

AN EVALUATION OF THE SOUTHERN INDIAN
LAKE COMMERCIAL FISHERMANS ASSOCIATION
SUBSIDY PROGRAM

by

Michael Thornton

A Practicum Submitted in
Partial Fulfillment of the Requirements
for the Degree
Master of Natural Resources Management

Natural Resources Institute
The University of Manitoba
Winnipeg, Manitoba, Canada
July, 1986

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ISBN 0-315-44126-7

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ABSTRACT

In February 1984 the Southern Indian Lake Commercial Fishermans Association (SILCFA) received a \$2.525 million settlement from Manitoba Hydro as full and final compensation for damages arising from the impoundment of Southern Indian Lake in 1976. The capital fund created from the settlement and interest revenues received thereon have been used to compensate Southern Indian Lake fishermen for the increased costs of fishing outlying lakes as well as to subsidize revenue lost due to the impairment of the Southern Indian Lake fishery resource.

The conditions and amounts of the subsidy have been established by the SILCFA through an ad hoc approach. Such an approach has failed to incorporate benefits which may be gained through a longer term plan.

The balance of the capital fund at June 1, 1986 was approximately \$1.72 million. An analysis was undertaken applying a range of interest rate, annual production and subsidy rate values to the capital fund. All combinations of values selected resulted in depleting annual balances. The mean number of years required to completely exhaust the fund was approximately eight years.

The subsidy rates applied to the Southern Indian Lake (\$.484/kg.) and outlying lakes (\$.836/kg.) allowed for aggregate long run economic viability based on 1985 costs and revenues. The sample of Southern Indian Lake enterprises, however, was characterized by a high proportion of enterprises achieving relatively low levels of production. Only twelve (12) of twenty-eight (28) sampled enterprises achieved long run economic viability. These enterprises were generally found in the higher production intervals. Only five enterprises would have achieved viability in the absence of the SILCFA subsidy. The relatively large subsidy rate applied to outlying lake production allowed for twenty-nine (29) of thirty-four (34) lakes to achieve long run viability. Without the inclusion of the SILCFA subsidy only two lakes would have achieved this status.

In May, 1986 the SILCFA membership voted to adopt the terms and conditions of a new subsidy program. The 1986 program establishes, for the first time, that total expenditures on subsidy be predetermined and limited to the expected annual interest revenues received on the capital

fund. Southern Indian Lake production will receive a rate of \$.38/kg. to a maximum of 181,416 kgs. while outlying lakes production will receive an average of \$.53/kg. to a maximum of 113,379 kgs.

The research considered the ramifications of the 1986 program by examining the impact the program would have had on the sampled enterprises and outlying lakes production of 1985. The Southern Indian Lake sample was found to be, on aggregate, unviable. The 1986 program's conditions had lesser impact on the viability of individual enterprises as ten (10) of the twelve (12) enterprises found to be viable during 1985 remained so. These enterprises were again generally concentrated in the higher production intervals. The outlying lakes fishery was also found to be, on aggregate, unviable. Seven of the twenty-nine (29) lakes found to be viable during 1985 retained this status under the conditions of the 1986 program.

Lastly the research considered two alternatives to past subsidy programs. The first approach examined the impacts of a "viability alternative". Under such a program subsidy would be extended only to those enterprises achieving a minimum production requirement and to outlying lake production exhibiting viable operating margins. The second alternative promoted an "income distribution" objective by extending subsidy to enterprises and outlying lake production otherwise unviable.

ACKNOWLEDGEMENTS

I extend my appreciation to the members of my committee; Dr. Dennis Cauvin (Fisheries and Oceans), Prof. Thomas Henley (Natural Resources Institute), Prof. David Young (Natural Resources Institute) and Mr. Wayne Wysocki (Fisheries Branch). The need for this study was first perceived by Mr. Wysocki.

Mr. Donald Cook (Department of Natural Resources) was most helpful in extending technical support over the course of the field work. Mr. Rick Hay (Freshwater Fish Marketing Corporation) also provided valuable assistance. Much of the data in the report was made available by permission of the Southern Indian Lake Commercial Fishermans Association and I am grateful for this courtesy. I would also like to thank Mr. Mark Miles of The Pas, Manitoba for his generous assistance extended to me while in The Pas.

Funding for the field work and report writing was provided by grants from the Fisheries Branch and the Natural Resources Institute.

Sincere appreciation is given to the faculty and staff of the Natural Resources Institute.

Lastly, I would like to thank my parents and family for their encouragement, assistance and support over the course of my education.

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Chapter I

BACKGROUND AND PROBLEM STATEMENT

1.1 INTRODUCTION

In the summer of 1976, as part of the Churchill River Diversion and Nelson River Hydroelectric Development, Manitoba Hydro flooded Southern Indian Lake. The impoundment had socio-economic and environmental impacts on the community of South Indian Lake and its traditional resource base. The fishery resource, in particular, was affected by a reduction in the quality of the fish caught and by an increase in the effort required to to catch a given quantity of fish (Bodaly et al, 1980).

Economic returns to the fishermen decreased in the years following the impoundment. Wagner (1981) demonstrated a reduction in the total catch by weight of over 13% for the period 1976 to 1980. This loss was, until recently, mitigated by Manitoba Hydro through the Commercial Fisherman's Assistance Program.

In February, 1984, the Commercial Fisherman's Assistance Program ended as the Southern Indian Lake Commercial Fisherman's Association (SILCFA) agreed to a \$2.525 million settlement as "full, final and complete compensation for all

past present and future loss of and damage to the Southern Indian Lake fishery alleged to have been caused by or resulting from the diversion and impoundment." In return the fishermen, individually and as an association, agreed to release Manitoba Hydro from any future action, regardless of future changes in water and fishery quality, so long as Hydro did not intentionally vary the current water level by more than three feet (.923 m) in either direction (Northern Flood Agreement, Claim 42, Final Order, 1984).

The final order awarding damages to the the SILCFA outlined the ongoing fisheries management role of the provincial government as a party to the Northern Flood Agreement.

...[the] Province of Manitoba [will continue] in its management of the Southern Indian Lake commercial fishery and in its monitoring of the development of the Southern Indian Lake fishery with a view to protecting the interests of commercial fishermen upon Southern Indian Lake. (Northern Flood Agreement, Claim 42)

Under Article 19.4 of the Northern Flood Agreement the Province of Manitoba has a continuing obligation to develop fisheries programs in flood affected areas which will enhance the resource and all dimensions of resource use (Harvey, 1983).

A necessary first step for the province in meeting these obligations is the development of a long term management plan which incorporates the economic, social and cultural

needs of the fishermen. An intrigal part of such a plan will be the use and administration of the \$2.525 million compensation settlement.

1.2 SOUTHERN INDIAN LAKE COMMERCIAL FISHERY

The Southern Indian Lake Commercial Fisherman's Association is a duly incorporated organization under the laws of the Province of Manitoba. Its objective is the advancement of the interests of the commercial fishermen. At present there are 122 members. In addition approximately 30 hired non-member fishermen are active within the fishery. The association recommends to the Provincial Government's Department of Natural Resources Fisheries Branch the allocation of commercial fishing licences for Southern Indian Lake and an additional number of outlying lakes (Figure 1)

Commercial fishing is the single most important economic activity in the community of South Indian Lake (Department of Northern Affairs, 1983). In 1985 the total quota for the summer fishery was 419,600 kg.(Table 1). During the 1985 summer season 59% (247,814 kg) of the quota was harvested. Since 1980 57% of the combined Southern Indian and outlying lakes production occurred on Southern Indian Lake while the outlying lakes received less constant effort. This was due, in part, to the higher costs associated with moving men and equipment into and fish out of the outlying lakes. Recent

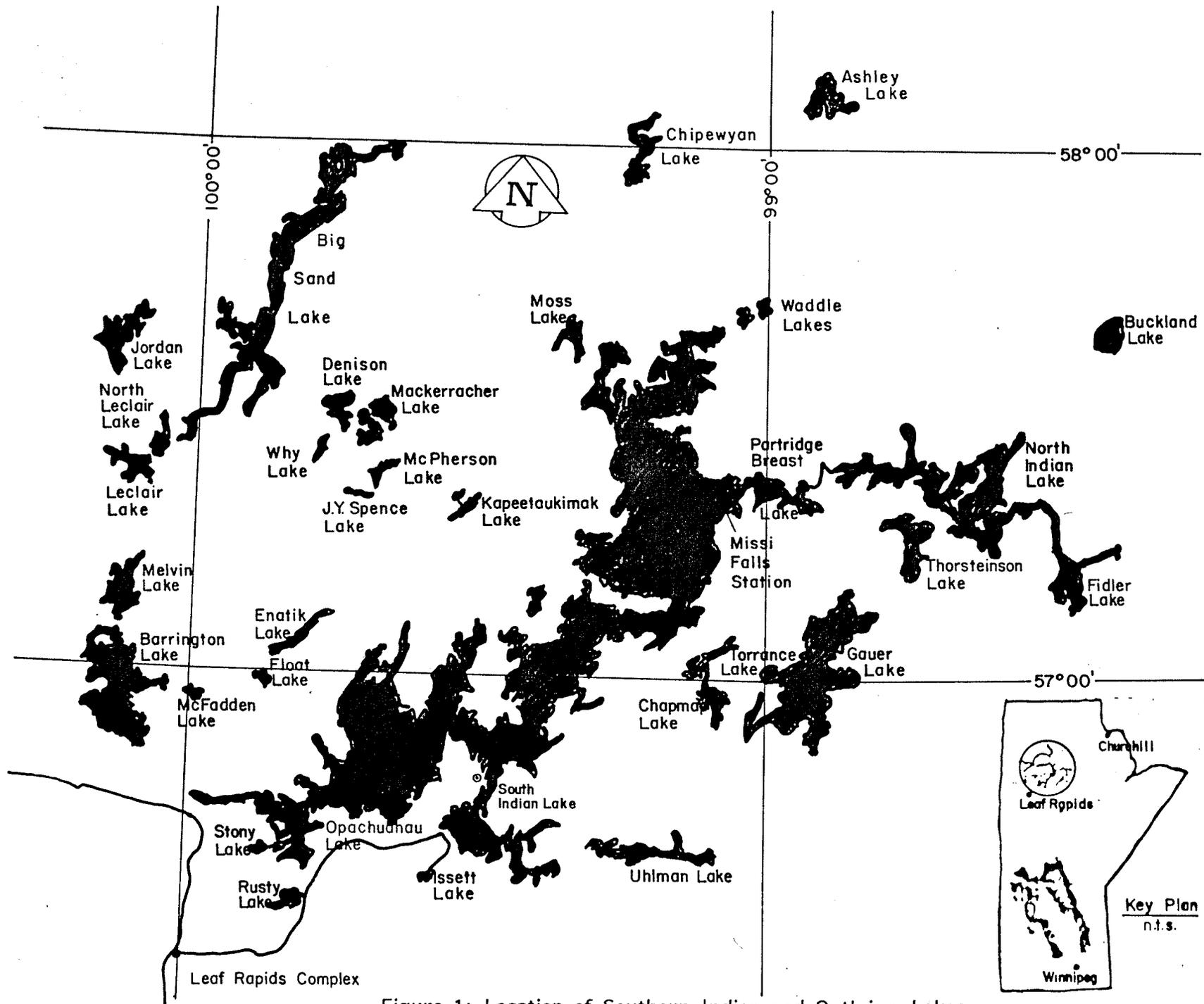


Figure 1: Location of Southern Indian and Outlying Lakes

TABLE 1

Southern Indian and outlying lakes production: 1980 - 1985

	Southern Indian Lake	Outlying Lakes
1980	363,592	250,562
1981	342,627	122,979
1982	157,212	196,659
1983	181,144	151,717
1984	253,798	162,407
1985	247,814	258,995

subsidization of outlying lakes, beginning in 1983 and increased in 1985, however, has led to a relative increase in fishing effort and in 1985 258,995 kgs. were produced from thirty-four (34) outlying lakes (Fisheries Branch records).

1.3 PROBLEM STATEMENT

The intent of the compensation, as negotiated under Claim 42 of the Northern Flood Agreement is "to augment and to maintain the fishery, and the income of the monies will be used to subsidize the ongoing fishery" (MacIver D.N., quoted

from the Northern Flood Agreement, Claim Number 42 Final Order hearing, 1984). It was further implied that the objectives of the SILCFA, in terms of the allocation of the funds, would be both to compensate members for increased costs associated with fishing the outlying lakes and, as well, to subsidize revenue lost due to the impairment of the Southern Indian Lake fishery resource (Northern Flood Agreement, Claim 42, Final Order Hearing, 1984).

The conditions and amounts of the subsidy programs are established by the SILCFA through an ad hoc approach (D.Cook, pers.comm). While such an approach may satisfy short term criteria it does not incorporate the possible benefits which may be gained through a long term plan. Nor does such an approach ensure the optimal use and condition of the resource or the capital fund by present or future generations.

The SILCFA requires a "best use" strategy for the allocation of funds received under the Manitoba Hydro settlement. An evaluation of the various aspects of the fishery will provide an initial first step towards the development of a decision making framework for the future use of compensation funds.

Note: The SILCFA have, to date, allocated the compensation funds amongst its membership on a volumetric basis. Throughout this report this allocation is referred to as a subsidy. This usage is consistent with the definition of a subsidy as "a direct pecuniary aid" and should not be confused with a government program or policy intended to achieve social objectives.

1.4 RESEARCH OBJECTIVES

In order to develop a strategy for the allocation of subsidy funds the research addresses four specific objectives. They are;

1. to project possible future states of the SILCFA capital fund based on past, present and likely future interest rates, subsidization rates and the amount of production on which subsidy is paid
2. an economic evaluation of the primary harvesting sector of Southern Indian Lake
3. an indexation of outlying lakes based on economic viability
4. and a presentation of alternative strategies, based on the findings of the first four objectives, to the SILCFA.

1.5 OUTLINE OF STUDY

The initial phase of the study is a review of the literature related to fisheries management. The review includes discussion on the objectives and strategies of fisheries management as well as an examination of the common property nature of the resource.

The second phase of the research is a projection of possible future states of the SILCFA capital fund. The research considers the variables of interest rates, subsidy

rates and the amount of production on which subsidy is paid in order to determine their impact on the fund.

The third stage of the research is an economic evaluation of the primary harvesting sector of the Southern Indian Lake fishery. This evaluation is carried out through the use of a capital budgeting model.

Fourthly, the outlying lakes currently fished by members of the SILCFA are indexed according to their economic viability. The index is based on the revenue generated by various product mixes (i.e. whitefish, walleye, pike, etc.) and the higher costs associated with transporting the fish to delivery points.

The final stage of the study is an integration and assessment of the results of the research. The options for alternative strategies for the use of subsidy funds are based on the state of the current program, the results of the economic evaluation of the Southern Indian Lake fishery and the indexation of outlying lakes, and possible objectives of the SILCFA.

Chapter II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

Commercial fisheries management consists of two components; the development of objectives and the implementation of strategies designed to achieve them. Since its modern inception in the 1930's fisheries management has continually evolved in terms of both strategies and objectives. This evolution has been driven by biological, social and economic forces acting within and upon the fisheries, as well as an increased understanding and sophistication in dealing with the resource. The following review will trace the development of fisheries resource management.

2.2 OBJECTIVES OF COMMERCIAL FISHERIES MANAGEMENT

The primary objective of the Province of Manitoba's Fisheries Branch is to implement and maintain a management regime "that will result in the greatest long term benefit to Manitobans and ensure survival or improvement of fish stocks" (Fisheries Branch, 1981). Such an ideal is complicated by the fact that objectives of various interest

and user groups often conflict (i.e. short term profit maximization and fish stock conservation).

