Investment Analysis of Commercial Aquaculture in Central Canada

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May 1986

Canadian Industry Report of Fisheries and Aquatic Sciences No. 160

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Fisheries and Oceans Pêches et Océans

Canada

Canadian Industry Report of Fisheries and Aquatic Sciences

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INVESTMENT ANALYSIS OF COMMERCIAL AQUACULTURE IN CENTRAL CANADA

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Catalogue No. FS97-14/160E ISSN 0704-3694

Correct citation for this publication:

Pfeiffer, W. C., and H. Jorjani, 1986. Investment Analysis of Commercial Aquaculture in Central Canada. Can. Ind. Rep. Fish. and Aquat. Sci. 160:70p.

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FOREWORD

This study was commissioned in response to a need for improved understanding of the viability of commercial aquaculture in central Canada. I would like to thank Dr. Wayne Pfeiffer and Mr. Hamid Jorjani, P.Ag., for contributing to our further understanding of the aquaculture industry, particularly trout farming in Ontario.

The opinions and interpretations expressed in the report are those of the authors, and do not necessarily reflect those of the Department of Fisheries and Oceans.

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May, 1986

PREFACE

Commercial aquaculture is an emerging enterprise in Ontario. The aquaculture industry has made considerable progress in recent years in establishing its position among the enterprises which have traditionally comprised the agricultural industry. Because of its relative newness, little is known about the economics of the aquaculture industry, particularly from a potential return on investment point of view. This study was an attempt to gather data from commercial aquaculturists and develop a clearer impression of the potential this enterprise has to produce an acceptable financial return.

This study was done under contract with the Department of Fisheries and Oceans, Ottawa. Mr. R.V. Huntley was responsible for much supervisory direction and provided many helpful comments. Others who cooperated with the study team and deserve recognition here are:

Mr. David Thomson, Ontario Ministry of Agriculture and Food.

Dr. Allan Castledine, Ontario Ministry of Natural Resources.

Dr. Ted Cowan, Department of Fisheries and Oceans.

Mr. Richard Moccia, Ontario Trout Farmers' Association.

Dr. John Hilton, University of Guelph.

Mr. Ron Crowley, Department of Fisheries and Oceans.

ABSTRACT

Pfeiffer, W.C. and H. Jorjani, 1986. Investment Analysis of Commercial Aquaculture in Central Canada. Can. Ind. Rep. Fish. and Aquat. Sci. 160:70p.

Data were gathered from cooperating aquaculturists to provide a basis for cost benefit analysis of the commercial aquaculture industry in Ontario.

Schedules for recording aquaculture enterprise data were developed which after being completed during field interviews, provided the basis for enterprise budgets. An automatic system for financial analysis of this data was developed using a micro-computer and electronic spreadsheet software.

Financial analysis included the preparation of balance sheets, income statements and a series of eleven indicators (ratios) of financial performance for each enterprise in the study. Results showed that commercial aquaculturists have moved quickly to invest sufficient capital to reach a size where economically efficient commercial operation can be maintained. Borrowed capital was used in every case.

Investment analysis was based on the concept of the Internal Rate of Return (IRR). Results indicated relatively short planning horizons gave acceptable IRRs for full-time fish farms. While part-time and hobby farms did not produce IRR results which would indicate viable investment, many factors were considered to be unduly influencing the analysis.

The enterprise carries a high degree of risk. Results showed the aquaculturists to be vulnerable to unforeseen market forces. Aquaculturists were also seen to be turning profits back into their enterprises at a rapid rate, presumably to increase their equity to reduce short-run financial vulnerability. All aquaculturists in the study expressed plans to continue in the business.

RÉSUMÉ

On a recueilli des données auprès d'aquiculteurs consentants qui serviront de base à l'analyse des coûts-rendements de l'industrie aquicole commerciale en Ontario.

On a préparé des tableaux pour consigner les données sur les entreprises aquicoles qui, une fois remplis lors d'entrevues sur le terrain, ont servi de fondement aux budgets d'entreprises. On a élaboré un système automatique pour l'analyse financière de ces données en se servant d'un micro-ordinateur et d'un programme de calcul de tableaux financiers.

L'analyse financière comportait la préparation de bilans, d'états des résultats et d'une série de onze indicateurs (rapports) de rendement financier pour chaque entreprise mentionnée dans l'étude. Les résultats ont montré que les aquiculteurs commerciaux se sont mis rapidement à investir suffisamment de capitaux pour atteindre une taille où on peut maintenir des opérations commerciales rentables. Dans chaque cas, on a emprunté des capitaux.

L'analyse des investissements était fondée sur le concept du taux de rendement interne (TRI). Les résultats ont montré qu'une planification relativement à court terme donnait des TRI acceptables pour les pisciculteurs à temps plein. Bien que les pisciculture à temps partiel ou d'agrément n'ont pas produit de résultats de TRI qui indiqueraient que l'investissement soit rentable, on a considéré qu'un grand nombre de facteurs ont trop influencé l'analyse.

Le degré de risque d'une entreprise est élevé. Les résultats ont montré que les aquiculteurs sont vulnérables aux tendances imprévues du marché. On a vu également des aquiculteurs réinvestir rapidement leurs profits dans leur entreprise, afin vraisemblablement d'augmenter leur avoir net dans le but de réduire la vulnérabilité financière à court terme. Tous les aquiculteurs interrogés dans l'étude ont fait part de leurs projets de persévérer dans l'entreprise.

PART I - INTRODUCTION

The following report contains the results of an attempt to use actual farm data to assess the investment potential (cost vs. benefits) for commercial aquaculture in Ontario. It also contains an extensive development of methodology for that purpose. Included in the report is a standardized system of record keeping for aquaculture farms which grew out of the methodology. That system is designed in such a way that it can be used by individual farmers to analyze and manage their own operations.

The project included a questionnaire and series of interviews with farmers which provided both detailed enterprise information and subjective commentary by producers regarding major business concerns, managerial attitudes, attitudes toward government policy and plans for the future. While no attempt has been made as yet to rigorously analyze this commentary against the background of enterprise data, certain references are contained in the report.

1.1 Background

Fish occupy a very important niche in earth's ecosystem in the human diet and, consequently, in the world economy. Their annual harvest from ocean fisheries is over 68 million tonnes and this exceeds combined world beef and pork production by a considerable margin. Fish harvested from the ocean fisheries amount to 16 kilograms per capita worldwide and account for 23 percent of all animal protein consumed.(Ref.#2) More than one hundred species of finfish, crustaceans and shellfish are commercially harvested. According to Brown, over twenty species are commonly harvested at levels exceeding 900,000 tonnes per year and just five species of finfish - herring, cod, jack, redfish

and mackerel (and their associated relatives) account for over half the annual catch.

Between 1950 and 1970, the world fish catch more than tripled. During the seventies, projections indicated that the catch would rise to over 360 million tonnes annually by the turn of this century. There was a pervasive feeling that the oceans contained a practically infinite supply of fish. Advances in fishing technology and cheap fuel enabled distant-water fleets to search the planet for edible sea species.

By the late 60's many signals that fallacious reasoning lay behind the further development and exploitation of ocean fisheries began to emerge. The collapse of the Southeast Pacific anchovy fishing in the early seventies caught the attention of many and stood as the primary signal that over-fishing was not only possible but probable at current levels of harvest. According to WorldWatch Institute and others (Ref.#2) eleven major ocean fisheries (six Atlantic and five Pacific) had been depleted by the early eighties to the point of biological collapse. Brown argues that because of the depletion of fishery stocks through mismanagement, and subsequent management control measures, the annual oceanic harvest has been reduced by over 10 million tonnes (Ref. #2). While such reports are intended to be alarming, one must also recognize that new restrictions on fishing have done much to preserve the ocean fisheries in recent years.

Annual growth in the world fish catch has slowed to less than one percent. The annual per capita growth of the fish catch during the 50's and 60's has changed to a one percent annual decline since 1970. With oceanic over-fishing during that time period documented and in evidence economically, fish farming and ranching is rapidly capturing attention

worldwide. In many parts of the world, fish can be raised like livestock. Using natural ponds or artificially flooded land, many production techniques have been successfully developed for both fish and shellfish. Collectively known as aquaculture, this approach to supplying fish can be done on either a small or large scale. It holds tremendous potential for integration with conventional farming by utilizing organic wastes for fertilizing ponds to provide a food supply for fish.

In North America, fish farming is growing at more than 7 percent each year. The percentage of cultivated fish is growing faster than any other part of the human diet. Interest in fish farming is on the rise worldwide. Worldwide, aquaculture supplies 15-20 percent of all fish and seafood directly consumed. Of the total production of finfish of nearly 3.6 million tonnes, 80 percent is carp which provides the basis of both the Chinese and Indian aquaculture industries. In the United States, the U.S.D.A. estimates that over 90 percent of rainbow trout, 60-70 percent of catfish, over 50 percent of crawfish and 40 percent of oysters are raised on fish farms.

In the United States a virtual explosion in fish farming began in the early eighties. Worldwide the U.S. will soon be among the top ten producers of aquacultural products. By far and away China is the world leader with an annual output of aquacultural products of over 3.6 million tonnes. In Canada, fish farming is beginning to catch the attention of small-scale entrepreneurs and government agencies which possess the major portion of knowledge for fish culture. The Department of Fisheries and Oceans estimates that production is currently 6,000 tonnes/year and valued at roughly $15 million.

1.2 Outlook for Aquaculture in Canada

A primary question facing the Canadian aquaculture industry is that of potential return on investment. Lending institutions and government will increasingly be sought by entrepreneurs as sources of capital for aquaculture as a growth industry. Evidence of this pressure can be found in the lending patterns of international agencies such as the World Bank and the United Nations' Food and Agriculture Organization. Up until the mid-seventies, capital assistance was focussed mainly on investments in improved fleets, larger ports and more efficient processing facilities. Since then the emphasis has shifted toward aquaculture. It appears that lenders have realized a limited horizon for ocean fisheries in which further investment would be profitable.

It seems clear that fish farming is destined to expand. How fast expansion may take place will be governed by many factors. Aquaculture as a form of animal husbandry will likely have to compete for productive resources within the agricultural industry with the established enterprises producing beef, pork, poultry, eggs and milk. On the other hand, aquaculture presents opportunities for recycling use of low lying wetlands and lowering transportation costs by staying in closer proximity to urban centres. Fish farming is usually acceptable close to urban centres because, compared to other farm enterprises, it is relatively quiet, odourless, uses fewer chemicals and occupies less land area.

With growing demand for fish in the diet borne partly out of a shift in consumer preference away from red meat, some analysts predict rising seafood prices for the rest of the century. Rising prices signal rising producer expectations and, in Canada, aquaculture has already

attracted a following among existing farmers. The purpose of this study was to survey the experience of a group of entrepreneurs who have begun aquaculture enterprises in Ontario to assess the potential for profitable investment in aquaculture in Central Canada.

