



Recirculating Aquaculture Systems: Questions to Ask Before You Invest

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The idea of raising fish indoors where year-round growing conditions can be provided is an appealing one. Before making an investment in such a system, however, it would be wise to learn all you can about such systems. First, read this fact sheet and the others listed at the end, then visit several different indoor systems and ask plenty of questions.

The authors are cautious about the future of recirculating systems. Many individuals and corporations have lost considerable sums of money on such systems which they could not make profitable regardless of how much capital and expertise was invested. Nonetheless, breakthroughs are possible and research is ongoing at various universities and other private facilities. The following guidelines are suggested for evaluating investments in this area.

Buying A Turn-key Operation

You may be offered an opportunity to invest in a system which is reported to be successfully operating already. Claims may be made about confidential or proprietary technology. In this case you should ask for information, in writing, which documents the financial and production performance of the system:

Finances

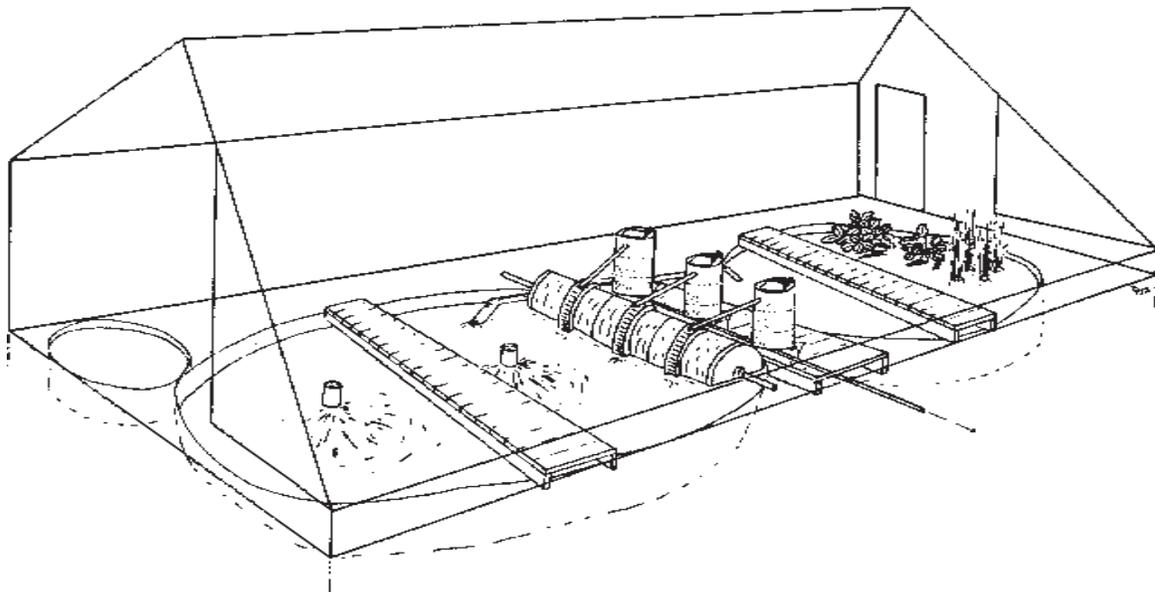
- Income statements
- Cash flow statements

To evaluate the financial soundness of the operation, historical information is needed. Copies of past and present cashflow and income statements provide information about annual growth, profitability, and stability of the operation.

Production

A complete operating history for each crop of fish produced, which includes the following information:

- Date of stocking _____
 - Average fish size at stocking _____
 - Date of harvest _____
 - Average fish size at harvest _____
 - Total amount of feed used _____
- This information will allow you to calculate feed conversion ratios and rate of gain.
- Number of fish/gallon of tank volume _____



A light stocking rate may provide misleadingly good feed conversion ratios and rates of gain which cannot be achieved when stocking rates are increased to levels needed for profitable operation.