In response to increasingly complex problems, managers have developed, over time, objectives that have attempted to reflect and deal with these concerns. The early fisheries management objectives dealt with over-fishing and the associated depletion of fish stocks and as such it was almost exclusively biological in scope. Later objectives introduced economic and social considerations.

2.2.1 Maximum Sustained Yield

Maximum Sustained (or Sustainable) Yield (MSY) is the maximum yield of a distinct fish stock that can be obtained over an indefinite period of time. A fish stock is defined as a resource management unit and is, ideally, an interbreeding group (Royce, 1975). If actual yield is less than the maximum the food value of the resource can be increased by increasing fishing effort and hence yield. Catches in excess of the MSY impair biological recruitment to the stock and result in diminishing future yields (Ricker, 1958).

The MSY theory rests on a compensatory mechanism inherent in fish stocks. The mechanism operates on the fact that environmental conditions and biotic capacity exert a much greater influence on recruitment to the stock (the survival

rate of egg and larvae stages) than does the actual number of spawning fish (Troadec, 1983). As such a biological surplus is available for harvest and the continual annual capture of this group would not theoretically endanger the reproductive capacity of the stock (Roedel, 1975).

Sustainable yields for existing commercial fisheries can be determined through the analysis of historic fishing effort and yield data. Fishing effort is a composite index of all factors employed in realizing a catch but is usually expressed in standard values such as the amount of net set over a specified time period. Yield is the summation of the catches of the individual enterprises exploiting the same stock over the same time period (Panayotou, 1982).

Yield curves assume sigmoid (Graham, 1948), parabolic (Schaefer, 1954) or eumetric shapes (Beverton and Holt, 1957). Generally speaking these curves all belong to the "bell-shaped family" and for purposes of illustration and discussion the simplest of these, the parabolic, is selected for representation (Figure 2) At lower effort levels aggregate catch is also low but increases with effort. Beyond the inflection point of the sustainable yield curve the increase in yield is not proportionate to the increase in fishing effort (i.e. the marginal unit increase in effort does not return a corresponding unit increase in yield). At a certain point (Point M) a further increase in total effort will result in no further increase in yield. This is the

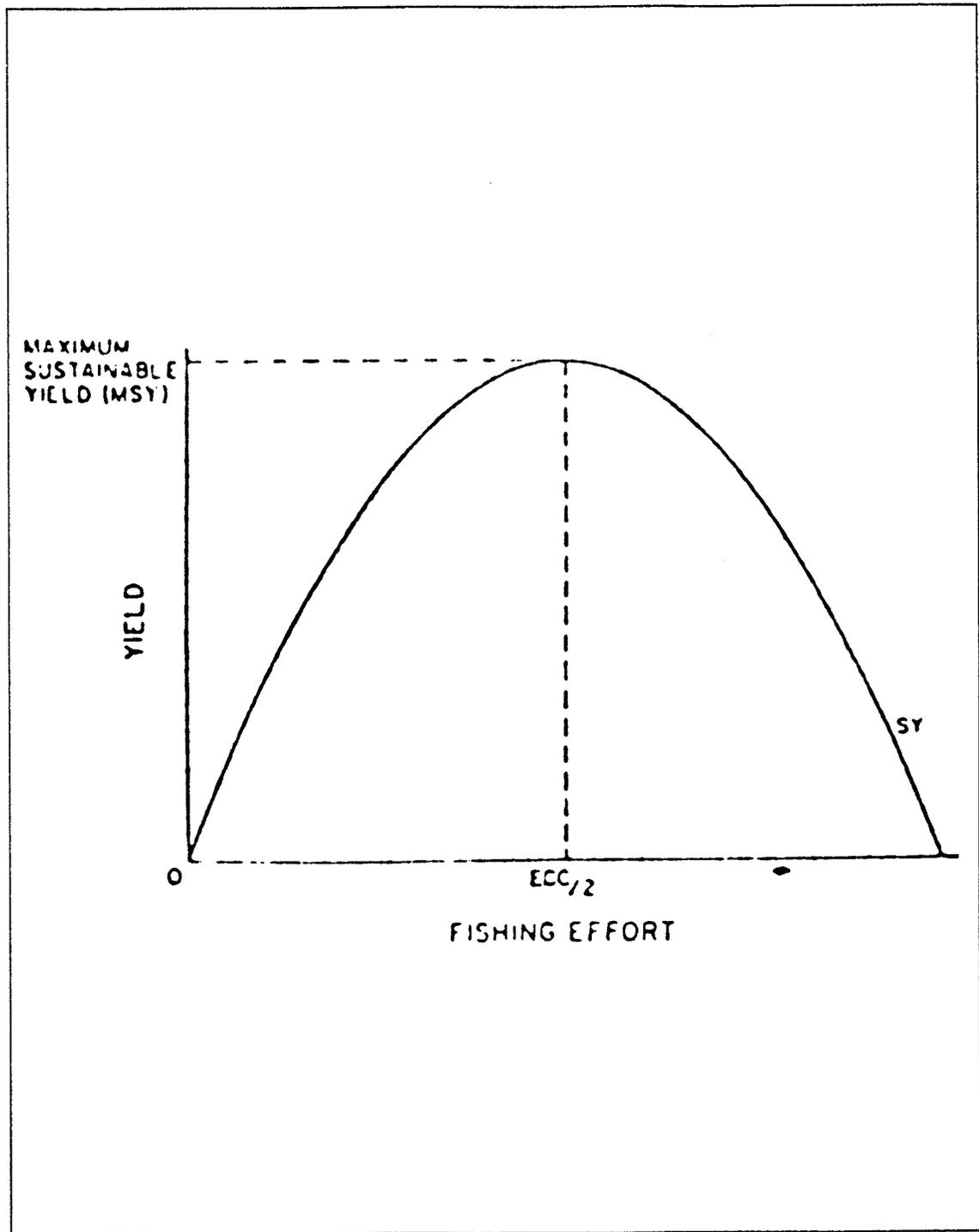


Figure 2: Maximum Sustainable Yield
After Cunningham and Whitemarsh, 1981.

point of MSY. Fishing efforts expended beyond this point will result in continually diminishing aggregate catches (Royce, 1973).

The MSY concept came under criticism during the 1970's (Wallace 1975). These criticisms can be grouped into two categories; firstly the biological shortcomings of the model and, secondly, the economic considerations that the model fails to incorporate.

Biologically the MSY model does not accurately reflect the natural complexities found in actual fisheries. Large and unpredictable population variations, especially amongst multispecies fisheries stocks, render the term "sustainable" somewhat less meaningful (Grima and Allison, 1983). Adasiak (1979) also noted that the model was based on a "romance of continuity" between effort and yield relationships whereas in fact there exists a discontinuity in this relationship that can lead to the collapse of some fish stocks should effort expand beyond a certain point.

Fisheries economists objected to the MSY concept on other grounds. Clark (1976) and Panayotou (1983) consider the concept as incomplete in that it ignores the value of the catch and the the costs of fishing and, therefore, is unsuitable for prescriptive management applications.

While MSY provides a "valuable rough index of production potential and is acceptable as a first rough cut at

management policy" (Larkin 1977) it has largely been eclipsed as a singular management objective because of the realization that modern fisheries management requires a greater degree of sophistication in dealing with the biological dynamics of fisheries and, as well, a greater cognizance of the social and economic aspects of the fishery resource.

2.2.2 Maximum Economic Yield

Given information regarding the economic costs of achieving various levels of harvest and assuming that the market mechanism, through the relative prices of inputs and outputs reflect social values accurately, it is possible to manage a fishery so as to achieve a maximum economic yield (MEY) (Crutchfield, 1975).

MEY (Figure 2) occurs at the point where the marginal revenue curve intersects the marginal cost line (Figure 3, Panel B). Marginal costs are assumed to be constant over all levels of effort. If marginal revenue is greater than marginal cost an increase in effort would increase total revenues more than total costs (Figure 3, Panel A). Conversely effort applied at levels greater than MEY increase costs more so than revenues.

MEY occurs at the level of harvest which maximizes resource rents - the difference between total costs and

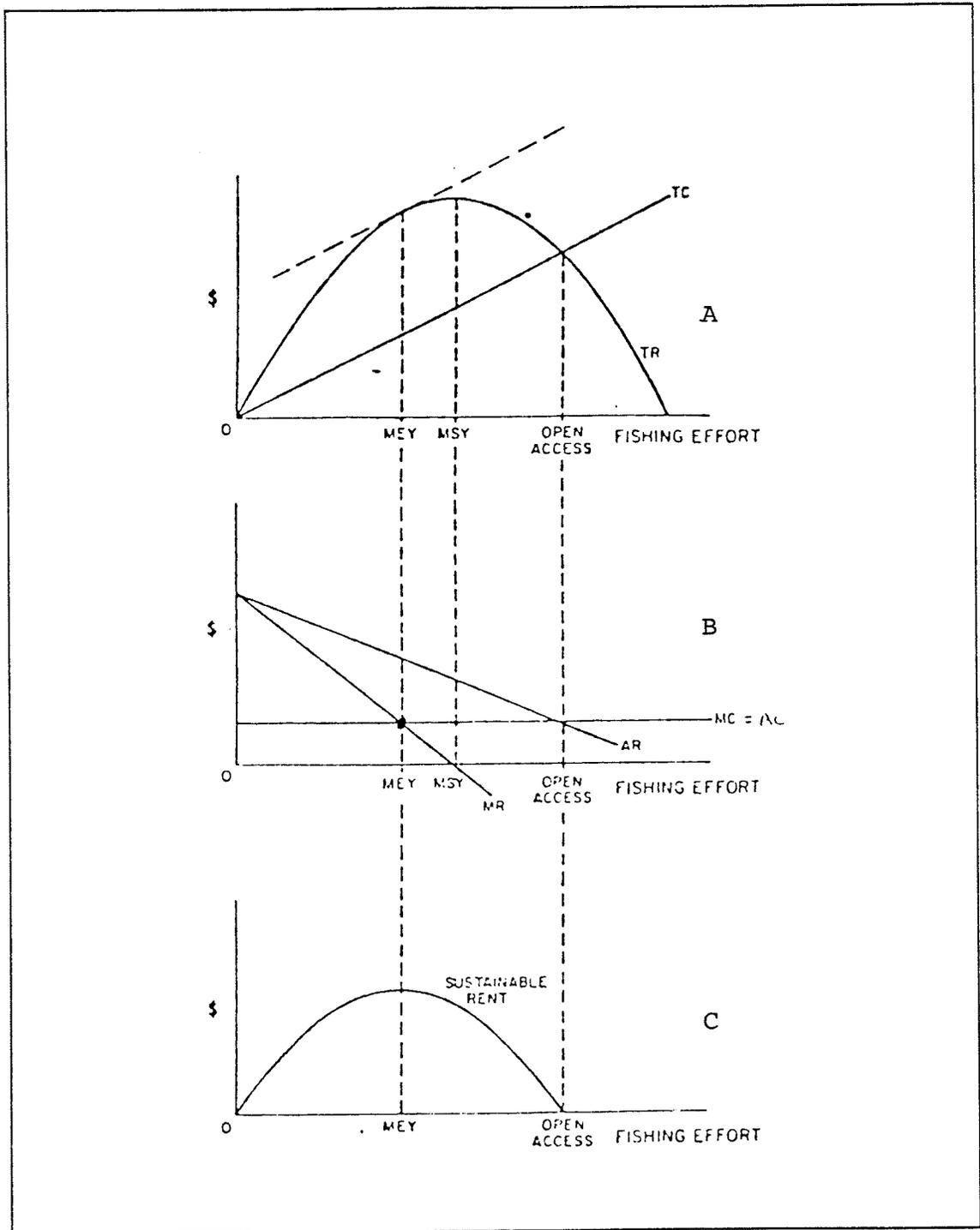


Figure 3: Maximum Economic Yield
 After Cunningham and Whitemarsh, 1981.

total revenues (Figure 3, Panel C). Resource rent is the surplus generated by the resource after all costs of production are met. In that MEY occurs at a point to the left of MSY (i.e. at a level of less fishing effort) it would be exclusively appropriate as a management objective void of social and political considerations in that as well as maximizing net economic benefits it also reduces the risk of the negative ecological impacts associated with overfishing. The level of effort required to achieve a MEY has been estimated to be approximately one-half that of open access (Cunningham and Whitemarsh, 1981).

2.2.3 Optimum Sustained Yield

As support for the MSY concept as a fisheries management objective waned during the 1970's the concept of an Optimum Sustained Yield (OSY) was put forward. It attempted to meld economic, social and political values with biological objectives so as to produce a maximum benefit to society (Roedel, 1975).

In that economic, social and political value differ amongst individuals, as well as over time, the manifestation of these values in fishery resource policy objectives is likely to differ, through interpretation (Larkin, 1977), and over time and jurisdiction (Royce, 1975). As such, optimum yields are likely to vary according to alternative and often inexorable sub-objectives within the fishery. Grima and Allison (1983) identify five (5) such objectives. They are:

1. profit maximization
2. resource conservation
3. nutritional value
4. recreational value and
5. societal structure - i.e. the maintenance of communities and traditional life styles.

In that the simultaneous maximization of more than one objective is impossible (Von Neumann and Morgenstern, 1947) the development of a single optimum yield objective is also impossible (Larkin, 1977). While OSY is, therefore, an abstraction and of limited value in policy formulation it has served to acknowledge the human aspect of the fishery resource. By acknowledging that fishery resources are managed for the greater benefit of society, the social costs and benefits of fishery uses, of which economics is an important subset, must be determined in order that the resource be effectively managed.

By assuming that the amount of effort applied to a fishery is related to the number of fishermen, two polar, and highly, generalized management objectives emerge. Firstly a "distributional objective" in which the employment and income benefits of the resource are divided amongst the greatest number of fishermen while, at the same time, the biological viability of the fishery is maintained. This would imply an effort at or near MSY. A second, alternative, objective is that of "economic efficiency". This would

result in a lower effort (i.e. less fishermen) than the distributional objective and would maximize instead the rent available in the resource. Gislason et al (1982) found that stated Manitoba government policy and objectives, deduced from ongoing initiatives, emphasized the distributional objectives more so than the efficiency objectives.

2.3 THE COMMONS: FEATURES AND REGULATIONS

The previous sections has examined the objectives of fisheries management. These objectives have evolved and developed over time in response to internal and external forces acting within and upon the fishery. While management sophistication and technologies have made considerable advances, the fishery resource, in many parts of the world, continues to be characterized by depleting stocks and poor economic returns. This situation is attributable, in part, to the common property nature of the resource (Gordon, 1953).

The following section will, firstly, examine the implications of the common property institution on commercial fisheries from the point of view of a hypothetical, unregulated, fishery. Secondly a review of some of the attempts at correcting the biological and economic problems that occur as a result of the common property nature of the resource is undertaken.

2.3.1 The Tragedy of the Commons

A common property resource is one in which no single user has private rights to its use or to prevent others from using it. This definition applies to most of the Canadian fisheries (i.e. except those for which individual quotas have been established) in that the unharvested portion of the stock is available for capture by all participants in the fishery.

Hardin (1969) illustrated the "tragedy of the commons" using the example of independent herdsman operating within a common pasture. Each herdsman, seeking to maximize personal economic gain, will realize a unit of positive utility from the addition of one more animal to his herd. A corresponding unit of negative utility resulting from the added congestion, depleted browse, etc. is shared amongst all other herdsman. Each and every actor in the tragedy continues to add to the herd until the pasture, limited by nature in its capacity, is ruined. When "independent, rational, free enterprisers" operate within a commons the result is necessarily "ruin for all" (Hardin, 1969).