Ontario fish farmers face a seasonal variation in natural water temperature which, if managed correctly, provides for high fish carrying capacity per unit volume of water. Normally, cold water can carry higher population densities of fish because of high dissolved oxygen content. Fish growth, however, is slow in colder water. Some Ontario fish farmers must provide some means to accommodate fewer fish per unit volume during the warm season when growth becomes rapid but dissolved oxygen levels are reduced. By careful planning of hatching, rearing and grow-out facilities Ontario fish farmers can arrive at a balanced production system capable of supplying fish profitably on a fully commercial basis. Capital costs are a major management concern for any emergent farmer and for any producer intent on expanding an aquaculture enterprise. Arriving at a balanced and, hence, optimal system for fish production under Ontario conditions presents a complex puzzle for management to solve. Aquaculture in Ontario places a premium on good production management relative to many other North American sites. There is no reason to believe that there are any technical or managerial roadblocks standing in the way of economic survival for aquaculturists in Ontario.

With nearly 100 commercial and hobby aquaculturists now operating in Ontario at various sizes of operation and with various specializations of product, it appears that the industry is still in an early phase of development. Resources potentially available for

aquaculture, especially labour and feed, may be deployed at the expense of other agricultural pursuits for some short period of time without complete regard to their relative earnings. There is no question that certain of these operations can survive and remain solvent in the business. What is unclear at the present time is whether or not the practice of commercial aquaculture is sufficiently profitable and will yield a sufficient return to invested capital to sustain further investment leading toward a bona-fide aquacultural sector within the agricultural industry.

1.3 Goals and Objectives

The objectives of the study were:

1. To build a data base of economic performance variables for the industry which can provide a framework for comparative studies of firms within the industry. This will contain the data collected from studying existing commercial aquaculture enterprises.
2. To structure the database in the form of a spreadsheet so that it might provide a system of farm record-keeping for fish farmers which could be made available to the industry through extension.
3. To apply basic investment analysis techniques and accounting practices to carry out economic viability analyses for several levels of operation based on physical parameters and scale of operation.

PART II - METHODS AND PROCEDURES

This study was begun under the assumption that no standardized system was widely used by aquaculturists to organize and record their enterprise data for managerial purposes. It was also realized from pre-study interviews with selected aquaculturists that many had been in the business only a short time (less than 10 years). Therefore, the following steps were taken in organizing the study, namely:

1. Develop a standardized form for an aquaculture enterprise budget.

2. Survey aquaculturists using both mailed questionnaires and field interviews.

3. Develop enterprise budgets using averaged responses for characteristic groups of fish farmers.

4. Perform business (profitability) and financial feasibility analysis for the groups.

5. Perform investment analysis and calculate profitability indices (cost-benefit ratios) for characteristic groups of fish farmers.

This procedure, albeit long, was seen to be necessary to develop a well-rounded picture of returns being earned in the industry both at present and as may reasonably be expected in the future (10 years hence).

2.1 An Electronic Spreadsheet System for Enterprise Budgeting

Because one of the objectives of the project was to produce a tool which fish farmers could use for their own purposes, we decided to build an enterprise budget on a microcomputer. Electronic spreadsheet software appeared to be the best alternative. A template was developed for SuperCalc$_{TM}$ which would run on an IBM-PC with a low memory requirement. In this way the spreadsheet might be usable by the

greatest number of farmers owing to the fact that the IBM-PC is popular at the present time.

Schedules for 1) an enterprise budget, 2) recording financial details and 3) setting managerial goals for the enterprise were established as follows (Figures 1 to 3):

Figure 1: Schedule for Aquaculture Enterprise Budget*

INCOME DATA:	Current $
CASH INCOME:	
Eggs	_____
Fry (0-5cm)	_____
Fingerlings (5-20cm)	_____
Table size fish	_____
Operation of a Fishing Preserve	_____
Export sales	_____
Specialty items	_____
Miscellaneous farm income	_____
INCOME FROM SALE CAPITAL ITEMS:	
Brood stock	_____
Machinery and equipment	_____
Consulting services	_____
Real estate	_____
Miscellaneous	_____
EXPENSE DATA:	
CASH EXPENSES:	
Hired labour (full time)	_____
Hired labour (part time)	_____
Purchased feeds	_____
Purchased seed stock (eggs, fry, fingerlings)	_____
Other expenses	_____
Veterinary	_____
Drugs and chemicals	_____
Water quality expenses	_____
Other	_____
Custom machinery hire	_____
Automobile (farm share)	_____
Truck	_____
Freight and hauling	_____
Fuel-oil (heating, gasoline, lube)	_____
Machinery and equipment repairs	_____
Buildings and structures - maintenance	_____
Administrative costs (Secy.phone, etc.)	_____
Taxes (real estate)	_____
Taxes (income tax)	_____
Insurance	_____
Rents and leases	_____

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* This is not an income statement but rather a budget to record enterprise data. For an income statement see Figure 4.

Figure 2: Schedule for Aquaculture Enterprise Financial Records*

	Current $
ASSETS:	
CURRENT:	
Cash on hand	_____
Bank deposits	_____
Other	_____
INTERMEDIATE:	
Brood stock	_____
Machinery and equipment	_____
Other	_____
FIXED:	
Land and improvements	_____
Buildings and support facilities	_____
Water system	_____
LIABILITIES:	
OPERATING LOANS:	
Total annual interest payments	_____
Total annual principal payments	_____
INTERMEDIATE-TERM LOANS:	
Total annual interest payments	_____
Total annual principal payments	_____
Total principal outstanding	_____
LONG-TERM LOANS:	
Total annual interest payments	_____
Total annual principal payments	_____
Total principal outstanding	_____
MORTGAGES:	
Buildings:	
Total annual interest payments	_____
Total annual principal payments	_____
Total principal outstanding	_____
Land:	
Total annual interest payments	_____
Total annual principal payments	_____
Total principal outstanding	_____
RECEIVABLES AND PAYABLES:	
Accounts receivable (end-beginning)	_____
Accounts payable (current)	_____
INVENTORIES (value):	
Fry (0-5cm) (beginning)	_____
Fry (0-5cm) (ending)	_____
Fingerlings (beginning)	_____
Fingerlings (ending)	_____
Table size fish (beginning)	_____
Table size fish (ending)	_____
Farm supplies (beginning)	_____
Farm supplies (ending)	_____

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* This is not a balance sheet but rather a schedule to record financial details of an aquaculture enterprise. For a balance sheet see Figure 5.

Figure 3: Schedule for Managerial Goal Setting

BUSINESS REQUIREMENTS:

SHORT-TERM SURVIVAL: (cash requirement)	_____
Owner-Family labour	_____
LONG-TERM SURVIVAL: (asset replacement)	_____
Investment:	
Machinery and equipment (mkt. value $)	_____
Buildings and structures (mkt. value $)	_____
Maintenance Rates (%):	
Machinery and equipment (%)	_____
Buildings and structures (%)	_____
Depreciation Rates (%):	
Machinery and equipment (%)	_____
Buildings and structures (%)	_____
LIVING:	
Expected rate of return to management (%)	_____
GROWTH:	
Expected rate of return to equity (%)	_____

2.2 Survey of Ontario Aquaculturists

The database in any study acquires most of its meaning and value from both the context in which it is collected and the design of the specific information system in which it is processed. Any data system must represent reality by describing empirical phenomena in categories or units which serve its intended purpose. In our case, investment analysis of fish farming in Ontario, the data required were assumed to be much the same as for management of the enterprise by the farmers themselves.

Contacts with Provincial Government agencies (OMAF and OMNR) and Producers' Associations revealed that data available from public sources were either not related to our project or did not meet this basic criterion for reliability. We, therefore, focused on developing a questionnaire for a producer survey. The questionnaire shown in Appendix I was developed in consultation with industry and government.

The reliability of the data, in terms of defining categories of business costs and returns which were relevant to our study was not judged statistically but rather it was assumed to have the same reliability as necessary for audit purposes at the farm level.

Systematic, non-random sampling was applied in this study. That is, out of a list of registered fish farmers, only farmers known to undertake commercial production of table trout were approached to take part in the survey. A total of 56 questionnaires were sent out to fish farmers, selected from 100 licensed fish farms in Ontario.

In developing a questionnaire for this investigation several meetings were held with selected individuals involved in aquaculture research and development and others with special experience regarding

current problems of the aquaculture industry in Ontario. The individuals who cooperated with our research team included representatives from the aquaculture industry, OTFA, OMNR, and OMAF. After each phase of development of the questionnaire there was a telephone conference with the D.F.O. project representative as a feedback process. Consequently, after numerous exchanges of opinions between the project members and the aforementioned representatives an appropriate questionnaire package was developed. Although the questionnaire could have been more complete, there was a general consensus that this questionnaire must not be intimidating and complicated as it was the first of its kind. The questionnaire was designed as a first step towards a systematic approach to compiling economic performance data. It was also designed as a pretest or basis for further research. Moreover, it was intended to develop a questionnaire which would provide a general picture about fish farmers in Ontario, their sales and revenues, and to some extent their managerial skills (parameters such as farmer's age, average cost, and productivity ratios etc.). Therefore, the questionnaire was designed with the following format.

1. Income

   - How income is generated
   - How many sources of income
   - Channels through which product(s) are sold, and their percentages

2. Expenses

   - Yearly Expenses: including all the variable expenses and costs of doing business.
   - Capital Expenditure: including cost of land, farm buildings and support facilities, and water system.

3. Finances

- Detailed questions regarding different loans and mortgages, opportunity costs, and depreciation rates.

4. Overall Information:

- Qualitative and quantitative questions concerning:
  - size, type, investment cost,
- Questions concerning farmers' attitudes toward:
  - their enterprise, government involvement, policies.

For details refer to Appendix I.

The nature of the study (investment analysis) was believed to cause concern among farmers about the possibility of disclosure of confidential material. In order to minimize possible reluctance to participate in the project survey, the project team was advised to delay the survey until after OTFA's Seminar and Annual Meeting in Guelph (April 12-13). At that meeting the project was introduced by government authorities and then project members presented and demonstrated the computer aided Electronic Spreadsheet data analysis system and established dialogue with several fish farmers. This introduction was very successful and 10 farmers, out of the 18 recommended by OTFA and OMNR, agreed to cooperate in our survey. They offered full cooperation by allowing complete access to their enterprise and financial records.

2.3 An Electronic Spreadsheet System for Financial and Investment Analysis

An electronic spreadsheet system was designed for enterprise budgeting which not only provided for the standardization of data obtained in the survey of aquaculturists but also provided a tool for

fish farmers to use in analyzing their own operations. The spreadsheet, provides; 1) a balance sheet, 2) an income statement, and 3) eleven popular financial ratios. Details are included in Appendix II to facilitate the use of this system by fish farmers on their own personal computer. A copy of the spreadsheet system and basic documentation can be obtained from Dr. W.C. Pfeiffer, c/o Department of Agricultural Economics and Business, University of Guelph, Guelph, Ontario, N1G 2W1, for a nominal fee covering the cost of diskette, postage and handling.