- Volume of water in fish tanks _____
- Volume of new water added each day _____

A system that receives a large amount of new water each day is a flow-through system, not a 100 percent Recirculating system. Flow-through systems provide more reliable conditions for fish, but it is usually prohibitively expensive to heat water in winter. Effluent water must also be disposed of in a manner acceptable under local water quality regulations.

- Number of dead fish and cause of death _____

Marketing

When starting any type of fish farm, the earlier marketing plan is developed, the better. Buyers will not automatically come knocking at your door when your fish are ready for harvest. Taking the time to explore the questions below will allow you to anticipate what you must do to build your market.

- Who are your potential customers? For example, direct to consumer, restaurants, supermarkets, or wholesalers.
- What are their requirements? Including size, uniformity, number per week, live, processed, fresh, or frozen.
- How will you gain their trust?
- Who is the competition and how will you compete with them?
- What price per pound are potential customers paying now and what is your projected production cost?

In addition, it is advisable to seek legal council before entering into a contractual agreement.

Starting From Scratch

The most important piece of advice for someone intent on building his or her own recirculating aquaculture system is to begin with a small prototype. A small system will allow you to learn without going bankrupt.

A variety of problems which have plagued past attempts are discussed in the following sections. You will need to answer this question: How will your system overcome these problems?

Biofilters

Fish in a recirculating system live or die based on how effectively fish wastes are handled by biofilters. Unfortunately, biofilters are less than 100 percent reliable. The most common biofilter consists of bacteria growing on media such as plastic beads or corrugated fiberglass panels. Bacterial biofilters can die unexpectedly. They can also be killed by many of the chemicals used to treat fish diseases. Following such a biofilter "crash," two to six weeks are required before normal functioning resumes.

Another type of biofiltration involves flowing water through the root beds of plants in hydroponic systems. Uptake of nutri-

ents by the plants varies with the growth stage and health of the plants. Balancing plant growth stages and harvesting with the biofiltration needs of the fish culture system is difficult.

Knowledge of Water Chemistry

A recirculating system manager should be able to conduct water chemistry tests, understand what the results mean and know what to do to correct problems before adverse conditions stress or kill fish. A manager who is not already familiar with or willing to learn basic chemistry concepts and test procedures will not succeed. Computer-based monitoring systems are not a substitute for a capable manager who can think quickly and act decisively to change the water chemistry.

Aeration and Plumbing Systems

Recirculating systems are unforgiving of mechanical problems. When aeration systems shut off, fish in in-door systems typically have about 10 minutes of oxygen left before they die. Automatic backup systems and pipes large enough to prevent clogging by stray fish are essential.

Economics

The cost of producing fish is usually higher in recirculating systems than in earthen pond culture. Be certain that your projected production cost will be low enough to allow you to compete with fish from other sources. A complete business plan should be prepared for this or any other major investment. The help of a neutral advisor, such as your local SBA Small Business Development Center, can be useful in preparing such plans.

Additional References

A basic understanding of how recirculating systems work can be obtained by reading the following Southern Regional Aquaculture Center (SRAC) publications. They are available in Oklahoma from the author through your local County Extension Center. Readers in other states should contact the local Cooperative Extension service office in their county. The publications include:

- SRAC 451, An Overview of Critical Considerations
- SRAC 452, Management of Recirculating Systems
- SRAC 453, Component Options
- SRAC 454, Integrating Fish and Plant Culture

Your local library may be able to help you obtain a copy of the following informative article:

Van Gorder, S. (1990). Closed systems: a status report. *Aquaculture Magazine* 16(5):40-47.

The Cooperative Extension Service, in Oklahoma and many other states, offers water quality short courses for fish farmers. In addition, the following SRAC publications on water chemistry are also recommended:

- SRAC 462, Nitrite in Fish Ponds
- SRAC 463, Ammonia in Fish Ponds
- SRAC 464, Interactions of pH, Carbon Dioxide, Alkalinity, and Hardness in Fish Ponds.

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0703