The above illustration is equally applicable to the fishery resource. Uncontrolled access and competition amongst fishing enterprises for the unharvested portion of the stock subjects the resource to depletion (Cauvin, 1979). Because any fish that an enterprise may leave unharvested is

thereafter available for capture by other competing enterprises, conservation is neither rational nor likely to be undertaken. The fishermen, each acting in a manner they perceive as rational, will expand effort until total costs equal total revenues. This equates to a yield level beyond that which can be sustained. It should not be unexpected, therefore, that biological management, within the framework of the common property institution, has not proven to be highly successful.

The common property nature of the resource has considerable implications regarding the economic value of the resource. As a result of the "rule of capture" enterprises will continue to operate until the average cost of realizing a catch equals the average revenue generated by the catch. At this point the total value of the catch is worth exactly what it cost (including the opportunity costs of labor and capital) to harvest. All surplus or economic rent has been dissipated (Scott, 1955).

The dissipation of resource rents is further exasperated by a number of factors that may possibly cause negative rents to accrue to the fishery. Troadec (1983) identified the following factors;

- a time delay between the feasibility analysis and investment decision period and the actual lifetime of the investment (i.e. the decision to enter or expand

capacity occurs during years of high or increasing yields while actual operation occurs during years of low or declining yields)

- decisions to enter or expand capacity are made independently
- the mobility to enter the fishery is often greater than exit
- a tendency for fishermen to overlook depreciation costs
- and a tendency for governments to subsidize enterprises in order to achieve objectives other than those of economic efficiency.

Another feature of the common property fishery resource is its unique response to certain economic stimuli. While most, if not all, other industries benefit from an increase in the real price of the produced good or service sold or from a decrease in the total costs of production through a technological adaptation such is not the case in the fishery.

A decrease in the unit cost of fishing, through a decrease in one or more of the input costs or through the adaptation of a costs saving technology, or an increase in the real price of the catch, has no long term impact on the creation or enhancement of resource rents in the unregulated fishery. The creation of short term profits will cause existing enterprises to increase effort through increasing capital investments, variable inputs or both. As well the

existence or perception of available profits will attract new entrants to the fishery. The net result will be an increase in fishing effort, an intensification of overcapitalization and a complete dissipation of resource rents. Furthermore, the new equilibrium results in an increased level of exploitation and may lead to stock depletion (Troadek, 1983).

The preceding discussion has examined some aspects of the common property resource in a hypothetically, unregulated, fishery. The biological and economic equilibriums inherent in such a situation are such that resource conservation is endangered and rents are dissipated. A review of the more common regulatory measures which attempt to correct for these tendencies follows.

2.3.2 Regulation of Fisheries

The previous section discussed the forces that drive the unregulated fishery to a level of effort that dissipates economic rents and endangers biological conservation. The following section will examine and discuss regulatory mechanisms that have been enacted to correct for the common property features of the fishery.

Fisheries regulations may be divided into two types; firstly those that control for factor inputs and assume a causal effect on output, and secondly those that control

directly for output. As well, regulations act either directly or indirectly on factor inputs and output.

Regulations that control directly for factor inputs include restrictions on gear (i.e. mesh size), time (i.e. closed seasons), place (i.e. closed areas), fishing vessel power (i.e. engine horsepower) and the number of participants (i.e. restrictive licencing).

Gear, time and place restrictions have been found to be capable of achieving biological conservation goals. The most common gear restriction, minimum mesh opening size, allows younger, smaller fish to escape capture during periods of relatively rapid growth and, therefore, allow them to contribute positively to stock biomass (Beverton and Holt, 1957). Closed seasons may be enacted to protect stocks during critical periods such as spawning. Closure may also be enforced when catch per unit effort falls below a certain level (Bettington and Rettig, 1983). Similarly, area closures may be enacted to protect spawning or declining stocks.

Controlling for factor inputs in order to achieve economic efficiency goals has been found to be generally ineffective (Pearse, 1980). Restrictions on gear that do not affect the composition of the catch, as, for example, the total amount of allowable net, merely restrict efficient fishing techniques and, therefore, raise costs. Conservation

of fish is achieved through the wasting of other scarce resources (Crutchfield, 1965).

Another direct control of factor inputs is to restrict, through licencing, the number of participants in a fishery. Such attempts have had, at best, limited and temporary success both biologically and economically. The reason that restrictive licencing, in and of itself, fails, is that enterprises remaining in the fishery, on the basis of available rents, expand their fishing power. Any efficiencies created through the removal of enterprises is dissipated through the additional effort created by existing ones (Pearse and Whilen, 1979).

An alternative to the direct regulation of factor inputs is to control for them indirectly through taxation. If the various inputs that comprise fishing effort were to be identified and equitably taxed, so that there would be no incentive to switch between them, the effect on the fishery would be similar to that of direct regulation. Pearse (1980) identified the difficulties inherent in enacting a tax on factor inputs; i) identifying the components of effort and controlling for substitution towards non- or lesser taxed components, ii) the distributional effect of the tax in that in order to be effective in controlling effort it would require exodus from the fishery and, iii) the tax rates would require continual adjustments in response to the changing availability of fish, harvesting costs and fish prices.

Regulations which control directly for output include total allowable catch (i.e. fishery quotas) and individual quotas which assign portions of the total quota amongst participants as quantitative rights. Total allowable catch regulations establish a maximum harvest of a particular stock and require that fishing be suspended once this is achieved. Individual quotas allocate and assign portions of the total amongst participants.

Total allowable catches or fishery quotas, if properly determined and enforced, would seem to be capable of satisfying biological conservation requirements. Experience has shown that establishing sustainable yields in actual, multi-species fisheries, however, is not without substantial uncertainty (Pope, 1984). Cauvin (1979), for example, noted that the Lake Winnipegosis (Manitoba) fishery pickerel stocks had declined despite existing control measures which included a total allowable catch quota.

Consequently total allowable catch quotas do not correct for the common property characteristic of rule of capture. Therefore, competition amongst enterprises will necessarily lead to rent dissipation. Furthermore, the incentive to realize the largest possible share of the available rent often leads to the emasculation and circumvention of existing (quota) regulations thereby jeopardizing biological objectives (MacKenzie, 1983).

Quantitative rights are the most common means of allocating publicly owned natural resources in North America. Their use includes, but is not limited to, the allocation of water, timber, hydrocarbons and the discharge of waste material. They have also received increased attention as a method of rationalizing the fisheries resource (Moloney and Pearse, 1979).

By issuing transferable rights to harvest a specific quantity of fish, or share of a total allowable catch, to individual fishing enterprises the fundamental causes of biological and economic overfishing are removed. Individuals are no longer encouraged to increase or protect (through capture) "their" portion of the catch. Rather they are motivated to catch their allocated share in the most efficient manner possible and in so doing preserve the rent inherent in the resource (Pearse, 1980).

Pearse (1982) identified other biological and economic advantages of an individual quantitative transferable quota system. They are;

- the sum of the individual quotas would constitute a sustainable yield
- fishermen remaining in the fishery would achieve a greater degree of security
- many of the traditional effort controls would become redundant thereby reducing costs of regulation

- if fishing were to become more profitable the value of the right to fish would increase as opposed to the incentive to realize a larger portion of the catch and the associated overcapitalization increasing
- the issuing of quantitative rights would provide to the regulatory authority a vehicle for generating revenue (i.e licence fees) and
- due to its apparent administrative simplicity it would allow for greater concentration on resource management issues as opposed to the regulation of effort.

While the system is not without its disadvantages they would appear to pertain largely to the novelty of the approach. Grima and Allison (1983) observed that the introduction of individual quotas in Ontario in 1983 was resisted by affected fishermen on the following grounds;

- the initial distribution of quota would possibly be more advantageous to some and less advantageous to others
- the holders of quota would be required to pay an annual fee
- the quota would require monitoring and assessment and
- the total allowable catch and therefore individual quotas would be subject to annual fluctuations.

Another, complementary or alternative, approach to controlling output is to impose a tax or royalty on the

catch. By reducing the net value of the catch to the producer biological and economic goals are attainable. The tax dampens the the incentive to expend effort because total costs equal total revenue at lower levels of harvest than would otherwise occur. As well, the tax has the additional benefit of allowing for revenue to accrue to the agency which imposes it.

In order to be effective the amount of the royalty would have to be such that it removed all of the available resource rent. In that the amount of rent available fluctuates with such variables as stock abundance, species mix, prices, etc. determining an appropriate rate would prove difficult (Scott, 1979).

2.4 SUMMARY

The preceding sections have discussed the various biological, economic and social management objectives pursued within the fishery. As well, the common property nature of the resource and the various regulations designed to achieve those objectives have been examined.

The biological objectives of the Southern Indian Lake fishery are accomplished through a total allowable catch regulation. Social objectives such as employment opportunities and the maintenance of traditional life styles would appear to have a higher priority than those economic.

Evidence of this is the availability of fishing licences to all community residents, an absence of individual property rights, royalties or other mechanisms designed to preserve the rent available in the resource. Future strategies designed to maximize benefits available from the capital fund will need to take into account the objectives and approaches to the management of the resource itself.

In 1953, Scott Gordon concluded that an optimum level of fishing effort could be achieved only if the resource could be divided into private property rights or, when this is not possible, into group private rights. When neither of the above were not feasible the resource was best exploited, under specific regulations, as public property. Lastly he proposed a taxation scheme to control for excessive effort. To date fisheries managers have chosen, for the most part, to enact regulations within the framework of the fishery as a common property institution. The failure of this approach is evidenced not only by the wide spread depletion of fish stocks but also by the wasting of other resources in the course of that depletion.

While there exist considerable impediments to the rationalization of commercial fisheries, the past consequences of the management of the resource as a common property requires that its appropriateness be brought into question. Hardin (1969) observed that unconscious, automatic, rejection of proposed reforms often occurs

because of the assumption that either the status quo is perfect or that the proposed reform is imperfect and, therefore, it is preferable to delay change until the perfect proposal is developed. As populations and demands on natural resources have increased over time, the commons approach has often been abandoned because it was found to be unsuitable and preferable, alternative, methods of allocating rights existed. Marshall (1920) noted both the tendency to reject alternatives to common property rights as well as the merits of private property rights.

The rights of property, as such, have not been venerated by those master minds who have built up economic science; but the authority of the science has been wrongly assumed by some who have pushed the claims of vested rights to extreme and antisocial uses. It may be well therefore to note that the tendency of careful economic study is to base the rights of private property not on any abstract principle, but on the observation that in the past they have been inseparable from economic progress....

Chapter III
RESEARCH METHODS

3.1 CAPITAL FUND

The first objective of the research is to project, on the basis of a multi-variable analysis, possible future events as they pertain to the SILCFA capital fund.

In order to predict future conditions of the capital fund a computer model is used to analyze the relative effects of three (3) variables. These variables are;

1. the interest rate applied to the fund,
2. the annual harvests on Southern Indian and outlying lakes,
3. and the per unit weight (\$/kg.) subsidy rates paid on fish harvests from Southern Indian and outlying lakes.

The model simulates twenty-seven (27) alternative scenarios in order to predict the future state of the capital fund. Each of the three variables is assigned three different values. These values are based firstly on conditions that existed during 1985 and thereafter are assigned a minimum and maximum range of values so as to

provide an indication of their sensitivity on the state of the capital fund. The model considers a twenty (20) year time horizon.

3.1.1 Interest Rate Variable

In order to predict changes in the levels of interest revenues received on the capital fund the research employs an analysis relating to the term structure of interest rates. The term structure of interest rates is the structure of yields by term to maturity on assets of otherwise similar characteristics (Cameron, 1982). The analysis is based on the arbitrage which occurs between short and long term bond markets and the liquidity preference attached to shorter term bonds.

In that Government of Canada bonds are available in a wide range of maturities and are widely traded, and therefore good indicators of the bond market, they provide a fair barometer of expected future trends in interest rates in all financial markets (R. Cameron, pers. comm.). The expected interest rate, for an n period bond, is determined through the following equation;

$$1+rn=[(1+r) (1+r_e) (1+r_e^2)...(1+r_e^n)]^{1/n+Ln}$$

where r_n is the yield to maturity, L_n is the liquidity premium and $r_{e,n}$ is the expected one-year rate for year n .

From the results of the above equation a weighted mean bond rate for the period 1986 - 2006 is determined. This weighted bond rate is then applied to the rate that is assumed to currently apply to the SILCFA capital fund to provide an average expected annual rate of return through the year 2006. In order to observe the sensitivity of a range of interest rates the model further considers interest rates of 1.5% above and below the level predicted by the bond market analysis.

3.1.2 Production Variable

The first value attached to the annual harvest variable is the 1985 observed production from Southern Indian and outlying lakes. For Southern Indian itself the range of values considered in the analysis equates to one (1) standard deviation above and below the 1981 to 1985 observed mean. These values are considered to be more indicative of future potential harvests than the extreme results over the same time period.

The number of outlying lakes fished by SILCFA members and the total production from these lakes increased significantly after the impoundment of Southern Indian Lake

and again with the increased production subsidy that occurred in 1984. The range of values that has occurred, therefore, is not necessarily indicative of what is likely to occur. For this reason a somewhat arbitrary range of values of 10% above and below the 1985 value, are assigned to this variable. While the maximum value considered in the analysis has not been observed, two ongoing trends suggest it merits consideration. Firstly, the demographic characteristics of the South Indian Lake community indicate that the proportion of work force aged individuals will continue to increase (Department of Northern Affairs, 1983). A lack of suitable, permanent employment opportunities would suggest that many of these individuals will participate in the, traditional, commercial fishery. Secondly, the trend towards increasing the number of outlying lakes, given the current SILCFA subsidy scheme, could continue (D. Cook, pers. comm.). The increasing labor force and expanding resource base could facilitate an increase in total production.

3.1.3 Subsidy Rate Variable

The first value assigned to the rate of subsidy variable is that which occurred in 1985. Because the present subsidy scheme has only been in effect since 1983 there is little in the way of historical data on which to draw inferences regarding possible future rates. The model arbitrarily

attaches values of 10% above and below the current subsidy rates. The minimum value for the outlying lakes and the maximum value for Southern Indian Lake have been observed since the inception of the program. The maximum value for the outlying lakes and the minimum value for Southern Indian Lake have not.

The subsidization of winter fishing production was suspended after the 1984 winter season. The analysis assumes that this suspension will continue for the duration of the time frame considered.

The model, therefore, simulates a number of alternative scenarios in order to predict the future state of the subsidy fund. In that each of the three variables is assigned three different values a total of twenty-seven (27) combinations result. For each alternative the amount contained in the capital fund in each subsequent year is determined and in the case of alternatives which are found to deplete the fund (i.e. expenditures exceed interest revenue) the year in which the capital fund is entirely depleted is also determined.

3.2 INVESTIGATION OF THE PRIMARY HARVESTING SECTOR OF THE SOUTHERN INDIAN LAKE FISHERY

The second objective of the research is to investigate the primary harvesting sector of the Southern Indian Lake fishery. Specifically, the research studied a randomly selected sample of fishing enterprises in order to determine the nature of their economic viability.

Economic viability may be viewed both in the short and long run time frames. A firm is considered to be economically viable in the short run if it is able to generate revenues sufficient to meet its annual operating costs. Long run viability requires a level of revenue that meets not only the operating costs but, as well, the fixed costs of capital invested in skiffs and outboard motors.

The analysis of the harvesting sector is presented in the form of the income statements of the selected enterprises for the 1985 summer fishing season. An income statement offers the reader a "snapshot" (i.e. an annual assessment) of the performance of the enterprise. A description of the the revenue and expenditure components of the income statement follows.