It was assumed that all aquaculturists who participated in the survey were in business to make a profit including the hobby farmers. The following material describes the concepts important to the construction and use of the spreadsheet system.

Income Statement

The purpose of the income statement is to determine the flow of income generated by the business over a period of time. The change in asset values is a source of return to farmers who own land and other assets, which will affect the income position of the business and must be included for comparison purposes. Farm businesses typically calculate the income statement annually to measure the profitability of the business over the previous business year. The annual nature of many crop and livestock enterprises makes measurement of profitability once each year meaningful. However, the income statement can be completed monthly, quarterly, semiannually, or for some other period if it is useful to do so for management purposes. We realized from the field interviews that, while aquaculture tends to be continuous, the basis on which aquaculturists keep records is annual. Therefore, the income statement and related financial items was considered to reflect one

year's participation in the business. The income statement which was used in this research project was set up as shown in Figure 4.

Figure 4: Format for Income Statement - Aquaculture Enterprise

INCOME STATEMENT:

	Current $
CASH INCOME:	
Eggs	_____
Fry (0-5cm)	_____
Fingerlings (5-20cm)	_____
Table size fish	_____
Operation of a Fishing Preserve	_____
Export sales	_____
Specialty items	_____
Miscellaneous farm income	_____
INCOME FROM SALE CAPITAL ITEMS:	
Brood stock	_____
Machinery and equipment	_____
Consulting services	_____
Real estate	_____
Miscellaneous	_____
TOTAL FARM CASH SALES:	
Plus: Accts. Rec., closing	_____
TOTAL FARM SALES:	
Plus: Inventory change (end-beg.)	_____
Fry (0-5cm) (end-beg.)	_____
Fingerlings (end-beg.)	_____
Table size fish (end-beg.)	_____
Farm supplies (end-beg.)	_____
GROSS FARM INCOME:	
CASH EXPENSES:	
Hired labour (full time)	_____
Hired labour (part time)	_____
Purchased feeds	_____
Purchased seed stock	_____
Other expenses	_____
Veterinary	_____
Drugs and chemicals	_____
Water quality expenses	_____
Other	_____
Custom machinery hire	_____
Automobile (farm share)	_____
Truck	_____
Freight and hauling	_____
Fuel-oil (heating,gasoline, lube)	_____
Machinery and equipment repairs	_____
Buildings and structures maintenance	_____

Administrative costs (Secty.,phone, etc.)	_____
Taxes (real estate)	_____
Taxes (income tax)	_____
Insurance	_____
Rents and leases	_____
Interest	_____
DEPRECIATION:	
Machinery and equipment	_____
Buildings and structures	_____
NON-CASH ADJUSTMENTS:	
Value of Owner-family labour	_____
Accounts payable	_____
TOTAL CASH EXPENSES	_____
NET FARM INCOME	_____

Balance Sheet

The balance sheet, also commonly known as the net worth or the financial statement, provides a picture of the financial characteristics of the firm at a point in time. The balance sheet systematically lists all assets and liabilities of the business on a particular date. This provides a measure of the stock of real and financial assets included in the firm, while the income statement measures the flow of income generated by this stock of assets. Hence, the balance sheet measures a stock at a point in time, whereas the income statement measures a flow over a period of time.

The balance sheet provides data on two financial characteristics of the firm - solvency and liquidity. Solvency refers to the firm's ability to meet its financial obligations over a long period of time. Liquidity is a short-run characteristic; it refers to the firm's capacity to generate enough cash to meet its financial commitments as they fall due and to provide for unanticipated events. Lenders use the balance sheet as the base document to analyze the ability of the farm operation to handle additional borrowed funds. Thus, it is important for the farm operator to understand how to prepare the balance sheet properly.

The structure of the balance sheet is derived from the basic accounting equation: Assets = Liabilities + Equity (or Net Worth). An asset includes anything of value in possession of the operator and a claim on anything of value in the possession of others. Assets include such items as land, machinery and equipment, buildings, livestock, grain inventories, supplies, accounts receivable, and cash. Note that machinery leased or rented on a seasonal basis and land rented on a

year-to-year basis for cash rent may be part of the capital managed by the farm operator, but such rented items are not included as assets on the farmer's financial statement or balance sheet. However, the longer term capital and operating leases for machinery and land represent a future flow of services which have a value and entail a commitment of future funds for lease payments (a liability). The value of these assets should be reflected on the balance sheet.

Someone has a claim on each asset of the farm business. This claim is based on the source of funds used to acquire the asset. The farm operator may have used earnings from previous years to acquire the machinery and equipment or broodstock. Thus, the operator has a claim on those assets. In contrast, money may have been borrowed to acquire assets. Consequently, the lender has a claim on those assets, in the amount of the loan used to purchase them. The farmer may have also used savings plus money borrowed to purchase them. Therefore, both the farmer and the lender have claims against some assets. Those claims held by the farm operator are referred to as equity, whereas claims held by individuals who are not part of the farm operation are known as debts or liabilities. Examples of liabilities are accounts payable, notes payable, and mortgages payable.

The basic accounting equation requires that the value of claims in the form of liabilities plus the value of claims in the form of equity must be equal to the value of assets. Because liabilities represent a higher priority claim than equity under the laws of business finance, the value of the equity claim or net worth is typically calculated as a residual value. Thus, assets are valued on the financial statement, the amount of debt obligations is subtracted, and any remaining value is

imputed to equity or net worth.

The balance sheet constructed for the purposes of financial analysis in this project appears as shown in Figure 5:

Figure 5: Format for a Balance Sheet - Aquaculture Enterprise

BALANCE SHEET:

	Current $
ASSETS:	
CURRENT:	
Cash on hand	_____
Bank deposits	_____
Accounts receivable	_____
Ending Inventories:	
Fry (0-5cm.)	_____
Fingerlings	_____
Table size fish	_____
Farm supplies	_____
Other current assets	_____
TOTAL CURRENT ASSETS:	
INTERMEDIATE:	
Brood stock	_____
Machinery and equipment	_____
Other intermediate assets	_____
TOTAL INTERMEDIATE ASSETS	
FIXED:	
Buildings and facilities	_____
Land and improvements	_____
Water system	_____
TOTAL FIXED ASSETS	_____
TOTAL FARM ASSETS	_____
LIABILITIES:	
CURRENT: <1 yr.>	_____
Operating loans payable	_____
Accounts payable	_____
Rent payable	_____
Taxes payable	_____
Interest payable	_____
Plus: Principal payments due	_____
within 1 year on	
a) Intermediate Term loans (1-10 yrs.)	_____
b) Long Term loans (>10 yrs.)	_____
TOTAL CURRENT LIABILITIES	_____
Intermediate: (1-10 yrs.)	_____
Intermediate term loans payable (balance)	_____

Less: Principal payments due within 1 year on IT loans	_____
TOTAL INTERMEDIATE LIABILITIES	
Long-term: (> 10 yrs.)	_____
Building mortgages (balance)	_____
Land mortgages (balance)	_____
Other LT loans (balance)	_____
Less: Principal payments due within 1 year on LT loans and mortgages	_____
TOTAL LONG TERM LIABILITIES	
TOTAL FARM LIABILITIES	
TOTAL OWNER'S EQUITY	
TOTAL LIABILITY AND EQUITY	

2.4 Accounting Method

The flow of income can be measured using two different methods, the cash method and the accrual method. The cash method records income and expense items when cash changes hands or when checks are written or received. With cash accounting, inventory changes are ignored because they do not reflect cash transactions. For example, if an input, such as feed, were purchased in December but not paid for until January of the following year, the expense would be included in the income statement for the following year rather than for the current year. Likewise, if broodstock were sold before the end of the year but the check was not received until after January 1, the proceeds would be recorded as income in the following year. Thus, an increase or decrease in inventories would have no impact on the income statement using the cash accounting method. The only exception to this rule (by which the cash method only recognizes cash transactions) is depreciation which is included as an expense item.

The cash method can accurately reflect the income of a business over time because all inventory changes and deferred purchases or sales will eventually show up as cash over a period of years. However, it may not indicate the actual income produced during a particular accounting period, because the amount of production maintained in inventory varies from year to year in the typical farm business.

With the alternative method of measuring income, accrual accounting, transactions that increase or decrease income are included in the statement when production occurs or the expense commitment is made, not when cash changes hands. For example, feed purchased in December, even if delivery did not occur until January of the following

year, would be included as an expense in this year's income statement. Similarly, the sale of broodstock on December 31 would be included as an income item in this year's statement, even if the check were to be received in January of the following year.

The accrual accounting method also includes changes in inventory in the computation of net income. If the value of inventories increased from the beginning to the end of the year, the accrual method recognizes it as coming from increased production and includes it as income during the current accounting year even though it has not been converted into cash. In contrast, a decrease in the value of inventory from the beginning to the end of the accounting period indicates that a larger volume of production was sold for cash during the year than was produced.

The accrual method attempts to reflect more accurately the actual production and expense commitments made during the accounting period. In the short run it provides a more accurate indication of the actual income generated by the physical and financial resources. It must be recognized, however, that there may be a significant difference between the accrual income and the cash flow of the typical farm business because of inventory changes, delayed sales, prepaid expenses, or other noncash adjustments that are part of accrual accounting.

The accrual method was chosen for determining current business performance in aquaculture. All enterprises in this study were relatively new and a major stumbling block to estimating their true income potential involved the timing of capital expenditures relative to the production of revenue earnings. Using the cash accounting method would have very likely distorted the financial and investment analysis.

The choice of accounting method is crucial when studying enterprises during the start-up phase of any business. It is important to remember that even while the study did not include any historical information, accrual accounting was chosen. Another reason for this choice was the desirability of adopting a method which offered "repeatability". If a longer term study were to be done, or indeed, if aquaculturists themselves adopted this accounting system, a better picture of the income generation potential of the enterprise would emerge.

2.5 Financial Analysis

Financial ratios are the "vital" signs which signal current financial stability or oncoming financial problems. Several steps are necessary in monitoring financial performance, namely;

1. Select measurable criteria that indicate financial strength.
2. Determine a standard value for each criterion.
3. Determine an acceptable deviation from the standard value.
4. Determine appropriate corrective action when the tolerance limits are exceeded.

Financial ratios are usually grouped into categories according to the aspect of the enterprise which they best represent. Eleven ratios in four categories were built into the electronic spreadsheet financial analysis system developed for this study (Figure 6).

