

FISH FARMING CHECKLIST FOR HAWAII

Commercial fish farming can be profitable, but it also can be expensive. Commercial fish farming is generally more complicated than the potential producer first believes. The producer must be a combination business and sales person, as well as a biologist, lawyer, manager, and (possibly most of all) a hard worker. Time and work spent in planning is profitable, and the greatest profit or reward may be the decision not to go into fish farming: it definitely is not for everyone.

Elements for Success

Before moving forward, the potential farmer must consider that there are five elements essential to a successful fish farming enterprise. If a farmer lacks any one of these elements, his or her chance of success is very small.

1. Suitable land
2. Suitable water
3. Adequate financing
4. Sustainable market for product
5. Management time and skills

Risk Assessment

The potential farmer must understand the risks involved with the aquaculture industry. A quick list follows to consider before further planning or implementation. Each site and operation is unique but, conceptually, the farmer must be equipped to handle:

1. Poor water quality
2. Disease and parasites
3. Pesticide contaminations
4. Poachers and vandals
5. Competition from local and import products
6. Business challenges unique to an island environment (e.g., increasing costs for feed, distance to market)
7. Personal stress resulting from risk management

Moving Forward

If the potential farmer feels confident that he or she has the elements for success and can manage the risks of operating an aquaculture operation, the next step is more detailed planning. It is important for the potential fish producer to determine first what aspect of fish farming is of interest and how much it will cost to enter business. The checklist that follows is in the form of a long series of questions that should be fully answered.

ECONOMICS, MANAGEMENT, AND MARKETING

1. Do your State laws and regulations on aquaculture production and merchandising permit introduction, commercial rearing, and sale of the species you are interested in?
2. What permits or licenses are required?
3. Are there other Federal and State regulations that will affect operations, such as those on interstate shipment, predator control, water rights, processing, and retailing?

CAPITALIZATION AND OPERATING COSTS

1. Have you developed a business prospectus detailing the following? Such a prospectus is often necessary to obtain financing but, more important, it forces a prospective investor to take a hard look at the economic factors involved.
 - a. Land or space costs
 - b. Capital expenditure for fish to stock
 - c. Equipment, buildings, and water impoundment construction
 - d. Operating capital needed
 - e. Labor requirements
 - f. Costs of financing, production, harvesting and marketing
 - g. Profit and loss estimate
2. Do you have, or can you obtain, adequate financing for capital outlays and operating expenses for the period preceding the marketing of the first harvest – perhaps a year or more?
3. Are you psychologically and financially prepared to only break even, or perhaps take a loss, for the first several years of operation?
4. Can your fish in the water or warehouse be used as collateral for financing future operation or expansion?
5. Are you aware of all your production and processing costs, so that you can accurately evaluate your ability to meet competition and make a profit? Some of these costs follow:
 - a. Overhead and operating costs
 - b. Percentage of shrinkage or processing losses to expect from live harvest weight to processing plant or consumer product weight
 - c. Fringe benefit costs in labor expenses

MANAGEMENT

Personnel

1. Do you or your production manager have the technical training or experience to manager your operation at optimum efficiency? If not, have you arranged for management consulting and periodic checks on your operation by expert consultants?

2. Are you, or do you have available, a fishery biologist competent to make immediate diagnosis and proceed with proper chemical treatment of diseases and parasites for fish stocks and to deal with other biological problems of hatching and rearing?
3. Do you have adequate skilled help to efficiently carry out all phases of your operation, to maintain schedules, and to meet emergencies?

Production Plant Facilities and Layout

1. Are your ponds, tanks, hatcheries, and processing and shipping areas laid out for optimum efficiency in use of labor and time?
2. Are your facilities accessible during prolonged adverse weather?
3. Do you have, or can you arrange for (on short notice), holding facilities for quarantining incoming or diseased fish stock, for accumulating payload shipments, or for merchandise display?
4. Have you accounted for expansion in your production plant layout?
5. Are adequate utilities such as three-phase electrical power, potable water, and sewage disposal available?
6. What alternative production facilities should be considered – static ponds, earthen or concrete raceways, pen confinement, aquariums?