3.2.1 Revenues

The revenues accrueable to the Southern Indian Lake fishermen are composed of three components; the sale of

fish, the provincial freight subsidy and the subsidy paid from the SILCFA capital fund. These components are considered both separately and in aggregates. Three aggregates of revenue are considered. They are;

1. sales only,
2. sales and provincial freight subsidization,
3. and total revenues, or, sales, provincial freight subsidy and subsidies paid from the SILCFA capital fund.

Sales revenues consist of two components; an initial price and a final payment. The final payment is based on the FFMC year-end reconciliation of revenues and expenditures. If revenues exceed expenditures the surplus is distributed to the fishermen on the basis of their harvest in that year. In the years the FFMC has made a final payment it has usually been less than 10% of the initial payment (Gislason et al, 1982). The final payment paid on 1985 production will be distributed to fishermen in December of 1986. The final payment applied to the 1985 initial price is expected to approximate the 1984 final payment. The research assumes a 1985 final payment equal to 85% of the 1984 final payment with the exception of cutter whitefish on which no final payment is expected (R. Hay, pers. comm.).

The provincial freight subsidy program is intended to partially offset the high transportation costs experienced

in northern fisheries. The provincial government will pay to a maximum of \$.3528/ kg. on all species except cutter whitefish, pickerel and sauger. Southern Indian Lake fishermen incur the first \$.11/kg and any residual over and above the subsidized portion necessary in delivering fish to the FFMC complex at Leaf Rapids (W. Wysocki, pers. comm.).

The SILCFA subsidy is paid on all species. Production on Southern Indian Lake is subsidized by \$.484/kg. while outlying lakes, so as to reflect the higher costs incurred in transportation, receive \$.838/ kg. As these payments to fishermen are all administered by the FFMC the information is taken from the corporations Fishermens' Account Analyses.

3.2.2 Expenditures

Expenditures made by an enterprise are of three types; variable costs, indirect costs and fixed costs. Variable costs are the day to day costs incurred by fishermen and, as such, they vary with the fishing effort expended. Indirect costs are the seasonal costs of fishing and are, therefore, indirectly related to the level of effort or production. Fixed costs are those costs that accrue to an enterprise once the decision to enter the industry has been made and as such are independent of the level of production. They are the depreciation costs stemming from a capital investment in an enterprise spread out over the expected life time of the particular asset and the interest expense incurred in the

financing of the asset. A description of the specific variable, indirect and fixed costs follows.

Six categories of variable costs were examined; fuel, fishing supplies, provisions, transportation, labor, ice, and, miscellaneous. With the exception of the labor expense the data was taken from FFMC Account Analyses.

- Fuel - includes gasoline, oil and lubricants for the operation of outboard motors.
- Fishing Supplies - includes a range of items such as nets, ropes, gloves, floatlines, etc.
- Provisions - includes expenditures such as food, lanterns, camping tents, axes, etc.
- Transportation - includes the expense incurred by the enterprise in transporting the harvest to the FFMC complex at Leaf Rapids.
- Labor - the opportunity cost of the time devoted to fishing and fishing related activities. Eight hours per delivery and an opportunity cost equal to the Manitoba minimum wage are assumed.

Two categories of indirect costs are considered. They are licence fees and unemployment insurance contributions. Licences are sold by the province at a cost of \$10 each (D. Cook, pers. comm.). Unemployment insurance contributions are based on fish sales and the amounts paid by each enterprise is taken from FFMC account analyses.

The fixed costs of the sampled enterprises are estimated through a capital recovery factor applied to the current replacement costs of assets assumed common to all enterprises. A capital recovery factor is the equivalent of a present sum of money expressed in terms of an equal series of payments for a specific number of years (Edge, 1964). The capital recovery function considers both the depreciation of assets over their economic life as well as the costs incurred in financing their purchase. Each of the sampled enterprises is assumed to consist of one six meter skiff and one twenty-five (25) horsepower outboard motor. Skiffs are assumed to have an economic lifetime of ten (10) years and outboard motors three and one-third ($3 \frac{1}{3}$) years. The Manitoba Agriculture Credit Corporation (MACC) provides loans to fishermen at a subsidized interest rate and the rate charged by the MACC as of June 1, 1985 is used in the analysis.

Enterprises that display revenues in excess of variable and semi-variable costs, therefore, are considered to be viable in, at least, the short run. The excess is available to discharging the costs of fixed assets and if it is sufficient to cover the annual costs of depreciation and financing of capital the enterprise is considered viable in the long run. The assumption is made, therefore, that the year observed is representative of the long term.

The economic viability of the sample is examined according to three different methods. The methods provide differing forms of insight into the nature of the fishery. The first method determines the average unit revenues and costs over the entire sample. The second method divides the sample on the basis of production levels. Average costs and revenues of each production interval are compared. Lastly the net revenue of each of the individual enterprises is determined.

The research, therefore, determines the economic viability, in both the short and long term, of the sampled enterprises. In order to examine the effect of the three components of revenue on the viability of the sample they are considered in various aggregates.

3.3 INDEXATION OF OUTLYING LAKES

The third objective of the research is to index the outlying lakes (Figure 4) on the basis of economic viability. This indexation is based on average (\$/kg.) costs and revenues. For purposes of this index a lake is considered to be economically viable if the average revenues exceed average costs of capture and transportation. Revenues are again considered in the three aggregates of sales only, sales and freight subsidy, and sales, freight subsidy and the SILCFA subsidy in order to determine their effect on the viability of the outlying lakes.

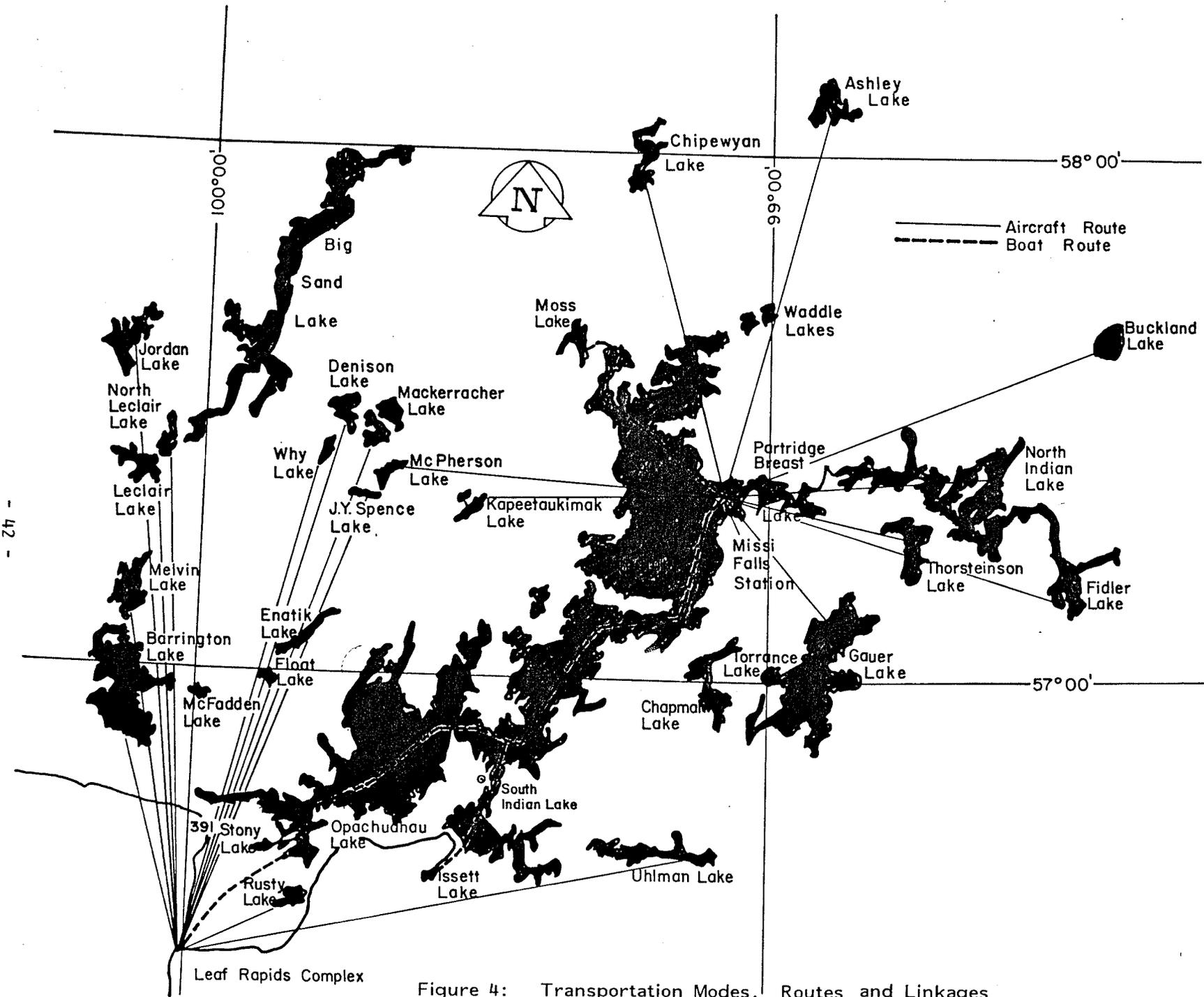


Figure 4: Transportation Modes, Routes and Linkages

Average sales revenues vary according to the species mix (i.e. relative proportions of whitefish, pickerel, pike, etc.) and qualities (i.e. export, continental or cutter) of the fish harvested in the different outlying lakes. The quality and species mix are based on a three year (1983 - 1985) weighted average.

By applying the price the fishermen receive for the different species and qualities to the relative proportion of those species and qualities harvested, an average sales revenue is determined. The price applied to the species and quality mix is the 1985 initial price plus the final payment as estimated in section 3.2.1.

The transportation costs considered are the total costs incurred in delivering the fish to the FFMC complex at Leaf Rapids and are based on Fisheries Branch survey information. The transportation modes and linkages used vary depending on the lakes location relative to Missi Falls and Leaf Rapids, its accessibility via boat to Southern Indian Lake and its accessibility by road. There are currently five forms of delivery. They are;

1. direct to Leaf Rapids via aircraft,
2. direct to Leaf Rapids via boat,
3. direct to Leaf Rapids via truck,
4. to Missi Falls station via aircraft and then to Leaf Rapids via FFMC boat

5. to Missi Falls station via boat and then to Leaf Rapids via FFMC boat.

The costs of fishing the outlying lakes (except for transportation costs) are assumed to be equal to the normal costs of fishing Southern Indian Lake. This cost was determined using the cost information from the Southern Indian Lake fishing enterprises sample. The total of the sample variable, operating and fixed costs was divided by the total catch (in kilograms) achieved by the sample. The product of this equation is the average total cost (\$/Kg.) of fishing. By replacing the transportation cost of Southern Indian with that of each of the outlying lakes individual average total costs are determined.

Chapter IV

RESULTS

4.1 CAPITAL FUND

Future year end balances of the SILCFA capital fund are predicted on the basis of a multi-variable analysis. The variables selected are those that impact most directly on the capital fund. The assigned values reflect a range equal to, and above and below, that which has occurred and can reasonably expected to occur over the time horizon considered.

4.1.1 Current Balance

The current balance of the SILCFA capital fund (as of June 1, 1986) was approximately \$1.72 m (W. Dysart, pers. comm.). This balance represents a total depletion of approximately \$805,000 since the inception of the program in June of 1983.

Expenditures on subsidization over the course of the program, based on observed production and subsidy rates, total \$803,717. Interest revenues, based on an assumed rate of 1.5% less than the prime borrowing rate, are approximately \$650,000. The observed production, subsidy

rates and assumed interest rates are presented in Appendix B. This Appendix also details the timing of the remittance by Manitoba Hydro to the SILCFA. If the observed expenditures and assumed interest revenues represented all of the transactions made on the fund a total depletion of approximately \$154,000 could be expected. As such, an apparent discrepancy of some \$651,000 exists. This discrepancy apparently results from expenditures made by the SILCFA on ice and packing stations established on some of the outlying lakes, improvements to the Missi Falls receiving station and a planned tourist fishing lodge. Although these "non-subsidy" expenditures represent a considerable draw down on the capital fund to date, they were undertaken as "special projects" and are not expected to be repeated. As well, legal and management expenses on the capital fund are not included as observed expenditures although they are known to exist (R.Hay, pers. comm.).

Expenditures made from the fund on projects and programs other than the direct subsidization of fishing on Southern Indian Lake and the outlying lakes represents, as noted above, a considerable draw down on the capital fund and, as such, impairs the ability of the Association to continue to extend adequate levels of subsidy to its member fishermen. As well, these expenditures would appear to be further evidence of an ad hoc approach to the management and distribution of the fund.

4.1.2 Assigned Variable Values

The values assigned to the interest rate, production and rate of subsidy values are presented in Table 2. Each

TABLE 2
Assigned Variable Values

Variable	Value		
	High	Actual	Low
Interest Rate	10.71%	9.21%	7.71%
Production (kgs.) Southern Indian Lake	258,184	247,814	161,800
Outlying Lakes	284,895	258,995	233,096
Subsidy Rate (\$/kg.) Southern Indian Lake	.532	.484	.382
Outlying Lakes	.922	.838	.754

variable was assigned three values. The analysis considered all possible combinations of values and determined the year end (June 1) balance. In situations in which annual expenditures on subsidy exceed interest revenue, the year in

which the fund would be completely exhausted was also determined.

4.1.3 Results of Multi-Variable Analysis

The results of the multi-variable analysis of the capital fund are summarized in Table 3. All combinations of interest rate, production and subsidy rate values analyzed resulted in expenditures exceeding revenues and, therefore, depleting year end balances. The number of years required to completely exhaust the fund ranged from a minimum of six years (in four instances) to a maximum of fourteen years in one instance. The mean number of years required to exhaust the fund over all variable values was 8.259 years.