Figure 6: Financial Ratios Included in The Study

PROFITABILITY:

1. Percent return to assets (%) $\frac{\text{(Net farm income + interest)}}{\text{(Total farm assets)}}$

2. Percent return to equity (%) $\frac{\text{(Net farm Income)}}{\text{(Equity)}}$

EFFICIENCY:

3. Capital Turnover (years) $\frac{\text{(Total farm assets)}}{\text{(Gross farm income)}}$

4. Operational Efficiencies (%)

   a. $\frac{\text{Total Purchases - interest}}{\text{(Gross farm income)}}$

   b. $\frac{\text{(Interest)}}{\text{(Gross farm income)}}$

   c. $\frac{\text{Depreciation}}{\text{(Gross farm income)}}$

   d. Cost Control (%)

   $\frac{\text{(Net farm income)}}{\text{(Gross farm income)}}$

LIQUIDITY:

5. Current Ratio $\frac{\text{(Current assets)}}{\text{(Current liabilities)}}$

6. Debt Structure Ratio (%) $\frac{\text{(Current Liabilities)}}{\text{(Total liabilities)}}$

SOLVENCY:

7. Debt:Asset Ratio $\frac{\text{(Total farm liabilities)}}{\text{(Total farm assets)}}$

8. Debt:Equity (leverage) Ratio $\frac{\text{(Total farm liabilities)}}{\text{(Owner's Equity)}}$

Measures of Profitability

Total profit is not a reliable indicator of relative economic performance between farms because of differences in size and type of farm. Profit must be viewed in relation to the value of assets or equity which were employed to produce it. For this reason, comparisons between farms of various sizes and technology levels are made on the basis of profitability ratios, such as the return on assets or return on equity, rather than on profit. The rate of return on assets indicates the earnings rate of the assets of the business. If the asset is profitable, it will earn more than it costs in any given time period. A projected rate of return on assets (ROA) is often used to decide on the feasibility of an investment; the equation is as follows:

$$ROA = \frac{\text{Net Farm Income + Interest Expense}}{\text{Total Farm Assets}}$$

It is important that the values used in this equation be relevant to the farm business only. Non-farm income, interest and assets should be excluded from the calculation.

The rate of return on equity, the second indicator of profitability, describes the returns per dollar of equity invested in the farm business. It is useful as a basis for comparing the profitability of the farm business relative to other investment alternatives, providing that equity and/or assets are consistently valued at either current market price or acquisition cost for competing alternatives. The rate of return on equity (ROE) is calculated as follows:

$$ROE = \frac{\text{Net Farm Income}}{\text{Equity}}$$

Net farm income should also include salaries and management fees.

Measures of Efficiency

Efficiency ratios indicate the manager's ability to transform available resources into valuable output with a minimum waste of effort or resources.

The capital turnover ratio describes farm earnings in relation to the size of the investment employed:

$$\text{Capital Turnover} = \frac{\text{Total Farm Investment}}{\text{Gross Farm Income}}$$

The capital turnover ratio indicates the number of years required to "turn over" the invested capital, or the number of years of cumulative gross income required to match the value of invested capital. The more physically efficient the production is, the fewer years are required. Operational efficiency ratios measure the expenses incurred per dollar of gross farm income generated. These ratios also illustrate the proportion of total farm expenses attributable to each type of expense, such as feed, interest, depreciation, etc. The operational efficiency ratios take the following general form:

$$\text{Operational Efficiency} = \frac{\text{Expense}}{\text{Gross Farm Income}}$$

The cost control ratio measures overall operational efficiency by calculating net farm income (rather than expenses) as a proportion of gross farm income. When net farm income is greater than zero, the cost control ratio plus the other operational efficiency ratios equal 100% of gross farm income (i.e.: the sum of the numerators, net farm income and farm expenses, equals the denominator, namely, gross farm income). The cost control ratio is as follows:

$$\text{Cost Control} = \frac{\text{Net Farm Income}}{\text{Gross Farm Income}}$$

Measures of Liquidity

Liquidity is concerned with the capacity to generate enough cash to meet financial obligations as they fall due. The financial structure of many farm businesses is composed of a large proportion of intermediate and long-term assets which typically earn a relatively low cash return. Consequently, the firm may have difficulty generating enough cash receipts to meet current financial obligations. Entries in the current assets and current liabilities sections can be used to indicate the liquidity position of the operation.

Current working capital provides an absolute measure of liquidity. It is calculated as:

Current working capital = Current assets - Current liabilities

The current capital ratio is one relative measure of liquidity that indicates the vulnerability to change in asset values.

$$\text{Current capital ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

Lending agencies frequently establish minimum levels which they consider acceptable for the current capital ratio by type of farm and geographic area. They may require refinancing current liabilities when the current capital ratio is less than the prescribed standard. The firm may want to set higher standards reflecting the operator's attitude towards risk. Current ratios of 1.25-1.75 are sought by agricultural lenders on the basis that market risks coupled with natural risks are high enough in agriculture to alter current ratios by as much as 0.5 in any year. A "good" ratio for aquaculturists does not exist at present owing to the lack of data on business performance in this new industry. Therefore, similar ratios will likely be used by lenders who provide credit to aquaculturists.

Measures of Solvency

The balance sheet provides information on the solvency of the firm or individual. Solvency is concerned with the relationship between the current market value of assets and the claims others have on the business. Various measures of solvency have been developed.

An absolute measure of solvency whether measured on the cost basis or on the market value basis is called net worth. Lenders and others concerned with the vulnerability of the operation to changes in the valuation of assets may also want to calculate a relative measure of solvency. One relative measure is the debt/asset ratio.

$$\text{Debt/asset ratio} = \frac{\text{Total liabilities}}{\text{Total assets}}$$

Whereas absolute measure of solvency provides a measure of the dollars of net worth which the owner has, the relative measure indicates how vulnerable the operation is to declining asset values.

Perhaps the reason for using both an absolute and a relative measure of solvency can be clarified with a simple example. Assume Farmers X and Y each have a $200,000 net worth. However, Farmer X has $2,000,000 in assets, while Farmer Y has $220,000 in assets. The absolute measure of solvency (net worth) is $200,000 for both farmers. However, the relative measure of solvency (debt/asset ratio) is, $1,800,000/$2,000,000 or 0.9 for Farmer X and $20,000/$220,000 or 0.09 for Farmer Y. This obviously shows that Farmer X is much more vulnerable to declining asset values. Long range management decisions must recognize this phenomenon.

2.6 Investment Analysis

Investment analysis, or capital budgeting, is the process of determining the profitability of an investment or comparing the profitability of alternative opportunities for investment. A thorough analysis of an investment requires four pieces of information: (1) net cash revenues from the investment, (2) the cost of making the investment [includes interest on borrowed capital], (3) the terminal or salvage value of the investment, and (4) the real interest (or discount) rate which relates the rate of return of the investment to the general rate of return to capital in the economy.

Net cash revenues or cash flows must be estimated for each year in the life of the investment. Cash receipts minus cash expenses defines the net cash revenue resulting from the investment. Depreciation is not included as an expense in investment analysis, because it is a noncash expense and is accounted for by the difference between the cost of making the investment and its terminal value at the end of the analysis period.

The cost of the investment should be the actual total expenditure for its purchase and not the list price or just the down payment if it is being financed. Of the four types of information required for investment analysis, this is relatively easy to obtain from farm records in most cases. The terminal value often must be estimated. One common practice is to let it be set equal to the salvage value for a depreciable asset. For a nondepreciable asset such as land, the terminal value should be the estimated market value of the asset at the time the investment is turned over (asset is sold).

When selecting the appropriate discount or real interest (or discount) rate, the "opportunity cost" of capital is an important consideration. However, this value is seldom known with any degree of accuracy, and several alternatives exist. The first is to use the current interest rate paid on savings accounts. This is the minimum opportunity cost of capital, and the discount rate should be at least this value. A second alternative is to use a discount rate equal to the current interest rate on borrowed money. This alternative would be preferred to the first when the investment will be financed with borrowed money. The third alternative would be the minimum rate of return acceptable or desired by the investor.

Various methods of investment analysis are in use such as 1) payback period, 2) simple rate of return and 3) internal rate of return.

Payback Period

The payback period is the number of years it would take for an investment to return its original cost through the net cash revenue it generates. If the net cash revenues are constant each year, the payback period can be calculated from the equation:

$$P = \frac{I}{E}$$

where P is the payback period in years, I is the amount of the investment, and E is the expected annual net cash revenue.

When the annual net cash revenues are not equal, they should be summed year by year to find the year where the total is equal to the amount of the investment.

The payback method can be used to rank investments. Limited capital can be invested first in the highest ranked investment and then on down the list until the supply of available investment capital is exhausted. Another way of using the payback period concept is to establish a maximum payback period and reject all investments with a longer payback. For example, a manager may select a 4-year payback and invest only in alternatives with a payback of 4 years or less.

The payback method is easy to use and quickly identifies the investments with the most immediate cash returns. However, it also has several serious disadvantages. This method ignores any cash flows occurring after the end of the payback period and the timing of cash flows during the payback period. Notice also that the payback method is not really a measure of profitability. For these reasons, it can easily lead to poor investment decisions and is not the best method of investment analysis.

Simple Rate of Return

The simple rate of return expresses the average annual net revenue as a percentage of the investment. Net revenue is average net cash revenue minus average annual depreciation. The simple rate of return is calculated from the equation:

$$\text{Rate of return} = \frac{\text{average annual net revenue}}{\text{cost of the investment}} \times 100$$

The simple rate of return method is generally thought to be better than the payback method because it considers an investment's earnings over its entire life. However, it uses average annual earnings, which fails to consider the size and timing of annual earnings and can cause

errors in selecting investments. For example, one $30,000 investment may have a 10 percent simple rate of return even though it had no net cash revenue the first 4 years and $15,000 in year 5, as the average return is still $3,000 per year. Another may simply have an annual return of $3,000 beginning in the first year.

However, a consideration of the time value of money would show these to be greatly different investments. Because of this shortcoming, the simple rate of return is not generally recommended for studying investment potentials in a new enterprise such as aquaculture.

Internal Rate of Return

The time value of money is reflected in another method of analyzing investments, the internal rate of return (IRR). It provides some information not available directly from other methods. The actual rate of return on an investment with proper accounting for the time value of money is called the internal rate of return. This is also sometimes referred to as 1) the marginal efficiency of capital or 2) the yield on the investment. In fact it is the discount rate which makes the present value of the net revenue flows (commonly referred to as Net Present Value, NPV)* just equal to zero. The equation for finding IRR is:

$$NPV = \frac{P_2}{(1+i)^1} + \frac{P_2}{(1+i)^2} + \ldots + \frac{P}{(1+i)^n} - C$$

where NPV (Net Present Value) is set equal to zero and the equation is solved for i, the discount rate. A moment's reflection will show this to be a difficult equation to solve. In the absence of a computer or

* For a discussion of Present Value and Net Present Value see Boehlje, Farm Management, Chapter 8, pp. 315-331.

sophisticated calculator, the IRR must be found through trial and error with some approximation.

An arbitrary choice of a discount rate must be made to begin the calculations. If the equation yields a positive net present value, the IRR is greater than the discount rate used. Selection of a higher rate and recalculation should follow. This process should be repeated until the net present value from the equation becomes negative. Whenever the calculated net present value is negative, the actual IRR is less than the discount rate being used. Linear interpolation between the last two discount rates (the one for the last positive NPV and the one for the negative NPV) usually gives a very close approximation to the true IRR. It is important to remember, however, that because the IRR formula is non-linear, small successive changes in the discount rate should be used. This is so that the final linear interpolation does not result in any significant numerical error.

