procedure will you use to check food consumption?
5. What adjustments will you make in your feeding program to compensate for cloudy, humid, hot days?

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6. If food consumption stops, what biological analysis must be made immediately?
7. What feeding schedule will you follow?
  - a. How often?
  - b. What is the best time of day?
  - c. In what depth of water?
8. How many areas in a given pond and over how large an area will you feed for best results?
9. If pelleted feeds are used:
  - a. What percentage of fines in your pelleted feed is permissible without creating water contamination?
  - b. What size feed pellets are best suited for fry, fingerlings and feeder fish?
  - c. Does your pellet feed have adequate binder to prevent disintegration in water before being consumed?
  - d. Should you use a floating or sinking feed?
10. What procedure must be followed -- and for how long -- prior to slaughter to eliminate feed flavoring in the processed meat?

HARVESTING, TRANSPORTING AND PROCESSING

Harvesting

1. What is the most economical type of harvesting method for your present and future facilities?
2. How will you construct your ponds or other production facilities for the most efficient harvesting techniques?
3. What special equipment will be needed for expeditiously handling fish from harvest facilities to transportation vehicles?
4. Will you need special holding tanks or ponds to keep quantities of fish ready for immediate delivery?

Transporting

1. What facilities do you have available for handling fish from harvest to market or processing plant?

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2. What will you use for water cooling purposes in transporting live fish -- ice, refrigerated vans, refrigerated water tank?
3. What percentage of chlorination in the water will the fish tolerate?
4. How will a suitable water supply for long distance shipments be made available in transit? Aeration equipment needed?

Processing

1. If you plan to dress and/or package fish for resale, will your facilities conform with state food processing and sanitation codes? Do you need processing and retail sales licenses?
2. Are your production facilities reasonably convenient to a processing plant?
3. Is it to your advantage to contract with a processor for your annual production?
4. Good service and good quality are major keys to sales expansion. Are you equipped to give both?