TABLE 3

Results of Multi-Variable Analysis

	i=7.71% P=High C=High	i=9.21% P=High C=High	i=7.71% P=1985 C=High	i=10.71% P=High C=High	i=7.71% P=High C=1985	i=9.21% P=Low C=High	i=9.21% P=High C=1985	i=7.71% P=1985 C=1985	i=10.71% P=1985 C=High
Year End	1	2	3	4	5	6	7	8	9
1985	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000
1986	\$1,449,359	\$1,475,159	\$1,479,044	\$1,500,959	\$1,486,019	\$1,504,844	\$1,511,593	\$1,504,404	\$1,530,644
1987	\$1,157,852	\$1,207,769	\$1,219,509	\$1,258,459	\$1,233,997	\$1,269,871	\$1,283,991	\$1,273,264	\$1,321,007
1988	\$ 843,869	\$ 915,751	\$ 939,965	\$ 989,987	\$ 962,545	\$1,013,258	\$1,035,428	\$1,025,459	\$1,088,918
1990	\$ 505,679	\$ 596,839	\$ 638,868	\$ 692,762	\$ 670,163	\$ 737,011	\$ 763,971	\$ 759,787	\$ 831,973
1991	\$ 141,414	\$ 248,555	\$ 314,556	\$ 363,704	\$ 355,240	\$ 426,952	\$ 467,514	\$ 474,960	\$ 547,509
1992	(\$ 250,936)	(\$ 131,806)	(\$ 34,760)	(\$ 596)	\$ 16,035	\$ 92,706	\$ 143,753	\$ 169,597	\$ 232,579
1993					(\$ 349,322)	(\$ 272,324)	(\$ 209,827)	(\$ 157,783)	(\$ 116,080)
1994									
1995									
1996									
1997									
1998									
1999									
2000									

	i=10.71 P=High C=1985	i=7.71% P=High C=Low	i=9.21% P=1985 C=1985	i=9.21% P=High C=Low	i=10.71% P=1985 C=1985	i=7.71% P=1985 C=Low	i=7.71% P=Low C=High	i=9.21% P=Low C=Low	i=10.71% P=High C=Low
Year End	10	11	12	13	14	15	16	17	18
1985	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000
1986	\$1,537,619	\$1,522,678	\$1,538,804	\$1,548,478	\$1,564,604	\$1,546,965	\$1,549,001	\$1,630,003	\$1,574,278
1987	\$1,335,704	\$1,310,142	\$1,340,921	\$1,361,159	\$1,392,566	\$1,360,589	\$1,364,818	\$1,460,295	\$1,412,949
1988	\$1,112,164	\$1,081,220	\$1,124,812	\$1,156,587	\$1,202,102	\$1,159,844	\$1,166,434	\$1,272,412	\$1,234,342
1989	\$ 864,684	\$ 834,648	\$ 888,799	\$ 933,175	\$ 991,239	\$ 943,621	\$ 952,755	\$1,064,406	\$1,036,605
1990	\$ 590,698	\$ 569,065	\$ 631,050	\$ 689,186	\$ 757,793	\$ 710,727	\$ 722,601	\$ 834,123	\$ 817,692
1991	\$ 287,368	\$ 283,006	\$ 349,562	\$ 422,726	\$ 499,345	\$ 459,877	\$ 474,702	\$ 579,177	\$ 575,332
1992	(\$ 48,448)	(\$ 25,108)	\$ 42,149	\$ 131,725	\$ 213,218	\$ 189,687	\$ 207,691	\$ 296,926	\$ 307,016
1993			(\$ 293,577)	(\$ 186,078)	(\$ 103,554)	(\$ 101,335)	(\$ 79,907)	(\$ 15,554)	\$ 9,964
1994								(\$ 361,501)	(\$ 318,903)
1995									
1996									
1997									
1998									
1999									
2000									

	i=9.21% P=1985 C=Low	i=9.21% P=Low C=High	i=7.71% P=Low C=1985	i=10.71% P=1985 C=Low	i=10.71% P=Low C=High	i=9.21% P=Low C=1985	i=7.71% P=Low C=Low	i=10.71% P=Low C=1985	i=10.71% P=Low C=Low
Year End	19	20	21	22	23	24	25	26	27
1985	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000	\$1,720,000
1986	\$1,572,765	\$1,574,801	\$1,576,602	\$1,598,565	\$1,600,601	\$1,602,402	\$1,604,203	\$1,628,202	\$1,655,803
1987	\$1,411,970	\$1,416,229	\$1,422,148	\$1,464,125	\$1,468,414	\$1,473,973	\$1,479,478	\$1,526,572	\$1,584,730
1988	\$1,236,365	\$1,243,052	\$1,255,785	\$1,315,285	\$1,322,070	\$1,333,716	\$1,345,136	\$1,414,058	\$1,506,046
1989	\$1,044,588	\$1,053,926	\$1,076,596	\$1,150,506	\$1,160,053	\$1,180,541	\$1,200,437	\$1,289,493	\$1,418,934
1990	\$ 835,147	\$ 847,382	\$ 883,591	\$ 968,078	\$ 980,683	\$1,013,258	\$1,044,582	\$1,151,588	\$1,322,493
1991	\$ 606,418	\$ 621,814	\$ 675,706	\$ 766,112	\$ 782,103	\$ 830,569	\$ 876,710	\$ 998,913	\$1,215,723
1992	\$ 356,622	\$ 375,472	\$ 451,793	\$ 542,516	\$ 562,255	\$ 631,055	\$ 695,895	\$ 829,886	\$1,097,517
1993	\$ 83,820	\$ 106,442	\$ 210,616	\$ 294,972	\$ 318,861	\$ 413,165	\$ 501,140	\$ 642,757	\$ 966,652
1994	(\$ 214,107)	(\$ 187,366)	(\$ 49,156)	\$ 20,917	\$ 49,400	\$ 175,207	\$ 291,368	\$ 435,586	\$ 821,772
1995				(\$ 282,490)	(\$ 248,920)	(\$ 84,667)	\$ 65,424	\$ 206,227	\$ 661,374
1996						(\$ 368,475)	(\$ 177,941)	(\$ 47,696)	\$ 483,798
1997							(\$ 440,070)		\$ 287,204
1998									\$ 69,554
1999									(\$ 171,406)
2000									

4.2 SOUTHERN INDIAN LAKE PRIMARY HARVESTING SECTOR

The research investigated the economic viability of a randomly selected sample of fishing enterprises. Cost and revenue data is compared in order to determine short and long run economic viability. The sample is considered in aggregate, by production intervals and individually.

4.2.1 Sample Size

During the 1985 summer season a total of 87 fishing enterprises were licenced and made deliveries on Southern Indian Lake. Of these 87, 22 were also licenced and made deliveries from outlying lakes. In order that all information on revenues and expenses could be attributed specifically to the Southern Indian Lake fishery the sample was randomly selected from the 65 remaining enterprises which produced from Southern Indian Lake only.

The research sampled a total of 28 enterprises. This sample size represented approximately 32% of all fishing enterprises active on Southern Indian Lake during 1985. The sampled enterprises accounted for 36.1% (89,537 kgs.) of the total production and, therefore, demonstrated larger individual mean production (3198 kgs.) than that of the population of all active enterprises (2848 kgs) (FFMC records).

4.2.2 Economic Viability: Sample Aggregate

The average total cost of fishing is the total cost incurred in realizing a catch divided by the volume (weight) of the catch. It includes the variable, semi-variable and fixed costs of fishing. If average revenues exceed average variable costs the surplus is available to discharge the semi-variable and fixed costs. The enterprise(s) is viable, therefore, at least in the short run. If the surplus is of the magnitude that it exceeds the average total costs of fishing long run viability is also achieved.

The average variable costs were determined by dividing the total variable costs incurred by the total production achieved by the sampled enterprises.

\$87,109.73 (Total Variable Costs)

89,537 kgs, (FFMC data)

=\$.9279/kg. (Table 3)

= Average Variable Cost

Average revenues from sales was determined through dividing the actual initial price plus the estimated final payment by the total production.

\$57,810.21 (Initial Payment)
+ \$24,366.96 (Estimated Final Payment)
= \$82,177.17 (Total Sales Revenue)

89,537 kgs. (FFMC data)

= \$.9178/kg. (Table 3)

= Average Sales Revenue

As average variable costs exceeded average revenues from sales the sample aggregate is considered to be unviable in the short run on this component of revenue.

The second aggregate of revenue considered is sales plus the provincial freight subsidy.

\$82,177.17 (Sales)
+ \$15,371.35 (Freight Subsidy)
= \$97,548.52

89,537 kgs. (FFMC data)
= \$1.0895/kg. (Table 3)
= Average Revenue (Sales + Freight Subsidy)

On the basis of this aggregate of revenue, average revenues exceeded average variable costs and, therefore, the sample is considered to be viable in, at least, the short run.

The third aggregate of revenue is total revenues; sales plus provincial freight subsidization plus SILCFA subsidization.

\$82,177.17 (Sales)
+ \$15,371.35 (Freight Subsidy)
+ \$37,568.64 (SILCFA Subsidy)
= \$135,117.16

89,537 kgs. (FFMC data)
=\$1.5091/kg. (Table 3)
= Average Total Revenues

The sample, on the basis of total revenues, is considered to be viable in, at least, the short run.

The average total cost of fishing is the sum of variable, semi-variable and fixed costs divided by the total production.

	\$87,109.73 (Variable Costs)
+	\$ 1,251.31 (Semi-Variable Costs)
+	\$36,314.64 (Fixed Costs)
=	\$124,575.68 (Total Costs)
<hr/>	
	89,537 kgs. (FFMC data)
=	\$1.3913/kg. (Table 3)
=	Average Total Costs

The average total costs of fishing exceeded the average revenues from sales alone and from sales and freight subsidy. The sampled enterprises, therefore, are not considered to be viable in the long run on the basis of these two aggregates of revenue. Average total revenues (sales + freight subsidy + SILCFA subsidy), however, exceed the average total costs and on the basis of this revenue aggregate the sample is viable in the long run.

The Southern Indian Lake fishery, on the basis of the sampled data, required the provincial freight subsidy in order to achieve short run economic viability. Further subsidy, in the form of the 1985 SILCFA program was required in order to achieve long run economic viability. Of the

TABLE 4

Sample Aggregate Total and Average Costs And Revenues

	Totals	\$/Kg.
Production (Kgs)	89537	
Deliveries	595	
Revenues		
Sales	\$57,810.21	\$0.6457
Est.Final Payment	\$24,366.96	\$0.2721
[Total Sales Revenue]	\$82,177.17	\$0.9178
MPFS	\$15,371.35	\$0.1717
[Sales+Freight Subsidy]	\$97,548.52	\$1.0895
SILCFA Compensation	\$37,568.64	\$0.4196
Total Revenues	\$135,117.16	\$1.5091
Variable Costs		
Supplies	\$13,881.79	\$0.1550
Labor	\$20,468.00	\$0.2286
Provisions	\$12,977.98	\$0.1449
Transportation	\$14,099.53	\$0.1575
Ice	\$5,816.73	\$0.0650
Fuel	\$20,243.47	\$0.2261
Total	\$87,109.73	\$0.9729
Semi-Variable Costs		
Licence	\$280.00	\$0.0031
UIC	\$971.31	\$0.0108
Total		
Semi-Variable Costs	\$1,251.31	\$0.0140
Gross		
Operating Profit (Loss)	\$46,756.12	\$0.5222
Capital		
Recovery Factor		
Skiffs	\$15,413.44	\$0.1721
Motors	\$20,801.20	\$0.2323
Total	\$36,214.64	\$0.4045
Total Operating Costs	\$124,575.68	\$1.3913
Net Operating Profit (Loss)	\$10,541.48	\$0.1177

\$.4196/kg. paid to fisherman through the SILCFA program, \$.3019 was, on average, used to defray operating costs. The residual, \$.1177 represented the average net operating profit.

Note: The rate of subsidization as specified under the 1985 program was \$.484/kg. The weighted mean rate of the sample was \$.4196/kg. The mean rate received by individual enterprises (unweighted mean) was \$.4163/kg. with a standard deviation of \$.0174/kg. Neither the apparent discrepancy between the actual rate received nor that set out by the program nor the variation in rates received by individual enterprises could be explained by individuals interviewed.

4.2.3 Economic Viability: Production Intervals

In order to examine the relationship between economic viability of sampled enterprises and production levels the enterprises were divided into intervals of 2000 kgs. of production increments.

The sample is characterized by a high proportion of the enterprises occurring in the lower production class intervals (Figure 5). Thirteen (13) of the twenty-eight (28) sampled enterprises (46%) realized less than 2000 kgs. of production while nineteen (19) (68%) realized less than 4000 kgs. and twenty-four (24) (86%) produced less than 6000 kgs. In that the mean production exhibited by the sample was greater than that of the population, this skewedness would be expected to exist in the Southern Indian Lake fishery at a yet more marked rate.

DISTRIBUTION OF PRODUCTION

Sample Size n=28

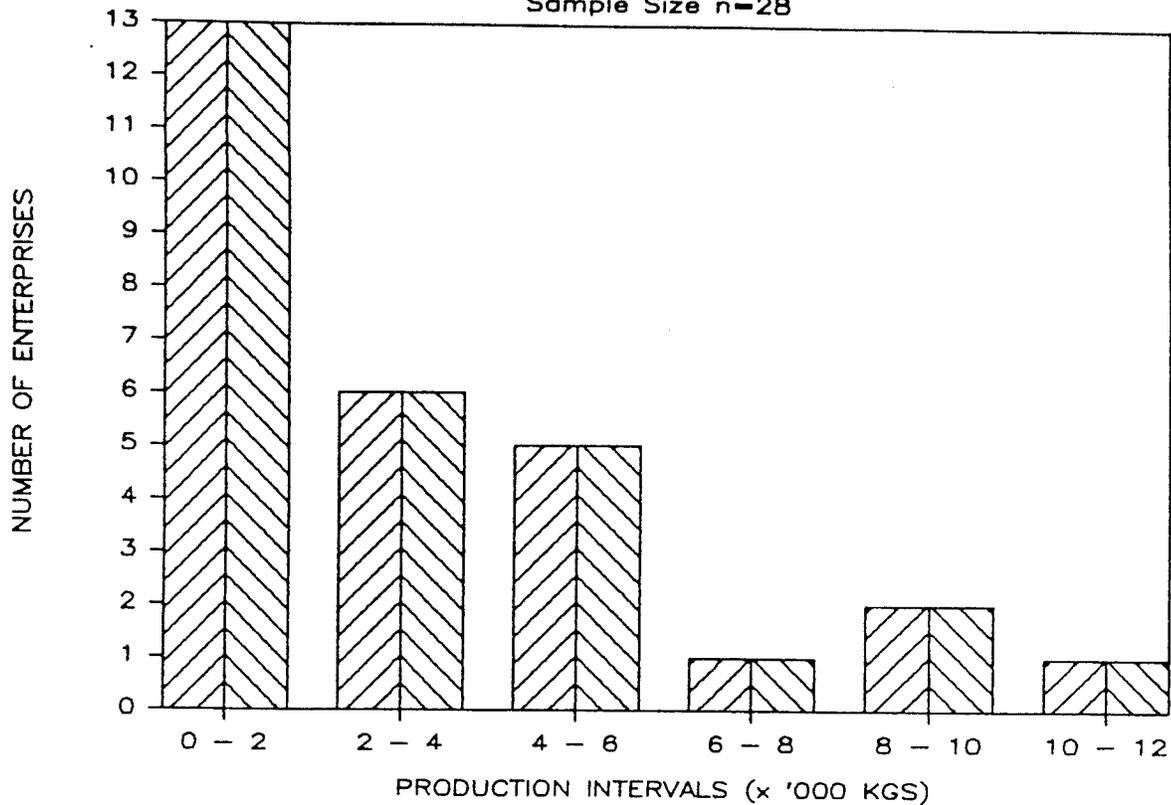


Figure 5: Distribution of Production

revenue. Unit variable cost means of the 0 - 2000 and 2000 - 4000 kg intervals also exceeded the combined unit revenues from sales and freight subsidization. Conversely, total unit revenues (i.e. sales, freight subsidy and SILCFA subsidy) exceeded mean variable costs over all classes of production.

TABLE 5

Production Intervals Mean Variable Costs

Production Intervals (Kgs.)	Number of Enterprises	Total Variable Costs (\$)	Total Production (Kgs.)	Average Variable Costs (\$/Kg.) (\$/Kg.)
0 - 2000	13	13,644.48	12,109	1.1268
2000 - 4000	6	21,544.98	18,688	1.1529
4000 - 6000	5	23,658.67	23,702	.9921
6000 - 8000	1	4,842.86	6,642	.7291
8000 - 10000	2	13,238.30	16,840	.7861
10000 - 12000	1	10,180.44	11,556	.8810
Totals	28	87,109.73	89,537	.9729

Average variable cost of the 0 - 2000 and 2000 - 4000 kg intervals also exceeded the combined average revenues from sales and freight subsidization. Conversely, average total revenues (i.e. sales, freight subsidy and SILCFA subsidy) exceeded the average variable costs over all classes of production. Average variable costs of the 6000 - 8000, 8000

TABLE 6

Production Intervals: Short Run Viability

Production Intervals	Sales Alone	Sales + Freight Subsidy	Sales + Freight Subsidy + SILCFA Subsidy
0 - 2000	NO	NO	YES
2000 - 4000	NO	NO	YES
4000 - 6000	NO	YES	YES
6000 - 8000	YES	YES	YES
8000 - 10000	YES	YES	YES
10000 - 12000	YES	YES	YES

- 10,000 and 10,000 - 12,000 kg. production intervals were less than average revenues accruing from sales alone. As such they were viable over all aggregates of revenue, in at least the short run.