An alternative method of gaining the answer involves the use of the non-annuity table for present value.

For example: If investment = $10,000		Assuming a 10% discount rate,
and net benefit = $ 4,010		the factors from the table
and t = 3 years		are:
		1st year = .909, 2nd year .826,
		3 year = .751

Then:

$$10{,}000 > (4{,}010).909 + (4{,}010).826 + (4{,}010).751 = 9968.86^{*}$$

* The procedure generally aims toward discovering the interest (discount) rate which would make the Net Present Value of an investment zero (i.e. the rate which the investment actually earns as compared to rates available elsewhere). When using this approach the equation is often rearranged with the cost of the investment on the left. This shows more clearly that an investment's present net revenue value must equal or exceed the cost of the investment to warrant it.

This indicates that 10% discount is a little too high, therefore the IRR must be somewhere in between 9% and 10%.

The internal rate of return method can be used several ways in investment analysis. Any investment with an IRR greater than the opportunity cost of capital would be profitable investment. However, some investors select an arbitrary cutoff value such as 10, 12, or 15 percent and invest only in those projects with a higher IRR. Unlike the net present value method, the IRR can be used to rank investments which have different initial costs and lives. This is an important consideration when investment capital is limited, as only those investments with the higher returns should be undertaken.

In addition to the rather difficult calculations involved, there is another potential limitation on the use of IRR. It implicitly assumes the annual net returns or cash flows from the investment can be reinvested to earn a return equal to the IRR. If the IRR is fairly high, this may not be possible, causing the IRR method to overestimate the actual rate of return.

PART III - RESULTS

The following section presents the field-work results, including a descriptive summary of industry concerns as described by fish farmers. Financial and Investment analyses were carried out in accordance with the procedures outlined in the previous section. Because the sample of ten fish farmers was very small, no attempt was made to include any statistical testing of questionnaire data. However, in the financial analysis section, ranges (sensitivity analyses) have been included to assist with the interpretation of financial ratios. This was done primarily to allow the results to be cast in a "sensitivity analysis" framework. Sensitivity analysis was also conducted in the calculation of Internal Rates of Return based on various discount rates, for varying lengths of time and using more than one way of estimating the cost of investment according to the variation in reporting found in the questionnaire responses.

The Questionnaire

Part I of the questionnaire's focus was on certain questions thought to be key to anyone considering new investment in or expansion of a fish farming operation. The questions sought to elicit responses on several subjects namely; 1) initial investment cost, 2) production capacity, 3) farmer's adaptability (age factor), and 4) a combination of commercial and policy related aspects. Our prime concern was the reliability of data collected in previous studies of Ontario trout farmers. Every effort was made to ensure the validity of the data as being representative of the industry by involving the majority of major aquaculturists in Ontario in our survey. It was felt that personal interviews were necessary to gain fuller knowledge of the enterprises of

all aquaculturists who indicated a willingness to cooperate in the study. This proved to be effective and notwithstanding the limited size of our data base, we consider the information to be highly reliable. Moreover, the questionnaire was used as a means to start the dialogue with fish farmers that we hoped would encourage participation in the financial study.

The sample of cooperating aquaculturists is most reliable in the cases of full-time operators, although statistical testing, calculation of variances, etc. was not feasible. On the other hand, borne mainly out of the positive nature of the interviews, we feel confident in conveying many of the responses as representative of genuine business concerns facing the industry. The questionnaire focussed on four areas and it is believed that the concerns expressed are integral components of the managerial decision-making framework on these farms. They are summarized as follows:

1. Researchers' Overview of the Industry

   - Fish farming is a growing industry mainly because the majority of the full-time fish farmers would like to expand their operation (Item 6, Table 1).

   - The average annual production (based on Spring 1985 Survey) is nearly 80,000 lbs. for full-time fish farmers.

2. Producers' Attitudes Towards the Aquaculture Industry

   - All of the full-time fish farmers interviewed expressed willingness to rear other species of fish. They believe that the present market for rainbow trout could be saturated within the next few years if all the fresh water production is limited to this one species. Fish farming in Ontario must evolve as a competitive farm enterprise rather than a cottage industry.

Table 1: Questionnaire Results - Part I (See page 64 for questionnaire)

					Question #'s					
1	2	3 $ 000	4 $ 000	5	6	7	8 '000 lbs.	9	10 1 2 3 4 5 6	Personal Comments Made by Interviewed Fish Farmers
F.T.	1973	880.67	(2m +)*	R.T.	Yes	Yes	92	35	5 3 1 4 2 6	Dumping of U.S. products into Ontario
F.T.	1967	40	175	R.T.	Yes	Yes	20-40	46	4	
F.T.	1977	40	300	R.T.	Yes (already expanded)	Yes	40	33	2 3 4 6 5 1	Lay off or educate the seafood distribution sector
F.T.	1967	65	750	R.T.	No	Yes	45	62	5 2 3 6 1	Raising of other species
F.T.	1975	90	500	R.T.	Not Sure	Yes	N.R.	50	2 1 4 5 6 3	Market development, R&D to increase growth rate, to reduce diseases, etc. and genetic improvements
F.T.	1969	150	700	R.T.	Yes	Yes	75	49	1 2 3 4 6 5	OMAF should look after fish farming in Ontario, different species, lower interest rate
F.T.	1975	200	(1.5m)*	R.T.	No	Yes	200	23	4 1 2	
P.T.	1978	40	160	R.T.	No	No	25	57	2 3 6	OMAF should look after fish farming in Ontario
L.R.	1972	10	30	R.T. & Brook	No	No	6	45	2 3 1 4 5 5	Certification seems to be a discouraging factor in my case! Had some opportunity to sell fish to government but lost that due to lack of certification.
H.F.	1978	10	500	R.T.	Yes	No	2	56	4 3 1 5 6 2	More financial help is needed

*Figure 1 in the parenthesis represent values in millions of dollars

3. Producers' Expectations Regarding Profit Potential

- Fish farming is a viable farm operation (provided the shift in the consumer's demand for meat remains more favourable towards fish products) particularly for some of the well established full-time fish farmers. This was evident in their willingness to expand and produce other aquatic products.

4. Major Policy Issues in Ontario Aquaculture Development

In evaluating their response about major factors detrimental to the growth of fish farming enterprise (question 10 on page 64, Appendix I) farmers cited many factors in the following order of priority:

First Priorities

- Limited sources of suitable water,
- availability of low-priced foreign products.

Second Priorities

- High interest rate,
- lack of commercially oriented research and development.

Third Priority

- Increased cost of production in concert with low prices.

Fourth Priority

- Price undercutting by Canadian competitors.

Fifth and Sixth Priorities

- Price undercutting by Canadian competitors,
- no common consensus could be identified.

From the questionnaire and field interview responses it appears that a consensus among full-time fish farmers is emerging with respect to the major policy issues they wish to be considered by the government authorities, if aquaculture is to be further developed in Ontario.

These concerns are real and should be heeded, particularly because all respondents expressed willingness to expand their operation.

It is interesting to note that, the collective response of all the sampled fish farmers (including part-time, limited resource and hobby fish farmers) is somewhat different. The overall response of all the sampled fish farmers regarding major factors detrimental to the growth of fish farming resulted in a slightly adjusted priority ranking compared with the response of only full-time operators described above.

First Priority

- Limited sources of water

Second Priority

- Availability of low-priced foreign products

Third Priority

- Lack of (marketing, investment) commercially oriented research and development.

Fourth Priority

- Increased cost of production in concert with low price.

Fifth Priority

- Price undercutting by Canadian competitors.

Both groups mentioned that having an adequate water supply of suitable quality was the highest priority. This appears to indicate that regardless of the size of the fish farming enterprise, there is a desire to expand. The second priority differs in that the full-time operators are primarily concerned with finance while the other ones are concerned mainly with foreign competition. Both groups also place a high priority on research and development, particularly commercial and/or marketing studies. Thus, further economics and business oriented

research should be well received by the fish farming industry in Ontario.

Financial and Investment Analysis

During the collection of financial data it became obvious that not all of the fish farmers interviewed were receptive to disclosing their business records. Many established farmers were cautious and distrustful. These farmers consistently expressed concern about the competitive threat of new entrants into fish farming once results of this study were published. Because of this, there was some negative and sometimes vocal reaction to the survey. On the other hand, several farmers, most of whom had recently become involved in the fish farming industry and seemed to be more confident about the competitiveness of their business, tended to be more supportive of the investigation. These five farmers supplied most of the financial data for the study.

The data collected from the sample of full-time aquaculturists were processed through the electronic spreadsheet system. Table 2 summarizes some of the relationships between cost items, revenue and production level. A discrepancy between feed costs and production level was found among producers. This is paradoxical given the care with which the data was reported to the study team. It is possible that if there are reporting errors then these likely came from the production figures. The records kept by the farmers detailed the cost side of the business quite accurately. The relationships in this table, therefore, should be interpreted as indicators of general cost levels for the sample of full-time fish farmers. More data would be required to obtain statistical relationships which are in keeping with the concepts of production economics.

Table 2: Relationships of Feed Cost, Income and Production Level To Various Cost Items for Full-time Fish Farmers

Cost Items									
Water System $	Farm Building $	Support Facilities $	Land $	Initial Investment $	Feed Cost $	Gross Farm Income $	Total Farm Assets $	Production Level (lbs.)	Type of Operation
337,000	50,000	223,500	49,750	200,000	30,000	658,580	710,250	200,000	Hatchery and Table Size[1] and Restaurant
126,600	40,000	117,965	170,000[2]	90,000	10,000	50,635	454,565	N.R.[3]	Hatchery and Table Size
56,500	80,000	20,400	22,500	65,000	27,000	81,450	179,400	45,000	Hatchery and Table Size
28,500	10,000	23,875	40,000	40,000	7,000	78,714	102,375	30,000[4]	Hatchery and Table Size
120,000	55,000	71,550	46,500	150,000	35,000	233,250	292,550	75,000	Hatchery and Table Size
57,500	172,389	92,550	378,300	880,670[5]	31,021	189,128	700,739	92,000	Hatchery and Table Size and Club
40,150	was included in the price of land	48,650	84,900	40,000	13,500	111,800	173,700	40,000	Hatchery and Table Size

1. Income from the restaurant was not included
2. Includes today's price of land
3. Not reported
4. It is an average of two years
5. Possibly an inflated figure

Financial analysis was provided by the financial ratios which were calculated from figures extracted from the balance sheets and income statements for each full-time fish farmer. The financial ratios that resulted are summarized in Table 3.