Equipment

1. What apparatus and laboratory equipment will you need to test dissolved oxygen concentration, detect presence of disease, and make other diagnostic evaluations of your operation?
2. What emergency power unit is available in the event of an electric power failure?
3. Do you have adequate power equipment, such as tractors, lifts, conveyors, and winches to ensure efficient operations?

Biological and Chemical Controls

1. What is a safe margin of dissolved oxygen that must be maintained? Do you have provisions for emergency oxygenation of water?
2. What other chemicals and physical water quality characteristics must be monitored? What equipment is needed to monitor them? What are the safe and unsafe levels of each, and how can unsafe levels be controlled?
3. What chemicals or other methods are required, and in what amounts for (1) aquatic plant control, including microscopic phytoplankton and macroscopic plants, and (2) control of undesirable fish and other aquatic organisms?
4. Can you obtain, or have obtained, special permits and the cooperation of State and Federal wildlife agencies for control of fish competitors and predators?

MARKETING

1. Have you studied your market outlets?

- a. Do you have reasonably firm market commitments as to quantity, price, and form of product?
 - 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 quality, type, form, and weight of products and other services that 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 your and competing products in the market?
2. Have you planned for market promotion and education activities?
 - a. Have you scheduled an advertising budget to stimulate sales?
 - b. Have you participated in and contributed to industry association programs to create an appealing image for fish farming, and products for consumers and merchandisers?
 - c. Have you cooperated with news media staffs to develop reports and programs to increase public awareness of the industry?

PHYSICAL FEATURES OF PRODUCTION COMPLEX

Site Location

1. Does your site have natural elevations that, with proper engineering, will allow each pond to be drained independently and completely?
2. Is it necessary to obtain a permit from the U.S. Army Corps of Engineers to build a pond on the selected site (some sites are considered wetlands and you may not be permitted to construct a pond regardless of ownership)?
3. Is an Environmental Impact Statement required by State or Federal agencies before an aquaculture site may be developed?
4. Does the land elevation permit biological supervision and general physical maintenance without excessive travel?
5. Has analysis of the soils been made to determine physical qualities for water retainment and fish culture?
6. Have core drillings been made to determine impervious qualities of subterranean soils?
7. 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 residues from previous years of crop spraying for insect or weed control?
8. Is the site free of all possible overflow by flooding?
9. Is drainage available to natural waterways without crossing other private lands?

10. Will your Federal, State, and local water management agencies permit drainage into existing streams?
11. Does the topographic elevation of your site make it possible to use the prevailing summer winds without creating excessive water erosion problems on levees?
12. Can you economically secure your production facilities from poaching and prevent escape of stock?
13. Can you receive or deliver fish regardless of weather conditions?

Water Supply

1. What is the source of your water supply – reservoir, well water, groundwater, or running stream? Is it adequate for present and future needs? Is there an alternate source available for emergencies?
2. Is it possible to secure water permits for the volume of water needed to meet 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. Do 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. If surface water is used, can you control predators and unwanted fish species?

SOURCE OF FINGERLING STOCK

Spawning and Raising Your Own Fingerlings

1. Procurement of brood stock
 - a. What age of brood stock should be purchased?
 - b. Where will the brood stock be obtained?
 - c. At what age will a female reproduce?
 - d. At what size and age is the female most profitable?
 - e. How many brood pairs should be stocked per surface acre of water volume in the spawning area?
2. Care of brood stock before spawning
 - a. How long must the brood stock be placed in spawning surroundings before spawning?
 - b. How closely must the male and female brood fish be paired in size?
 - c. What special feeds must be fed and for what length of time before spawning?
 - d. What hormone injections or other treatments can be administered to hasten or retard spawning?
 - e. What prespawning chemical treatment should the pond receive?
 - f. Does noise or physical activities 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 how long, to induce spawning?
 - b. What physical apparatus must be made available in the spawning areas?
 - c. In what location and at what water depth should such apparatus be placed?
 - d. Is available spawning apparatus compatible with the size of the brood fish?
 - e. How are eggs to be protected from predators before hatching – by parents, by chemical treatment, or by physical manipulation of the environment?
4. Artificial Incubation
- a. What types of equipment are required, such as troughs, hatching containers, incubation jars, and aeration or agitation devices?
 - b. What are the particular water requirements for the species being cultured, such as temperature, water chemistry, and flow rate?
 - c. What provisions are required to ensure continuous operation in the event of power failure?
 - d. Will fry be reared in troughs, tanks, or ponds? If they are to be reared in troughs or tanks, what are the specific requirements (e.g., water, feed, and lighting)?
 - e. How will you prevent or control cannibalism?
5. Procedure to be followed with fry upon hatching
- a. What diseases can be encountered in fry? What are the chemical treatments for such diseases? Are the chemicals readily available, and are they registered for use by the United States Food and Drug Administration?
 - 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 to the fry? Where can it be obtained?
 - d. How important are natural foods to the young and how can growth of natural foods be stimulated?
 - e. How are the fry to be protected from predators and competitors?