Average total costs of fishing also tended to decrease as production increased (Table 7). The average total costs of the 0 - 2000 and 2000 - 4000 kg. classes exceeded revenues available from all aggregates of revenue thereby precluding long run viability (Table 8).

TABLE 7

Production Intervals Average Total Costs

Production Intervals (Kgs.)	Number of Enterprises	Total Costs (\$)	Total Production (Kgs.)	Average Total Costs (\$/Kg.)
0 - 2000	13	30,757.87	12,109	2.5401
2000 - 4000	6	29,590.80	18,688	1.5834
4000 - 6000	5	30,457.87	23,702	1.3455
6000 - 8000	1	6,201.78	6,642	.9337
8000 - 10000	2	15,986.88	16,840	.8690
10000 - 12000	1	11,576.48	11,556	1.0018
Totals	28	124,576.88	89,537	1.3913

The average total cost of the 4000 - 6000 kg. class exceeded revenues available from from the sales only and sales plus freight subsidization aggregates. The addition of the SILCFA subsidy to average revenues, however, caused them to exceed the average total costs of this level of production. Average total costs of the 6000 - 8000, 8000 - 10,000, and 10,000 - 12,000 kg. intervals were greater than average

TABLE 8

Production Intervals: Long Run Viability

Production Intervals	Sales Alone	Sales + Freight Subsidy	Sales + Freight Subsidy + SILCFA Subsidy
0 - 2000	NO	NO	NO
2000 - 4000	NO	NO	NO
4000 - 6000	NO	NO	YES
6000 - 8000	NO	YES	YES
8000 - 10000	NO	YES	YES
10000 - 12000	NO	YES	YES

revenues available from sales only but were less than the sales and freight subsidy and total revenue aggregates.

The revenues available from all components, therefore, were insufficient to meet the total operating costs of the two lowest production intervals. All components were required to surpass average total costs of the 4000 - 6000 kg. interval. None of the interval average total costs were sufficiently low so as to not require any form of subsidy. The three highest production intervals required only a

portion of the provincial freight subsidy, and none of the SILCFA subsidy, to generate average revenues in excess of average total costs.

4.2.4 Economic Viability: Individual Enterprises

Eight of the sampled enterprises generated sufficient revenues from sales to recover their variable costs, allowing them, at least, short run viability (Table 9). These were enterprises Numbers (ranked in order of increasing production) 9, 11, 20, 23, 25, 26, 27 and 28 (see Appendix A). The mean production of these enterprises was 5858.25 kgs.

An additional seven enterprises were able to achieve short run viability on the basis of the second aggregate of revenues - sales and provincial freight subsidization. The fifteen (15) enterprises in this category were, again in order of increasing production, Numbers 9, 11, 12, 13, 15, 17 and enterprises 20 through 28, inclusive. Mean production achieved by these enterprises was 4722.21 kgs.

On the basis of the third revenue of aggregate - total revenues - all except five enterprises were able to recapture their variable costs. Enterprises failing to achieve short run viability were Numbers 1, 2, 3, 6 and 8. The mean production of these enterprises was 539.20 kgs. The mean production of the twenty-three enterprises that did earn revenues in excess of variable costs was 3775.69 kgs.

TABLE 9

Individual Enterprises: Short Run Viability

Enterprise Number and Production (Kgs.)	Sales Alone	Sales + Freight Subsidy	Sales + Freight Subsidy + SILCFA Subsidy
1 136			
2 335			
3 424			
4 504			*
5 823			*
6 835			
7 900			*
8 966			
9 1146	*	*	*
10 1271			*
11 1551	*	*	*
12 1583		*	*
13 1635		*	*
14 2175			*
15 2473		*	*
16 2692			*
17 3705		*	*
18 3707			*
19 3936			*
20 4159	*	*	*
21 4453		*	*
22 4893		*	*
23 4972	*	*	*
24 5225		*	*
25 6642	*	*	*
26 8357	*	*	*
27 8483	*	*	*
28 11556	*	*	*

None of the sampled enterprises were able to generate enough revenue from sales alone to offset their total costs (Table 10).

TABLE 10

Individual Enterprises: Long Run Viability

Enterprise Number and Production (Kgs.)	Sales Alone	Sales + Freight Subsidy	Sales + Freight Subsidy + SILCFA Subsidy
1	136		
2	335		
3	424		
4	504		
5	823		
6	835		
7	900		
8	966		
9	1146		*
10	1271		
11	1551		
12	1583		
13	1635		
14	2175		
15	2473		
16	2692		
17	3705		*
18	3707		*
19	3936		
20	4159	*	*
21	4453		*
22	4893		*
23	4972		*
24	5225		*
25	6642	*	*
26	8357	*	*
27	8483	*	*
28	11556	*	*

With the inclusion of the freight subsidy five of the sampled enterprises achieved long run viability. These were enterprises 20, 25, 26, 27 and 28. Mean production generated by this group was 7839.4 kgs. The average net operating profit, prior to the addition of the SILCFA subsidy, was \$599.46 or \$.0765/kg.

Total revenues allowed for 12 enterprises to achieve long run viability. These were enterprises 9, 17, 18 and 20 through 28, inclusive. Mean production generated by this group was 5,608.2 kgs. Average net operating profit was \$1942.07 or \$.3463/kg.

4.3 INDEXATION OF OUTLYING LAKES

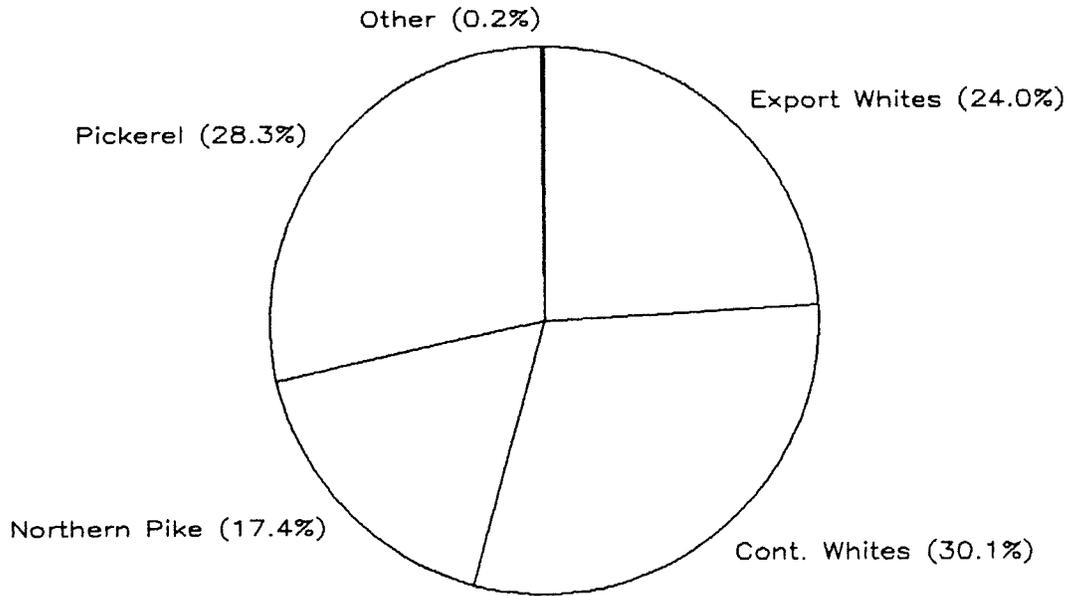
The thirty-four (34) outlying lakes fished by South Indian Lake fishermen during 1985 were surveyed for cost and revenue information. The normal costs of fishing were based on the Southern Indian Lake fishery sample (section 4.2.2) and transportation costs were based on provincial government Fishery Branch information. Sales revenues were based on a three year average product and species mix applied to the 1985 initial price and final payment as estimated in section 3.2.1.

4.3.1 Weighted Average Revenues

The weighted average sales revenue, over all outlying lakes, was \$1.0422/kg. as compared to \$.9178/kg. from Southern Indian Lake. The higher average revenue is due to a more valuable product species mix (Figure 6).

Freight subsidy mean average revenues were also higher than those of Southern Indian Lake - averaging \$.1812/kg. as compared to \$.1717/kg. In that the provincial freight

SOUTHERN INDIAN LAKE 1985



OUTLYING LAKES 1983 - 1985

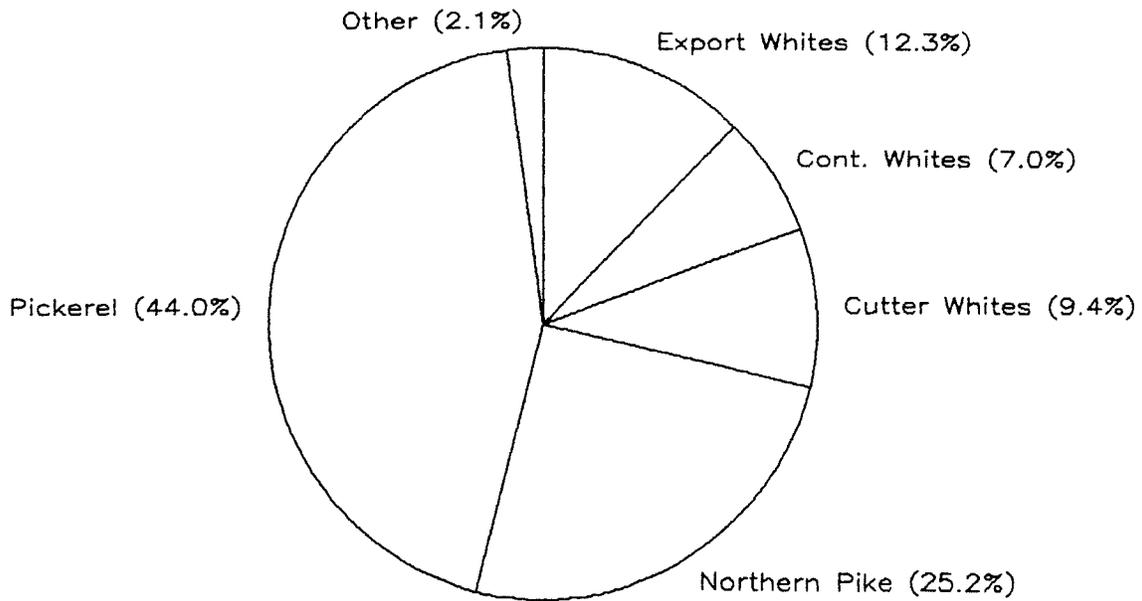
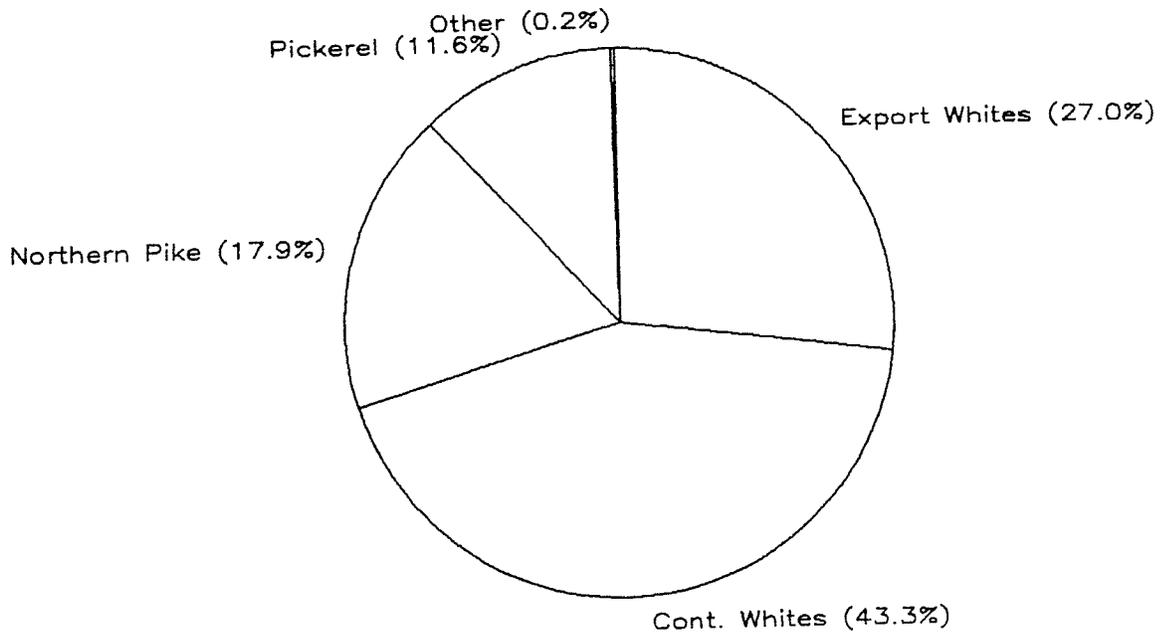


Figure 6: Components of Sales Revenue - Southern Indian and Outlying lakes

subsidy does not apply to pickerel or cutter whitefish production, which together account for 43.2% of outlying lake production and only 11.59% of Southern Indian production, (Figure 7) the \$.0095/kg. difference does not completely reflect the higher transportation costs associated with fishing outlying lakes.

The 1985 SILCFA subsidy program allocated a fixed rate of \$.8379/kg. to be paid on production of all species from all outlying lakes. Weighted average revenue and cost information for outlying lakes is summarized in Table 11

SOUTHERN INDIAN LAKE 1985



OUTLYING LAKES 1983 - 1985

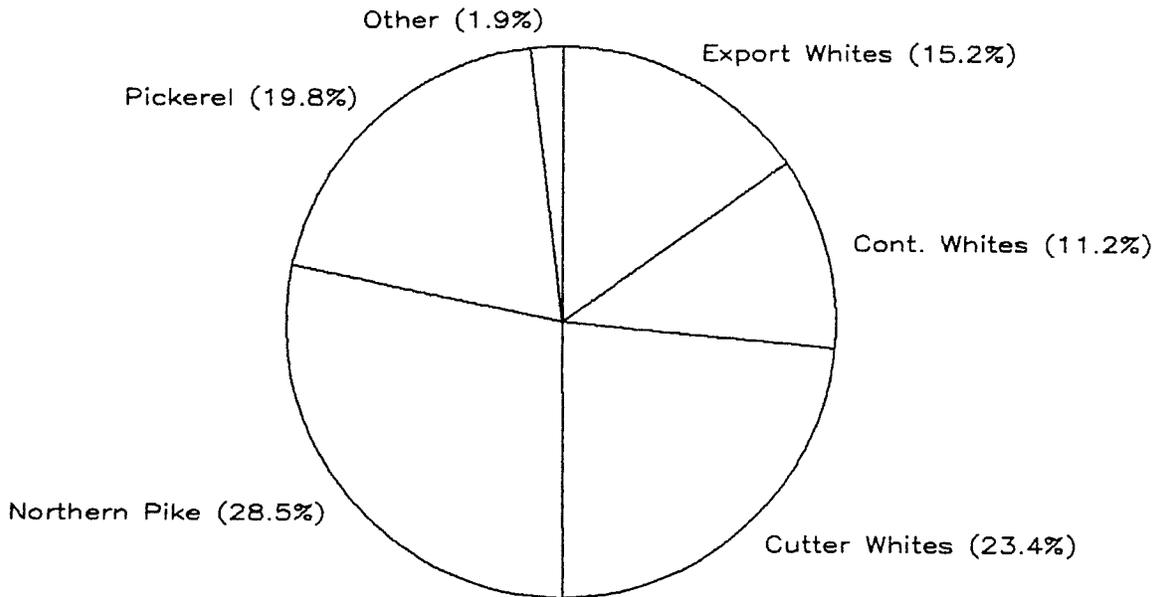


Figure 7: Components of Production - Southern Indian and Outlying lakes

TABLE 11

Outlying Lakes: Weighted Average Revenues and Costs

Revenues	
Sales only	\$1.0422/kg.
Freight Subsidy	\$.1812/kg.
SILCFA Subsidy	\$.8379/kg.
Total Average Revenues	\$2.0613/kg.
Costs	
Total Variable Costs	\$1.2215/kg.
Semi Variable and Fixed	\$.4184/kg.
Total Operating Costs	\$1.6399/kg.
Operating Profit	\$.4214/kg.