From Table 3 a number of conclusions can be drawn about the financial status of full-time aquaculturists in Ontario. Firstly, in considering whether or not aquaculture is profitable, an average Return on Assets (ROA) of 25.79% indicates a better-than-average performance when compared with other agricultural sectors. For extensive (crop and

Table 3: Financial Analysis - Full Time Aquaculturists

	Low %	Average* %	High %
Profitability			
Return on Assets	7.47	25.79	43.70
Return on Equity	5.70	24.38	44.24
Efficiency			
Capital Turnover	1.12	1.17	3.77
Cost Control	11.67	37.96	76.88
Liquidity			
Current Ratio	0.41	6.72	21.25
Solvency			
Debt:Asset Ratio	0.83	3.12	4.65
Debt:Equity Ratio	0.84	3.31	9.86

* Averages calculated on the basis of respondents who supplied complete data.

livestock) agricultural enterprises an average ROA of 7% is traditional. For the top producers (20-25% of farmers) a ROA of 10% or better is considered as good performance. For more intensive agricultural enterprises (where a smaller percentage of total assets is land) such as greenhouses and small-scale orchards a ROA over 12% is considered to be satisfactory and likely to guarantee long-term success. Therefore, on the surface it would appear that aquaculturists are experiencing better than average returns. However, note that their Return on Equity on average is lower than Return on Assets. While this appears questionable it must be pointed out that several respondents reported interest payments on outstanding debts but failed to disclose the principal outstanding to which those payments pertained. Furthermore, all respondents who reported the level of their financial liabilities considered them to be current rather than intermediate term (5-10 years) or long-term (more than 10 years). From this one cannot conclude whether the firms in this industry are solvent or insolvent at the present time.

Secondly, because these aquaculturists reported figures which yield a very high return on equity (just over 24% on average), one might argue that, either 1) because these firms are in such a low equity position, almost any return will appear as good performance, or 2) that even modest returns can be used to build a sound equity position rapidly. If the latter argument were to be consistent with the managerial approach being taken by these aquaculturists one might expect to encounter two trends. If the study were to be repeated at a later date the expected trends would be namely; 1) that equity was increasing giving an appearance of greater solvency (i.e. lower Debt:Equity Ratio)

and 2) that return on equity was falling off giving an appearance of poorer performance. This might be expected in a new industry such as aquaculture. The investigators believe that it is too early to tell whether commercial aquaculture owes its performance at the present time to conscious management decisions or to a current set of market conditions for both investment capital and fish products. In any case, the indication is that profitability indicators (Debt:Asset Ratio) are likely to fall and solvency indicators (Debt:Equity Ratio) are likely to rise. More accurate reporting of financial information would also likely move the ratios in the same directions on average.

Thirdly, with respect to the Efficiency Indicators, (Table 3) a Capital Turnover ratio of 1.17 (years) is very low. It indicates a strong rate of earning relative to the capital investment which was made to sustain the enterprise. Because of the newness of the enterprise, the authors believe that producers have striven to keep their capital costs as low as possible in the short-run. The Cost Control ratio also corroborates that the earning potential in aquaculture is strong. The average cost control ratio appears to the study team as relatively low. On average, only 37.96% of returns are needed to cover costs of production. However, it is important to notice the range in this figure. As mentioned earlier the study team suspects that the level of production (and, hence, returns) figures contain the greatest potential for inaccuracy in the survey. The details of the survey suggest that a range in the Cost Control ratio between 40 and 60% and an average of nearly 50% would more reasonably represent the industry. Unfortunately, agricultural enterprises are exceedingly diverse and evidence wide variability in managerial performance. (Clark & Sarpong, 1985). As a

rule of thumb, cost control ratios below 50% are usually associated with farms which are expected to continue in business. Cost control ratios greater than 60% raise concerns as to management's ability to master production technology and, hence, to maintain profitability.

Finally, the average Liquidity Ratio of 6.72 is consistent with the evidence discussed above that suggests that while earning potential seems strong, most aquaculturists are in a tight cash flow position owing to their high level of current financial liability. This, of course, raises the level of market risk. That is to say, these fish farmers are highly vulnerable to any change in the market which might reduce the price of table weight trout. It is not surprising that most aquaculturists expressed concerns about foreign competition and about competition from new entrants. They also expressed a desire to have more marketing research done for commercial aquaculture.

From an investment standpoint one might conclude that investment in aquaculture presents a rather interesting and generally encouraging picture. However, a closer look at the financial ratios gives a less clear impression. For example, in terms of liquidity (which reflects current financial ability to withstand short-run shocks such as low prices, etc.) a different picture emerges. It appears that most liabilities are to be regarded as current. However, one must note carefully that current assets in this enterprise are substantially less than total assets. Therefore, short-run shocks which normally would be met by internal borrowing through the use of current assets might cause the need for the use of credit from sources external to the fish farms. While not necessarily a dire situation, farmers may be reluctant to incur such debt at the present time. If this is true, it could mean

that farmers' attitudes toward indebtedness could have a major influence on the progress of the industry. However, at the present time all of the enterprises appear to have sufficiently strong cash flows to meet current debt obligations.

This phenomenon is common among emerging entrepreneurs in many industries which are in the beginning stages of capitalization. Managers appear to be using debt capital to plunge into commercial production to a sufficient degree to enable them to operate relatively large-scale operations. This may point toward scale economies in aquaculture which favour larger producers. The average cost control ratio of the full time operators of nearly 38% (Table 3) indicates that there is considerable room for greater success at reducing the gap between gross and net farm income even though 37% indicates good performance. In fact, the larger enterprises were found to have higher cost control ratios. This may, indeed, point toward the existence of size (or scale) economies in the business.

The analysis indicates managers probably recognize several factors as necessary for their future success in aquaculture: 1) a need to become as large as possible as soon as possible, 2) the necessity of using borrowed capital to achieve a size beyond an economic efficiency threshold, and 3) the desirability of recapitalizing as rapidly as possible to lend an outward appearance of only moderate potential in terms of return on investment. Further research is needed to confirm whether these are real phenomena by acquiring sufficient data to statistically test these hypotheses. If, in fact, evidence collected over a longer term did encounter the trends expected (i.e. equity increasing, return on equity declining), the investment potential in

commercial aquaculture over the long run in Ontario may actually be quite promising.

Internal Rate of Return

Financial analysts believe that a project should be undertaken only if the internal rate of return exceeds the prescribed discount rate. Technically the internal rate of return of an investment is the discount rate that equates the Net Present Value of the investment to zero. In calculating IRR's the most important factor that affects investor's decision making is the acceptance criterion, that is, the investor must select a cut-off point, which is defined as the boundary between accepted and rejected investments. Theoretically, the cut-off point should be the firm's cost of capital, which may be defined as the rate of return needed from an investment to maintain or increase the value of the firm. For this analysis the real interest rate was selected as the acceptance criterion. This rate is the difference between the prime rate and the inflation rate, which is approximately 4 per cent at the present time. Therefore, the economic viability of sampled fish farms would depend on the fact that whether or not their IRR exceeds the prescribed (4 per cent) discount rate. Table 4 shows the calculated IRR's for all of the fish farms in the sample including hobby, limited resource, part-time and full-time aquaculturists.

From Table 4 one can observe that using the "calculated" investment costs, except for the full-time farms, no other fish farm yielded an IRR significantly greater than zero during a short-term investment period. Obviously those farms having negative net farm income will produce no positive IRR (part-time and hobby). However, as the investment period is extended to the medium and long-term, not only

TABLE 4: Internal Rate of Return of Sampled Fish Farms in Ontario

Farm Category	Investment Cost (Calculated)	Net Farm Income[1] Annual	IRR Short Term 7 Years	IRR Medium Term 15 Years	IRR Long Term 20 Years
Full time	373368.4	75602.0	9.5	18.7	19.6
Part Time	116825.0	-4828.3	0	0	0
Limited Resource	44420.0	4010.0	0	4.0	6.4
Hobby Farmer	162645.0	-4840.0	0	0	0
	Inflated Investment Cost (Initial)	N F I Annual			
Full time	341894.0	75602.0	12.2	20.8	21.6
Part Time	63475.0	-4828.3	0	0	0
Limited Resource	25182.0	4010.0	2.8	13.5	14.9
Hobby Farmer	15869.0	-4840.0	0	0	0

The "calculated" investment cost refers to the sum of the cost items in the questionnaire (page 59 Appendix I) referring to cost of land, farm buildings, support facilities and water system.

does the IRR for full-time farms increase, the limited resource fish farm begins to show acceptable rates of return of 4 percent and 6.4 percent for the short-term and long-term investment periods respectively. Obviously the IRR for part-time and hobby fish farms remained less than zero due to negative net farm income.

As an alternative approach, the second phase of the investment analysis was carried out by using the respondents' reported "initial" investment cost (question 3 on questionnaire, page 64). However, these figures were inflated up to 1984 given the respective commencement dates of the fish farm investments. It was interesting to note that the IRR for full-time and limited resource fish farms increased substantially.

This analysis suggests that investment in aquaculture is only viable for full-time fish farms for a short-term investment period which falls within a manager's normal planning horizon. However, it is premature to disqualify other categories of fish farms (i.e. part-time, limited resource and hobby) when a larger sample of non-full-time fish farms could show better IRR's.

From the foregoing one might conclude that investment in aquaculture is only moderately viable. However, there remains the possibility that the data as given by the respondents may contain a bias in the form of over-estimated costs as mentioned earlier. Remembering that most farmers in the sample reported 100% of their financial liabilities as current, yet some indicated that their initial investment was made over 18 years ago, indicates to the study team that such a bias is likely. We feel that further research would likely show an IRR substantially higher for full-time operators. These farmers, in fact, made their investment and carried its financing through a

difficult economic period in the late 1970's when the real rate of interest was much higher. With an IRR of only 4% or lower, it is doubtful that these farmers would have survived in the business up to the present. Furthermore, 4 of 7 respondents (Table 1) indicated a desire to expand their enterprises.

At the present time, however, it must be remembered that managers are proceeding to retire indebtedness (i.e. build equity) very rapidly. This saddles them with a great degree of risk vis-a-vis market forces because it leaves little financial cushion to protect against periods of low market prices and/or high production costs. Product prices must remain at present levels or higher for them to be able to turn returns back into their enterprises to build equity and decrease current financial risk. Also if greater production efficiency can only be achieved by full-time operators expanding their output, market forces may operate to reduce the price of table size fish. This may happen fast enough to place producers at risk before they have retired much of their long-term financial liabilities. Therefore, in the final analysis, survival in aquaculture may be dependent on one single phenomenon, namely, a genuine shift in consumer preference away from red meat toward fish and poultry. The effect of this will be a relatively high degree of price inelasticity for fish for the medium term (i.e. higher volumes coming from fish farms may not depress fish prices so rapidly as previously). Such a change in consumer preferences may give the industry time enough to pass through this initial period of capitalization to a more stable financial footing with a higher degree of solvency. All the while, however, statistics will seem to indicate fairly weak profitablity in the short term.

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APPENDIX I

Aquaculture Enterprise Budget - Operating and Control

Cash Income

- Eggs — Quantity ..... Total price$..... unit ( )

  Quantity or (%) .... Sold to Government

  Quantity or (%) .... Sold to Ontario Fish Farmers

  Quantity or (%) .... Sold to Others

- Fry — Quantity ..... Total price$..... unit ( )
  size range =0-5cm.