Purchasing Fingerlings from Other Producers

1. What price can you economically pay for fingerlings?
2. What size are the smallest fingerlings – usually the cheapest – that can be grown to marketable size most economically in your production program?
3. What is the fingerling producer's reputation for producing disease-free fingerlings of good quality? Have you visited prospective fingerlings producers to investigate their operations? Will you inspect fingerlings before purchasing them?
4. Do you have an alternate source of sources of fingerlings if your primary supplier cannot meet your needs?
5. What chemical treatment for disease control should the fingerlings be given before they are planted into rearing waters? Who will treat the fingerlings – you or your supplier?
6. What water preparation is necessary before the fingerlings are planted?
7. How will your fingerlings be graded before they are planted to produce maximum uniformity at harvest?

8. How many fingerlings or other young fish should be stocked per surface acre or volume of water?
9. How many fry per unit of water can be feasibly carried through the growing season to produce fish for stocking in the following year?
10. 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 is such shock occurs?
 - b. What equipment is needed to handle fingerlings to overcome thermal shock?
11. How far in advance must you order fingerlings to be relatively confident that you will have the fish that you require?
12. Are you prepared to inspect the fingerlings upon delivery and, if unsatisfactory, reject them?

FEEDING

Feed Source

1. Is feed readily and constantly available in the quantities needed?
2. Have your feed rations been proved through experimentation to provide optimum growth or maintenance for the stock you are feeding?
3. Are the ingredients of your feed 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 food organisms?

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 allowance of feed to maintain desired consumption and growth?
3. At what water temperatures do you plan to begin, reduce, or cease feeding?
 - a. If you continued feeding during cold weather, how much feed will you provide?
 - b. What system will you use for control of ice cover in the winter? Will cloudy ice cover create 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?
6. What feeding schedule will you follow?
 - a. How often will you feed?
 - b. What is the best time of day?
 - c. What is the best water depth?

7. How many areas in a given pond and over how large an area must you feed for best results?
8. Have you considered the problems associated with the uses of pelleted feed?
 - a. What percentages of fines in your pelleted feed are permissible without creating water contamination?
 - b. What sizes of feed pellets are best suited for fry, fingerlings, and larger juvenile fish?
 - c. Does your pelleted feed have adequate binder to prevent disintegration in water before it is eaten?
 - d. Should you use a floating or sinking feed?
9. What effects do various feeding rates have on water quality and when are those effects most serious?
10. What is the shelf life of your feed and what precautions must be taken to prevent heat and moisture deterioration, rodent damage, and chemical and toxin contamination?
11. Are adequate storage facilities available for the type and amount of feeds required in your program?

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 to provide the most efficient harvesting techniques?
3. What special equipment will be needed for expeditiously handling fish from harvest facilities to transportation facilities?
4. Will you need special holding tanks or ponds to keep quantities of fish ready for immediate delivery?
5. If you are producing food fish, how will you test them for off-flavor? If off-flavor is detected, how will you correct it? Are you prepared to hold harvestable fish 2 to 8 weeks (or longer) if they cannot be harvested because of an off-flavor problem?

Transporting

1. What facilities do you have available for transferring harvested fish to market or to a processing plant?
2. What will you use for water cooling in transporting live fish (e.g., ice-refrigerated vans, mechanically refrigerated water tanks)?
3. What amount of chlorine in the water will the fish tolerate?
4. How will a suitable water exchange for long-distance shipments be made available in transit? What aeration equipment is needed?

Processing

1. If you plan to dress or package fish for retail, will your facilities conform to 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?