4.3.2 Weighted Average Costs

The weighted mean unit transportation cost, over all lakes, was \$.4061/kg. The weighted mean average variable cost, over all outlying lakes, was estimated to be \$1.2215/kg. (\$.9729/kg. (average total variable cost as per Southern Indian Lake) - \$.1575/kg. (unit transportation costs, Southern Indian to Leaf Rapids) + \$.4061/kg.

(weighted mean unit transportation costs, outlying lakes to Leaf Rapids)). The weighted mean average total operating costs of fishing outlying lakes was estimated to be \$1.6399/kg. (\$1.3913/kg. (average total operating costs as per Southern Indian Lake) - \$.1575/kg. (average transportation costs, Southern Indian to Leaf Rapids) + \$.4061/kg. (weighted mean unit transportation costs, outlying lakes to Leaf Rapids)).

The combined weighted mean average revenues of the sales and freight subsidy components was \$1.2234/kg. This was marginally greater than the average variable costs of \$1.2215/kg. and, as such, allowed for short run economic viability. With the addition of the \$.8379/kg. SILCFA subsidy the weighted mean average total revenues exceeded the average total operating costs allowing for long run economic viability.

4.3.3 Economic Viability: Individual Lakes

On the basis of the sales only component of revenue five lakes generated revenues in excess of the normal variable costs of fishing plus the costs of transporting the fish from the particular lake to Leaf Rapids. These lakes were Gauer, Leclair, Melvin, North Leclair and Opachuanau (Table 12) Average sales revenue from these lakes was considerably greater than the weighted mean from all outlying lakes - \$1.4308/kg. as compared to \$1.0422/kg. As well, the weighted

TABLE 12

Individual Outlying lakes - Average Costs and Revenues

Name of Lake	Species Product Mix Average *				Total Revenues (\$/Kg)	Normal Fishing Costs (\$/Kg)	Net Trans Costs (\$/Kg)	Total Costs (\$/Kg)	Net Revenues (\$/Kg)
	1985 Production (Kgs)	1985 Price (\$/Kg)	Freight Subsidy (\$/Kg)	SILCFA Subsidy (\$/Kg)					
	Ashley	2258	\$0.836	\$0.350					
Barrington	36357	\$0.822	\$0.124	\$0.838	\$1.783	\$1.234	\$0.320	\$1.554	\$0.230
Buckland	1305	\$0.871	\$0.350	\$0.838	\$2.059	\$1.234	\$0.670	\$1.904	\$0.155
Chapman	1004	\$1.058	\$0.147	\$0.838	\$2.042	\$1.234	\$0.400	\$1.634	\$0.409
Chipewyan	6696	\$1.159	\$0.254	\$0.838	\$2.251	\$1.234	\$0.590	\$1.824	\$0.427
Denison	11311	\$0.705	\$0.041	\$0.838	\$1.584	\$1.234	\$0.580	\$1.814	(\$0.230)
Dickinson	10126	\$0.666	\$0.111	\$0.838	\$1.615	\$1.234	\$0.350	\$1.584	\$0.031
Enatick	5443	\$0.764	\$0.114	\$0.838	\$1.716	\$1.234	\$0.370	\$1.604	\$0.112
Fidler	1956	\$0.882	\$0.350	\$0.838	\$2.070	\$1.234	\$0.580	\$1.814	\$0.256
Float	982	\$0.974	\$0.279	\$0.838	\$2.090	\$1.234	\$0.300	\$1.534	\$0.557
Gauer	38016	\$1.502	\$0.160	\$0.838	\$2.500	\$1.234	\$0.400	\$1.634	\$0.867
Issett	2880	\$0.688	\$0.100	\$0.838	\$1.625	\$1.234	\$0.220	\$1.454	\$0.172
Jordon	5242	\$1.415	\$0.195	\$0.838	\$2.448	\$1.234	\$0.650	\$1.884	\$0.564
Kapeetaukimuk	1985	\$0.717	\$0.042	\$0.838	\$1.597	\$1.234	\$0.510	\$1.744	(\$0.147)
Kasik	3110	\$0.757	\$0.154	\$0.838	\$1.749	\$1.234	\$0.610	\$1.844	(\$0.095)
Leclair	3262	\$1.251	\$0.136	\$0.838	\$2.225	\$1.234	\$0.400	\$1.634	\$0.591
Mackerracher	10769	\$0.532	\$0.054	\$0.838	\$1.424	\$1.234	\$0.410	\$1.644	(\$0.220)
McFadden	497	\$0.926	\$0.280	\$0.838	\$2.046	\$1.234	\$0.280	\$1.514	\$0.532
McPherson	8087	\$0.690	\$0.350	\$0.838	\$1.878	\$1.234	\$0.580	\$1.814	\$0.064
Melvin	13756	\$1.353	\$0.091	\$0.838	\$2.282	\$1.234	\$0.360	\$1.594	\$0.688
Moss	1185	\$0.671	\$0.081	\$0.838	\$1.590	\$1.234	\$0.470	\$1.704	(\$0.114)
North Indian	9375	\$1.202	\$0.267	\$0.838	\$2.307	\$1.234	\$0.500	\$1.734	\$0.573
North Leclair	4576	\$1.876	\$0.101	\$0.838	\$2.809	\$1.234	\$0.530	\$1.764	\$1.045
Opachuanau	23437	\$1.257	\$0.145	\$0.838	\$2.240	\$1.234	\$0.200	\$1.434	\$0.806
Partridge Breast	3716	\$0.950	\$0.318	\$0.838	\$2.106	\$1.234	\$0.400	\$1.634	\$0.472
Pine	4574	\$0.920	\$0.331	\$0.838	\$2.089	\$1.234	\$0.440	\$1.674	\$0.415
Rusty	5570	\$0.872	\$0.219	\$0.838	\$1.929	\$1.234	\$0.200	\$1.434	\$0.495
JYSpence	1984	\$0.975	\$0.288	\$0.838	\$2.101	\$1.234	\$0.510	\$1.744	\$0.357
Stony	1843	\$0.921	\$0.091	\$0.838	\$1.850	\$1.234	\$0.200	\$1.434	\$0.416
Thorseinson	13714	\$0.918	\$0.333	\$0.838	\$2.089	\$1.234	\$0.410	\$1.644	\$0.445
Torrance	1026	\$1.022	\$0.127	\$0.838	\$1.987	\$1.234	\$0.400	\$1.634	\$0.353
Uhlman	14573	\$1.049	\$0.301	\$0.838	\$2.188	\$1.234	\$0.510	\$1.744	\$0.444
Waddie	4318	\$0.820	\$0.324	\$0.838	\$1.982	\$1.234	\$0.400	\$1.634	\$0.349
Why	4062	\$0.771	\$0.335	\$0.838	\$1.944	\$1.234	\$0.520	\$1.754	\$0.190
Totals	258995	\$269,934	\$46,930	\$217,012	\$533,876	\$319,548	\$105,167	\$424,715	\$109,160
\$/Kg.		\$1.0422	\$0.1812	\$0.8379	\$2.0613	\$1.2338	\$0.4061	\$1.6399	\$0.4215

average transportation costs for these lakes was \$.3494/kg. against the overall weighted mean of \$.4061/kg.

With the addition of the freight subsidy unit of revenue, an additional eight lakes were able to achieve average revenues in excess of average variable costs. These were Lakes Chipewyan, Float, Jordon, McFadden, North Indian, Partridge Breast, Thorsteinson and Uhlman. Weighted average revenues from the sales and freight subsidy aggregate from these lakes was \$1.4835/kg. compared to \$1.2234 for all outlying lakes. Weighted average transportation costs for these lakes, conversely, was greater for these lakes (\$.4332/kg.) than that of all outlying lakes (\$.4061/kg.).

With the addition of the SILCFA subsidy the average total revenues exceeded the average variable costs of all outlying lakes.

Long run economic viability requires that average revenues exceed average total operating costs. Average total operating costs were assumed to be equal to that of Southern Indian Lake with the exception of the transportation cost component. Average total costs, therefore, were \$1.2338/kg. plus the unit transportation cost.

One lake, North Leclair, generated average revenues from sales in excess of average total operating costs. North Leclair Lake produced average revenues from sales of \$1.874/kg against average total costs of \$1.7638/kg.

On the basis of sales and freight subsidy aggregate, two lakes, North Leclair and Gauer, achieved average revenues in excess of average total operating costs, Weighted average sales and freight subsidy revenues from these two lakes was \$1.7094/kg. Weighted average transportation costs were marginally greater than the over all mean (\$.4199/kg. against \$.4061/kg.).

The average total revenues exceeded average total operating costs in all but five lakes. These were Lakes Denison, Kapeetaukimak, Kasik, Mackereracher and Moss. Weighted average total revenues from these lakes was \$1.5085/kg. as compared to the overall weighted average of \$2.0613/kg. These lakes produced a much higher weighted proportion of cutter whitefish (77.12%) than the overall outlying lake proportion of 23.44%. As well the weighted average costs of transportation from these lakes was \$.4737/kg. or \$.0676/kg. higher than the overall mean.

Chapter V
DISCUSSION

5.1 INTRODUCTION

The results of the previous chapter indicated that in order for the Southern Indian Lake and outlying lakes fisheries to achieve long run economic viability substantial subsidization was required. The extent of the subsidization that occurred during the 1985 program, however, was not sustainable given the interest revenue received on the fund. Assuming that estimates made in the research regarding future interest rates prove to be reasonably accurate a reduction in annual expenditures is required if the fund and subsidy program are to be continued.

While the SILCFA is under no formal obligation to perpetuate the capital fund, the membership have decided to do so. At a meeting of the membership on May 27, 1986 a motion was put forward limiting 1986 expenditures to less than expected annual interest revenues. The motion carried with no dissenting votes.

The following sections will examine and discuss the implications of a reduction in subsidy expenditures of the magnitude approved by the SILCFA. The discussion will be

limited to effects on the long run viability of the fishery as this is the normal time horizon - except under such circumstance as anticipated retirement - of an enterprise. As well, the discussion assumes that the total amount and timing of production by individual enterprises would occur exactly as it did during the 1985 season. While, in fact, the availability and magnitude of the subsidy, most likely did have some effect on production, this assumption is useful in illustrating the impact of the subsidy on economic viability.

5.2 PROPOSED 1986 SUBSIDY PROGRAM

The proposed 1986 subsidy program differs from the 1985 and other previous programs in several aspects, the most important being that total expenditures are both reduced and predetermined. Total expenditures are not to exceed \$130,000.00. This amount would require an annual interest rate of 7.56% in order to sustain the present balance. Other proposed changes and features of the program are:

- Cutter whitefish production would no longer receive subsidy. Initial prices for cutter whitefish for 1986 as established by the FFMC are \$.243/kg. In that cutter whitefish production is also not subsidized under the Manitoba Freight Assistance Program it was considered too unprofitable to continue subsidy during 1986. Cutter whitefish production accounted for 23.4% of the

total outlying lake production of 258,995 kgs. Total subsidy expenditures on cutter whitefish production amounted to \$50,781.

- Southern Indian Lake production will be subsidized to a maximum of 181,416 kgs. Outlying lake production will be subsidized to a maximum of 113,379 kgs. These changes represent reductions of 26.8% and 56.2%, respectively, from 1985.
- Outlying lakes production will be subsidized at an average rate of of 40% more than that of Southern Indian Lake. In addition, the subsidy rates of outlying lakes will be such that all transportation costs borne by the producer will be offset by the program. As such, all lakes are assigned individual SILCFA subsidy rates reflecting different transportation costs. Outlying lake production will be subsidized an average rate of \$.5336/kg. The average transportation cost, paid by fishermen, from the outlying lakes during 1985 was \$.4379/kg. leaving an average residual of \$.0956/kg. paid on the specified amount of production from all lakes. This rate of subsidization represents a reduction of 36.3% from the 1985 program.
- Southern Indian Lake production, to the maximum subsidized amount, will receive a rate of \$.3808/kg. This rate represents a reduction of 21.3% from the 1985 program.

The proposed subsidy rates are confined to the first 181,416 kgs. from Southern Indian Lake and 113,379 kgs. from outlying lakes. This is likely to compel fishermen to compete for available subsidy and, as such, preclude them from timing their fishing activities exclusively on the basis of their perceptions of the most favorable conditions. This, possibly negative, characteristic of the program was considered necessary due to the effort required to administer a program that would ensure the availability of a limited amount of subsidy throughout the fishing season.

5.3 SOUTHERN INDIAN LAKE FISHERY

The following sections consider the ramifications of the proposed 1986 subsidy program by examining the impact the program would have had on the sampled enterprises of the 1985 fishery. The discussion considers the changes to economic viability that would have occurred to the sample aggregate, production intervals and individual enterprises.

5.3.1 Sample Aggregate

The 1986 proposal allows for 181,416 kgs. of subsidized production from Southern Indian Lake. Assuming that the sample was representative of the fishery in terms of the timing of production, 65,547 kgs. of production would have been realized by the sampled enterprises and subsidized at a rate of \$.3808/kg. At this point in time the maximum amount

of subsidy would have been allocated and thereafter the remaining 23,990 kgs. produced by the sampled enterprises would have received no subsidy. This would result in an overall average rate of subsidization of \$.2788/kg. This blending of subsidized and unsubsidized production and the resultant overall rate of subsidy is illustrated for both the population of Southern Indian Lake enterprises and the selected sample enterprises in Table 13

Average total revenues, based on 1985 production and the reduced rate and maximum amount of subsidized production would be \$1.3683/kg. or \$.1408/ kg. less than that of 1985. Total average operating costs during 1985 were \$1.3913/kg. and, therefore, the sample aggregate would no longer be economically viable in the long run. The average operating loss would be \$.023/kg.

TABLE 13

Maximum Subsidized Production and Resultant Subsidy Rate

Population		
	Total Production	247,814 kgs.
X	Subsidized Production	181,416 kgs.
	Subsidy Rate	\$.3808/ kg.
=	Total Subsidy	\$69,083.
X	Unsubsidized Production	66,398 kgs.
	Subsidy Rate	\$0.00/ kg.
=	Total Subsidy	\$0.00
	Resultant Subsidy Rate = \$69,083./247,814 kgs. =	\$.2787/kg.
Sample		
	Total Production	89,537 kgs.
X	Subsidized Production	65,547 kgs.
	Subsidy Rate	\$.3808/kg.
=	Total Subsidy	\$24,960.
X	Unsubsidized Production	23,990 kgs.
	Subsidy Rate	\$0.00/kg.
=	Total Subsidy	\$0.00
	Resultant Subsidy Rate \$24,960./ 89,537 =	\$.2787/kg.