  Quantity or (%) .... Sold to Government

  Quantity or (%) .... Sold to Ontario Fish Farmers

  Quantity or (%) .... Sold to Others

- Fingerlings — Quantity ..... Total price$..... unit ( )
  size range =5-20 cm.

  Quantity or (%) .... Sold to Government

  Quantity or (%) .... Sold to Ontario Fish Farmers

  Quantity or (%) .... Sold to Others

- Table Size — Quantity ..... Total price$..... unit ( )

  Quantity or (%) .... Sold to Guelph Co-op

  Quantity or (%) .... Sold to Supermarket Chains

  Quantity or (%) .... Sold to Processors

  Quantity or (%) .... Sold to Wholesaler

  Quantity or (%) .... Sold to Restaurants

  Quantity or (%) .... Sold to Retail Outlets

  Quantity or (%) .... Sold to Farmgate Buyers

  Quantity or (%) .... Sold to Angling Facilities including Government Conservation Authorities.

  Quantity or (%) .... Sold to Private Ponds (stocking)

- Operation of a Fishing Preserve Total Revenue of $ .....

- Export Sales Total Revenue of $ .....

- Specialty Items (including smoked fish and other processed items) Total Revenue of $ .....

- Accounts Receivable (as of today) Total Amount $ .....

Item .....

Item .....

TOTAL OPERATING RECEIPTS (A) $ .....

Income From Sales of Capital Items*

- Brood Stock Quantity ..... Total Price $ ..... unit ( )

- Machinery, Equipment (New and Salvaged), Implements, Chemicals, Tanks, and Fishing Equipment etc. Total Amount $ .....

Item ..... Quantity ..... Value $ .....

Item ..... Quantity ..... Value $ .....

Item ..... Quantity ..... Value $ .....

- Consulting Services unit ( ) @ $ ..... Total Value $ .....

- Others

Item ..... Unit ( ) Total Value $ .....

Item ..... Unit ( ) Total Value $ .....

Item ..... Unit ( ) Total Value $ .....

TOTAL CAPITAL SALES (B) $ .....

TOTAL INCOME (A+B) $ .....

---

* not including transfer items

Cash Expenses

- Variable/"Physical"

- Yearly Expenses -

- Purchase of Seed-stock

Eggs Total $ ..... Quantity ..... Unit ( )

..... % own use

..... % for resale

Fry Total $ ..... Quantity ..... Unit ( )

..... % own use

..... % for resale

Fingerling Total $ ..... Quantity ..... Unit ( )

..... % own use

..... % for resale

Table Size Total $ ..... Quantity ..... Unit ( )

Large Broodstock
Total $ ..... Quantity ..... Unit ( )

..... % own use

..... % for resale

- Feed

Total Feed Cost $ .....

..... % starter

..... % grower

..... % finishing pigments for colour

- Labour

Skilled* Total $ .....

Unskilled Total $ .....

---

* skilled labour includes manager, owner, biologist, etc.

No. of seasonal employees ..... man years .....

No. of full-time employees ..... man years .....

Total man years per year .....

- Insurance

property	loans
vehicle	mortgage
fire	theft
partnership	professional
loss	others

Total Cost $ .....

- Repairs and Maintenance

property	pumping
vehicle	tanks
electrical	buildings
office equipment	others

Total Cost $ .....

- Transportation ..... miles/year Total Cost $ .....
- Veterinary, drugs and chemicals per year $ .....
- Administrative (telephone, typing, postage, shipping, photocopying etc. Total Cost $ .....
- Hydro ..... Heat ..... Total Cost $ .....
- Gas & Fuel Total Cost $ .....
- Operating Cost - spent on water quality analysis Total Cost $ .....

- <u>Variable/"Financial"</u>
  - Interest on Operating Loan $ .....
  - Financing Charges (interest on the loan to repay the previous loan) $ .....

- Bank Charges (chequing account statement etc.) $ .....

- Accounting Fees

legal	consulting
bookkeeping	others

Total $ .....

- Quasi Fixed (contracted etc.) "cost of doing business"

  - security systems Total $ .....
  - consulting Total $ .....
  - health regulations expenses (actual rather than perceived) $ value based on weight x $/lb. Total $ .....
  - advertising and promotional activities Total $ .....
  - membership, associations, clubs, professional organizations Total $ .....

- Fixed Costs

	Current $
- Taxes	
land	$ .....
income	$ .....
property	$ .....
municipal	$ .....
- licencing fees	$ .....
- producers co-op or	$ .....

TOTAL OPERATING EXPENSES (C) $ .....

Capital Expenditures

- Land

  A. Date purchased .....

  B. Acres purchased .....

  C. $/Acre .....

  D. Premium for water supply .....

- Farm Building Total Value $ .....

- Water System

  A. Source .....
  (Source could be artesian well, river, pumped well, spring water and others)

  B. Pumped ....% Not Pumped ....% Combination .....%

  C. Quantity of water used (new) GPM .....

  D. Cost of purchase and installation of pumps $ .....

  E. Total cost of water delivery system

     E_1 total cost if it is only gravity $ .....

     E_2 total cost if it is only pumped $ .....

     E_3 total cost if it is a combination of both $ .....

     E_4 total cost if it is only an artesian well $ .....

  F. Fish rearing facilities

     No. of ponds in which you currently rear fish .....

     Total cost $ .....

     Volume .....

     Year constructed .....

No. of tanks in which you currently rear fish .....

Total cost $ .....

Volume .....

Year constructed .....

No. of raceways in which you currently rear fish .....

Total cost $ .....

Volume .....

Year constructed .....

Total Cost $ .....

G. Water treatment - purification or recirculation
Total Cost $ .....

H. Other water holding facilities Total Cost $ .....

- Support Facilities

A. Office* Total Cost $ .....

B. Workshop* Total Cost $ .....

C. Freezer Storage

Volume .....

Size .....

Total Cost $ .....

D. Processing and Storage Facilities including smoker if any Total Cost $ .....

E. Electrical service for entire facility Total Cost $ .....

F. Back-up generator Capacity(KW) .....

Cost including installation $ .....

---

* These costs include items such as, wiring, plumbing, and sanitary facilities.

G. Vehicles

No. of .....

Type(s) .....

Size(s) .....

Year(s) .....

Cost per unit(s) .....

H. Tanks or trailers to transport live fish

tanks Total Cost $ .....

trailers Total Cost $ .....

I. Heat generators

human comfort water

Source .....

Cost $ .....

J. Aeration No. of Units ..... Total Cost $ .....

K. Feeding system

Demand Mechanical/Automatic Other

Type .....

Total Cost $ .....

L. Equipment for water quality control

oxygen meter

hach kit and/or equivalent equipment

temperature recorder

others

Total Cost $ .....

TOTAL CAPITAL EXPENSES (D) $ .....

Total Operating Expenses (C+D) $ .....

$ Interest Rate

OPERATING LOANS:

Total Annual Interest Payments	.....	.....
Total Annual Principal Payments	.....	.....

INTERMEDIATE-TERM LOANS:

Total Annual Interest Payments	.....	.....
Total Annual Principal Payments	.....	.....

LONG-TERM LOANS:

Total Annual Interest Payments	.....	.....
Total Annual Principal Payments	.....	.....

MORTGAGES:

Land - Total Annual Interest Payment	.....	.....
- Total Annual Principal Payment	.....	.....
Buildings - Total Annual Interest Payment	.....	.....
- Total Annual Principal Payment	.....	.....

SHORT-TERM SURVIVAL: (Cash Requirements)

Owner-Family Labour (Opportunity Cost)	.....

LONG-TERM SURVIVAL: (Asset Replacement)

Investment:	
Machinery and Equipment (Market Value $)	$ .....
Buildings and Structures (Market Value $)	$ .....
Maintenance Rates (%):	
Machinery and Equipment (%)	.....
Buildings and Structures (%)	.....
Depreciation Rates (%):	
Machinery and Equipment (%)	.....
Buildings and Structures (%)	.....

LIVING: (Opportunity Cost)

Expected Rate of Return to Management (%)	.....

GROWTH: (Opportunity Cost)

Expected Rate of Return to Equity (%)	.....

"Physical"

- Total Fish Inventory Losses % of annual production .....

  $ of annual production .....

  death % .....

  theft % .....

  unknown % .....

  predation % .....

  culling % .....

  estimation Error % .....

- Processing spoilage % of annual production .....

  $ of annual production $ .....

- Total Non-fish Inventory Losses
  Including equipment damage $ .....

"Financial"

- Penalties Total $ .....

Questionnaire

1. Which of the following four categories do you think you belong to?

   Full time fish farmer

   Part time fish farmer

   Hobby fish farmer

   Limited resource fish farmer

2. When did you start as a Fish Farmer? .....

3. How much money did you invest initially? .....

4. How much is your investment worth today? .....

5. What species do you produce? .....

6. Do you have any plans to expand and/or start producing other species? .....

7. Is the existing farm your major source of income? .....

8. How much do you produce annually? (lbs. or Kg.) .....

9. What is you age? .....

10. In your opinion which of the following factors are detrimental to the growth of your enterprise? Please rank.

    Lack of (marketing, investment) commercially oriented research and development.

    Limited sources of suitable water

    High interest rate

    Increased cost of production in concert with low price

    Availability of low-priced foreign products

    Price undercutting by Canadian competitors

    What would be the best way for the Government to assist development of your business or the industry in general? Please comment.

    .....

    .....

    .....

APPENDIX II

Electronic Spreadsheet System
for
Fish Farm Management

FARM FINANCIAL PLANNING & CONTROL SYSTEM

=A,F,J,P,V,AB DATA INPUT - SECTION 1 - ENTERPRISE DATA

AQUACULTURE ENTERPRISE

:RESET CODE =	.00	.00
INCOME DATA:	CURRENT	PREVIOUS
CASH INCOME:	--	--
	--	--
Eggs	.00	.00
Fry (0-5cm)	.00	.00
Fingerlings (5-20cm)	.00	.00
Table size fish	.00	.00
Operation of a Fish Reserve	.00	.00
Export sales	.00	.00
Specialty items	.00	.00
Misc. farm income	.00	.00
	--	--
INCOME FROM SALE CAPITAL ITEMS:	--	--
	--	--
Brood Stock	.00	.00
Machinery & Equipment	.00	.00
Consulting Services	.00	.00
Real Estate	.00	.00
Miscellaneous	.00	.00
	--	--
EXPENSE DATA:	--	--
	--	--
CASH EXPENSES:	--	--
	--	--
Hired Labour (full time)	.00	.00
Hired Labour (part time)	.00	.00
	--	--
Purchased Feeds	.00	.00
Purchased Seed Stock	.00	.00
Other Expenses	.00	.00
	--	--
Veterinary	.00	.00
Drugs & Chemicals	.00	.00
Water Quality Expenses	.00	.00
Other	.00	.00
	--	--
Custom Machinery Hire	.00	.00
Automobile (farm share)	.00	.00
Truck	.00	.00
Freight & Hauling	.00	.00
Fuel-Oil (heating,gasoline,lube)	.00	.00
Machinery & Equipment Repairs	.00	.00
Buildings & Structures Mt'nce.	.00	.00
Admin. Costs (Secty,phone,etc.)	.00	.00
	--	--
Taxes (real estate)	.00	.00
Taxes (income tax)	.00	.00
	--	--
Insurance	.00	.00
Rents & Leases	.00	.00
	--	--

FARM FINANCIAL PLANNING & CONTROL SYSTEM

=A,F,J,P,V,AB DATA INPUT - SECTION 2 - FINANCE & INVENTORY

AQUACULTURE ENTERPRISE

	CURRENT	PREVIOUS
ASSETS:		
CURRENT:		
Cash on Hand	.00	.00
Bank Deposits	.00	.00
Other	.00	.00
INTERMEDIATE:	--	--
Brood Stock	.00	.00
Machinery & Equipment	.00	.00
Other	.00	.00
FIXED:	--	--
Land & Improvements	.00	.00
Buildings & Support Facilities	.00	.00
Water System	.00	.00
LIABILITIES:	--	--
OPERATING LOANS:	--	--
Total Annual Interest Payments	.00	.00
Total Annual Principal Payments	.00	.00
INTERMEDIATE-TERM LOANS:	--	--
Total Annual Interest Payments	.00	.00
Total Annual Principal Payments	.00	.00
Total Principal Outstanding	.00	.00
LONG-TERM LOANS:	--	--
Total Annual Interest Payments	.00	.00
Total Annual Principal Payments	.00	.00
Total Principal Outstanding	.00	.00
MORTGAGES:	--	--
Buildings:	--	--
Total Annual Interest Payments	.00	.00
Total Annual Principal Payments	.00	.00
Total Principal Outstanding	.00	.00
Land:	--	--
Total Annual Interest Payments	.00	.00
Total Annual Principal Payments	.00	.00
Total Annual Principal Payments	.00	.00
RECEIVABLES & PAYABLES:	--	--
Accounts Receivable(End-Beginning)	.00	.00
Accounts Payable(current)	.00	.00
INVENTORIES (value):	--	--
Fry (0-5cm) (Beginning)	.00	.00
Fry (0-8cm) (Ending)	.00	.00
Fingerlings (Beginning)	.00	.00
Fingerlings (Ending)	.00	.00
Table Size Fish (Beginning)	.00	.00
Table Size Fish (Ending)	.00	.00
Farm Supplies (Beginning)	.00	.00
Farm Supplies (Ending)	.00	.00
BUSINESS REQUIREMENTS:	--	--
SHORT-TERM SURVIVAL: (Cash Requirement)	--	--
Owner-Family Labour (Opportunity Cost)	.00	.00
LONG-TERM SURVIVAL: (Asset Replacement).	--	--
Investment:	--	--
Machinery & Equipment (Mkt. Value $)	.00	.00
Buildings & Structures (Mkt. Value $)	.00	.00
Maintenance Rates (%):	--	--
Machinery & Equipment (%)	.00	.00
Buildings & Structures (%)	.00	.00
Depreciation Rates (%):	--	--
Machinery & Equipment (%)	.00	.00
Buildings & Structures (%)	.00	.00
LIVING: (Opportunity Cost)	--	--
Expected Rate of Return to Manag'mt (%)	.00	.00
GROWTH: (Opportunity Cost)	--	--
Expected Rate of Return to Equity (%)	.00	.00

FARM FINANCIAL PLANNING & CONTROL SYSTEM

=A,F,J,P,V,AB

INCOME STATEMENT

AQUACULTURE ENTERPRISE

	CURRENT	PREVIOUS	CHANGE (C-P)	(%)
CASH INCOME:				
Eggs	.00	.00	.00	.00
Fry (0-5cm)	.00	.00	.00	.00
Fingerlings (5-20cm)	.00	.00	.00	.00
Table size fish	.00	.00	.00	.00
Operation of a Fish Reserve	.00	.00	.00	.00
Export sales	.00	.00	.00	.00
Specialty items	.00	.00	.00	.00
Misc. farm income	.00	.00	.00	.00
INCOME from SALE CAPITAL ITEMS:				
Brood Stock	.00	.00	.00	.00
Machinery & Equipment	.00	.00	.00	.00
Consulting Services	.00	.00	.00	.00
Real Estate	.00	.00	.00	.00
Miscellaneous	.00	.00	.00	.00
TOTAL FARM CASH SALES	.00	.00	.00	.00
Plus: Accts.Rec.,closing	.00	.00	.00	.00
TOTAL FARM SALES	.00	.00	.00	.00
Plus: Inventory change (End-Beg)				
Fry (0-5cm) (E-B)	.00	.00	.00	.00
Fingerlings (E-B)	.00	.00	.00	.00
Table Size Fish (E-B)	.00	.00	.00	.00
Farm Supplies (E-B)	.00	.00	.00	.00
GROSS FARM INCOME	.00	.00	.00	.00
CASH EXPENSES:				
Hired Labour (full time)	.00	.00	.00	.00
Hired Labour (part time)	.00	.00	.00	.00
Purchased Feeds	.00	.00	.00	.00
Purchased Seed Stock	.00	.00	.00	.00
Other Expenses	.00	.00	.00	.00
Veterinary	.00	.00	.00	.00
Drugs & Chemicals	.00	.00	.00	.00
Water Quality Expenses	.00	.00	.00	.00
Other	.00	.00	.00	.00
Custom Machinery Hire	.00	.00	.00	.00
Automobile (farm share)	.00	.00	.00	.00
Truck	.00	.00	.00	.00
Freight & Hauling	.00	.00	.00	.00
Fuel-Oil (heating,gasoline,lube)	.00	.00	.00	.00
Machinery & Equipment Repairs	.00	.00	.00	.00
Buildings & Structures Mt'nce.	.00	.00	.00	.00
Admin. Costs (Secty,phone,etc.)	.00	.00	.00	.00
Taxes (real estate)	.00	.00	.00	.00
Taxes (income tax)	.00	.00	.00	.00
Insurance	.00	.00	.00	.00
Rents & Leases	.00	.00	.00	.00
Interest	.00	.00	.00	.00
DEPRECIATION:				
Machinery & Equipment	.00	.00	.00	.00
Buildings & Structures	.00	.00	.00	.00
NON-CASH ADJUSTMENTS:				
Value of Owner-Family Labour	.00	.00	.00	.00
Accounts Payable	.00	.00	.00	.00
TOTAL FARM EXPENSES	.00	.00	.00	.00
NET FARM INCOME	.00	.00	.00	.00

FARM FINANCIAL PLANNING & CONTROL SYSTEM

=A,F,J,P,V,AB

BALANCE SHEET

AQUACULTURE ENTERPRISE

	CURRENT	PREVIOUS	CHANGE (C-P)	(%)
ASSETS:				
Current:				
Cash on hand	.00	.00	.00	.00
Bank deposits	.00	.00	.00	.00
Accounts Receivable	.00	.00	.00	.00
Ending Inventory:				
Fry (0-5cm)	.00	.00	.00	.00
Fingerlings	.00	.00	.00	.00
Table Size Fish	.00	.00	.00	.00
Farm supplies	.00	.00	.00	.00
Other current assets	.00	.00	.00	.00
TOTAL CURRENT ASSETS	.00	.00	.00	.00
Intermediate:				
Brood stock	.00	.00	.00	.00
Machinery & Equipment	.00	.00	.00	.00
Other intermediate assets	.00	.00	.00	.00
TOTAL INTERMEDIATE ASSETS	.00	.00	.00	.00
Fixed:				
Buildings & Facilities	.00	.00	.00	.00
Land & Improvements	.00	.00	.00	.00
Water System	.00	.00	.00	.00
TOTAL FIXED ASSETS	.00	.00	.00	.00
TOTAL FARM ASSETS	.00	.00	.00	.00
LIABILITIES:				
Current: (<1 yr.)				
Operating loans payable	.00	.00	.00	.00
Accounts payable	.00	.00	.00	.00
Rent payable	.00	.00	.00	.00
Taxes payable	.00	.00	.00	.00
Interest Payable	.00	.00	.00	.00
Plus: Principal payments	--	--	--	--
due within 1 year on	--	--	--	--
a) IT loans (1-10 yrs.)	.00	.00	.00	.00
b) LT loans (>10 yrs.)	.00	.00	.00	.00
TOTAL CURRENT LIABILITIES	.00	.00	.00	.00
Intermediate: (1-10 yrs.)				
IT loans payable (balance)	.00	.00	.00	.00
Less: Principal payments	--	--	--	--
due within 1 year on	--	--	--	--
IT loans	.00	.00	.00	.00
TOT. INTERMED. LIABILITIES	.00	.00	.00	.00
Long Term: (>10 yrs.)				
Bldg. Mortgages (balance)	.00	.00	.00	.00
Land Mortgages (balance)	.00	.00	.00	.00
Other LT loans (balance)	.00	.00	.00	.00
Less: Principal payments	--	--	--	--
due within 1 year on	--	--	--	--
LT loans & Mortgages	.00	.00	.00	.00
TOTAL L. TERM LIABILITIES	.00	.00	.00	.00
TOTAL FARM LIABILITIES	.00	.00	.00	.00
TOTAL OWNER'S EQUITY	.00	.00	.00	.00
TOTAL LIABILITY & EQUITY	.00	.00	.00	.00
			.00	

FARM FINANCIAL PLANNING & CONTROL SYSTEM

=A,F,J,P,V,AB

FINANCIAL RATIOS

AQUACULTURE ENTERPRISE	CURRENT	PREVIOUS	CHANGE (C-P)	CHANGE (%)
PROFITABILITY:				
1. PERCENT RETURN TO ASSETS (%) (Net Farm Income + Interest) / (Total Farm Assets) =	.00	.00	.00	--
2. PERCENT RETURN TO EQUITY (%) (Net Farm Income) / (Equity) =	.00	.00	.00	--
EFFICIENCY:				
3. CAPITAL TURNOVER (years) (Total Farm Assets) / (Gross Farm Income) =	.00	.00	.00	.00
4. OPERATIONAL EFFICIENCIES (%)				
a. (Total Purchases - Interest) / (Gross Farm Income) =	.00	.00	.00	--
b. (Interest) / (Gross Farm Income) =	.00	.00	.00	--
c. (Depreciation) / (Gross Farm Income) =	.00	.00	.00	--
d. COST CONTROL (%) (Net Farm Income) / (Gross Farm Income) =	.00	.00	.00	--
LIQUIDITY:				
5. CURRENT RATIO (Current Assets) / (Current Liabilities) =	.00	.00	.00	.00
6. DEBT STRUCTURE RATIO (%) (Current Liabilities) / (Total Liabilities) =	.00	.00	.00	--
SOLVENCY:				
7. DEBT:ASSET RATIO (Total Farm Liabilities) / (Total Farm Assets) =	.00	.00	.00	.00
8. DEBT:EQUITY (leverage) RATIO (Total Farm Liabilities) / (Owner's Equity) =	.00	.00	.00	.00