5.3.2 Production Intervals

Carrying the assumption regarding the timing of production to the various intervals of production - i.e. the same proportion of production would be caught during the availability of subsidy by enterprises of all intervals - results in no changes occurring to the long run economic viabilities as a result of the decrease in subsidy revenues.

The average total costs of the 4000 - 6000, 6000 - 8000, 8000 - 10,000 and 10,000 - 12,000 kgs intervals would continue to be less than the average total revenues of \$1.3683/kg. Average operating losses of the 0 - 2000 and 2000 - 4000 kg. intervals would increase by the amount which subsidy revenues were decreased as a result of the reduced amount and rate of subsidy - \$.1408/kg.

5.3.3 Individual Enterprises

By hypothetically reducing the subsidy received by the individual enterprises to account for the proposed reductions in subsidy rates and amount of production subsidized, it is possible to estimate the effect the reduction would have on individual enterprises. The reduction was again carried out on the assumption that all individual enterprises achieved the same proportion of production during the availability of subsidy.

Of the twelve (12) enterprises that were able to achieve economic viability on the basis of all components of revenue ten (10) would have remained viable despite the reduction in subsidy revenue. The two enterprises that would have been unable to achieve long run viability given this rate and amount of subsidy were enterprises 17 and 18. Enterprises 9 and 20 through 28 inclusive retained their viable status.

5.3.4 Summary

The 1985 subsidy program allowed for the the sample aggregate to achieve long run viability. The rate and amount of production subsidized according to the proposed 1986 program did not allow for aggregate viability. The 1986 program had considerably less impact on the viability of individual enterprises or enterprises grouped according to production intervals. No changes would be expected to occur to the viability of enterprises grouped according to production intervals. Individual enterprises able to achieve economic viability were reduced from twelve (12) to ten (10).

The above was due, in large part, to the high proportion of enterprises that displayed relatively low production. These enterprises constituted the large majority of those that were unable to achieve economic viability despite the subsidy program. Nearly one - quarter (24.52%) of the total amount of subsidy paid to the sampled enterprises during

1985 accrued to these enterprises. These payments reduced economic losses incurred by these enterprises and, therefore, assisted in the aggregate achieving viability. The lower average costs displayed by the enterprises achieving larger amounts of production and economic viability were such that the reduced subsidy revenues had less significant impact.

5.4 OUTLYING LAKES

The proposed 1986 subsidy program undertakes to subsidize production from outlying lakes according to the transportation costs incurred by fishermen in delivering fish to Leaf Rapids plus a smaller residual amount. The subsidy plan also limits the total amount of production on which subsidy will be paid.

The following sections will determine the impacts these conditions would have had on the viability of fishing outlying lakes according to the conditions that prevailed during 1985. This assumption ignores the effect that the availability and magnitude of subsidy had on fishing activity in order to illustrate its impact on economic viability. A further assumption regarding the timing of production, similar to that employed in the analysis of the Southern Indian Lake fishery, is also employed in this analysis and, therefore, production from all outlying lakes is assumed to consist of constant proportions of subsidized and unsubsidized production.

5.4.1 Weighted Average Costs and Revenues

The major changes of the proposed 1986 program as they pertain to outlying lakes are the reduced rate and amount of production subsidized and the curtailment of subsidy on cutter whitefish production. While the average rate of subsidy proposed to occur in 1986 is 36% lower than the rate applied across all lakes during 1985, the average rate applied in this analysis is significantly lower again. This is due to the proposed condition that the total amount subsidized is not to exceed 113,379 kgs. while in 1985 subsidy was paid on 258,995 kgs. Of this amount 59,980 kgs. were cutter whitefish. The comparable amount of 1985 production applied to the analysis, therefore, is 199,015 kgs. It is assumed that cutter whitefish production will approximate the three year average of 23.4% but in the absence of subsidization the post-capture unit costs of ice and transportation exceed average revenues and, therefore, it is unlikely to be shipped except perhaps in order to utilize otherwise wasted aircraft cargo capacity (R.Hay, pers.comm.). The blend of subsidized and unsubsidized production results in the overall average rate of subsidy being less than the rate paid on subsidized production.

The changes proposed in the 1986 program cause changes to occur to all components of revenue. Average sales revenues and freight subsidy revenues increase due to the curtailment of cutter whitefish production. SILCFA subsidy revenue decreases as per the proposed program. (Table 14).

TABLE 14

Weighted Mean Unit Revenues: Outlying lakes 1986 Subsidy Program

Revenues	
Sales only	\$1.0546/kg.
Freight Subsidy	\$.2520/kg.
SILCFA Subsidy	\$.3043/kg.
Total Unit Revenues	\$1.6110/kg.
Total Operating Costs	\$1.6399/kg.
Total Operating Loss	\$0.0289/kg.

Total unit revenues, according to the hypothesized situation, above, are less than the total unit operating costs of \$1.6399/kg. The outlying lakes, on aggregate, therefore would no longer be economically viable.

5.4.2 Individual Lakes

Based on 1985 production values and the conditions of the proposed 1986 subsidy program seven of the outlying lakes demonstrated viability as compared to twenty-nine (29) in

1985. These lakes were Gauer, Jordon, Leclair, Melvin, North Indian, North Leclair and Opachuanau. This information is presented in Table 15. The weighted mean unit revenues from sales from these lakes was \$1.3676/kg. Net transportation costs to fishermen averaged \$0.3743/kg. or \$0.0352/kg. less than the overall weighted mean. Because the proposed SILCFA subsidy, and to a lesser extent the provincial freight subsidy, are based on transportation costs, they too were lower than the overall means of \$0.2380 and \$0.1835/kg., respectively.

TABLE 15
Proposed 1986 SILCFA Subsidy Program: Outlying Lakes

Name of Lake	Species Product Mix Average #	1985 Price (\$/Kg)	Freight Subsidy (\$/Kg)	SILCFA Subsidy (\$/Kg)	Total Revenues (\$/Kg)	Normal	Net	Total Costs (\$/Kg)	Net Revenues (\$/Kg)
						Fishing Costs (\$/Kg)	Trans Costs (\$/Kg)		
Ashley	2258	\$0.836	\$0.350	\$0.437	\$1.623	\$1.234	\$0.640	\$1.874	(\$0.251)
Barrington	17633	\$0.609	\$0.301	\$0.253	\$1.163	\$1.234	\$0.320	\$1.554	(\$0.390)
Buckland	1305	\$0.871	\$0.350	\$0.454	\$1.675	\$1.234	\$0.670	\$1.904	(\$0.229)
Chapman	666	\$0.919	\$0.265	\$0.299	\$1.483	\$1.234	\$0.400	\$1.634	(\$0.151)
Chipewyan	6696	\$1.159	\$0.254	\$0.406	\$1.821	\$1.234	\$0.590	\$1.824	(\$0.003)
Denison	2760	\$0.393	\$0.306	\$0.402	\$1.101	\$1.234	\$0.580	\$1.814	(\$0.713)
Dickinson	3736	\$0.406	\$0.331	\$0.270	\$1.006	\$1.234	\$0.350	\$1.584	(\$0.576)
Enatick	2340	\$0.530	\$0.314	\$0.282	\$1.125	\$1.234	\$0.370	\$1.604	(\$0.479)
Fidler	1956	\$0.882	\$0.350	\$0.402	\$1.635	\$1.234	\$0.580	\$1.814	(\$0.179)
Float	982	\$0.974	\$0.279	\$0.242	\$1.494	\$1.234	\$0.300	\$1.534	(\$0.040)
Gauer	35051	\$1.470	\$0.187	\$0.299	\$1.956	\$1.234	\$0.400	\$1.634	\$0.323
Issett	1359	\$0.470	\$0.231	\$0.196	\$0.897	\$1.234	\$0.220	\$1.454	(\$0.557)
Jordan	4969	\$1.394	\$0.213	\$0.442	\$2.049	\$1.234	\$0.650	\$1.884	\$0.165
Kapeetaukimuk	500	\$0.409	\$0.304	\$0.362	\$1.074	\$1.234	\$0.510	\$1.744	(\$0.669)
Kasik	1586	\$0.555	\$0.326	\$0.419	\$1.300	\$1.234	\$0.610	\$1.844	(\$0.543)
Leclair	2401	\$1.142	\$0.228	\$0.299	\$1.669	\$1.234	\$0.460	\$1.634	\$0.035
Mackererracher	1906	\$0.193	\$0.342	\$0.305	\$0.839	\$1.234	\$0.410	\$1.644	(\$0.805)
McFadden	497	\$0.928	\$0.280	\$0.230	\$1.438	\$1.234	\$0.280	\$1.514	(\$0.076)
McPherson	8087	\$0.690	\$0.350	\$0.402	\$1.442	\$1.234	\$0.580	\$1.814	(\$0.372)
Melvin	9574	\$1.228	\$0.197	\$0.276	\$1.701	\$1.234	\$0.360	\$1.594	\$0.107
Moss	1185	\$0.386	\$0.323	\$0.339	\$1.048	\$1.234	\$0.470	\$1.704	(\$0.656)
North Indian	9375	\$1.202	\$0.267	\$0.356	\$1.826	\$1.234	\$0.500	\$1.734	\$0.092
North Leclair	4576	\$1.870	\$0.899	\$0.373	\$2.343	\$1.234	\$0.530	\$1.764	\$0.579
Opachuanau	23437	\$1.257	\$0.145	\$0.184	\$1.586	\$1.234	\$0.200	\$1.434	\$0.153
Partridge Breast	3716	\$0.950	\$0.318	\$0.299	\$1.567	\$1.234	\$0.400	\$1.634	(\$0.067)
Pine	4574	\$0.920	\$0.331	\$0.322	\$1.573	\$1.234	\$0.440	\$1.674	(\$0.101)
Rusty	5570	\$0.872	\$0.219	\$0.184	\$1.275	\$1.234	\$0.200	\$1.434	(\$0.159)
JYSpence	1984	\$0.975	\$0.288	\$0.362	\$1.625	\$1.234	\$0.510	\$1.744	(\$0.119)
Stony	1095	\$0.754	\$0.182	\$0.184	\$1.120	\$1.234	\$0.200	\$1.434	(\$0.313)
Thorseinson	13714	\$0.918	\$0.333	\$0.305	\$1.555	\$1.234	\$0.410	\$1.644	(\$0.089)
Torrance	610	\$0.855	\$0.269	\$0.299	\$1.423	\$1.234	\$0.400	\$1.634	(\$0.211)
Uhlman	14537	\$1.049	\$0.301	\$0.362	\$1.712	\$1.234	\$0.510	\$1.744	(\$0.031)
Waddie	4318	\$0.820	\$0.324	\$0.299	\$1.443	\$1.234	\$0.400	\$1.634	(\$0.191)
Why	4062	\$0.771	\$0.335	\$0.368	\$1.474	\$1.234	\$0.520	\$1.754	(\$0.280)
Totals	199015	\$209,890	\$50,159	\$60,567	\$320,616	\$245,545	\$81,493	\$327,038	(\$6,422)
\$/Kgs.		\$1.0546	\$0.2520	\$0.3043	\$1.6110	\$1.2338	\$0.4095	\$1.6433	(\$0.0323)

5.4.3 Summary

The conditions of the 1986 SILCFA subsidy program propose to reduce the rate of subsidy by 36.3% and the amount of production subsidized by 56.2%. These conditions will result in a decrease in expenditures of \$156,445 from those of 1985. It is not surprising, therefore, that the the most profound changes expected will occur within the outlying lakes fishery.

Chapter VI

CONCLUSIONS AND ALTERNATIVE APPROACHES

6.1 CONCLUSIONS

The results of the research have shown that the 1985 Southern Indian and outlying lakes fisheries required considerable subsidization in order to achieve economic viability. In the case of the sampled enterprises of the Southern Indian Lake fishery the research indicated that twelve (12) of the twenty-eight (28) enterprises were able to achieve long run viability with the inclusion of the freight and SILCFA subsidies. Unfortunately, in spite of receiving 25% of the total subsidy expenditures sixteen (16) of the enterprises remained economically unviable. These enterprises were generally characterized by low production volumes. This situation suggests that a minimum level of harvest is required, in addition to subsidization, if total costs are to be covered. In the case of the outlying lakes fisheries that with the inclusion of the freight and SILCFA subsidies average total revenues exceeded average total costs on twenty-nine (29) of thirty-four (34) lakes. In this regard, inspite of receiving 11% of the subsidy expended on outlying lakes, average total costs exceeded average total revenues, inclusive of subsidy, on five lakes. This

situation suggests that these lakes are beyond the margin of economic viability.

It would appear that the subsidy rate of \$.484/kg. for Southern Indian Lake in 1985 was insufficient to permit all enterprises, regardless of production volumes, to cover their total costs. Similarly, the subsidy rate of \$.838/kg. was insufficient to cover total costs on all lakes. Further, attempts to increase subsidy rates to cover costs, regardless of the level of production or lake fished, would quickly dissipate, even further, the principle upon which the subsidy programs are based.

The proposed conditions of the 1986 program applied to the 1985 production, revenue and cost data of the sampled enterprises resulted in relatively minor changes to individual economic viability. The larger reductions in outlying lake subsidization caused somewhat more significant changes. In either case individuals operating enterprises will have to contend with reduced unit revenues.

Any conclusions drawn from research pertaining to a traditional economic activity such as the Southern Indian Lake commercial fishery must consider the perceptions and attitudes of the individuals involved. The principle of generating maximum profits is central to the micro-economic theory of the firm. Whether such a principle is central to all individuals operating within the traditional commercial

fishery is questionable, if unlikely. Benefits accruing to participants in the fishery such as income-in-kind from the domestic consumption of fish, non-fishing use of skiffs and eligibility for unemployment insurance benefits tend to reduce the importance of economic profits as a criteria in the individuals decision as to whether or not to continue fishing operations.

The traditional activity of partaking in the commercial fishery acts to reinforce the social structure of the community. As such, the perpetuation of a capital fund that provides a reduced amount of revenue for the subsidization of the fishery would appear to be preferable to one, such as that of 1985, that provide larger amounts of subsidy at the expense of future availability. The conditions proposed under the 1986 program appear to be an important and necessary first step.

It is important to note that the intention to perpetuate the capital fund for the purposes of the subsidization of fishing activities has considerable implications regarding the purchasing power of funds in future years. If subsidization in future years is to be of the same magnitude as that of the 1986 program the integrity of the capital fund and the interest revenues received thereon must be protected so that future subsidy programs are able to provide the same level of subsidy in real dollars and not merely nominal dollars. The implication, therefore, is that

only the revenues from the capital fund that represent the time value of money - that is the difference between the interest rate received on the fund and the inflation rate - are in fact available for subsidy in any particular year. The continued expenditure of the total annual interest revenues will result in a capital fund maintained in nominal dollars but eroded by inflation so that the real value of the subsidy may be far less than at present. This reality may restrict the number of options available to the SILCFA given their expressed desire to perpetuate the fund.

The SILCFA have implied two objectives through the proposed 1986 program; firstly that the fund be perpetuated and secondly that subsidy be made available to all participants in the fishery. The following sections will briefly discuss alternatives to the second objective.

6.2 ALTERNATIVE APPROACHES

The proposed 1986 SILCFA subsidy program will reduce the Southern Indian Lake subsidy rate to \$.3808/kg. In addition the subsidy will be terminated at such time as 181,416 kgs. are realized. Similarly, the rate of subsidy on outlying lakes will be reduced to an average rate of \$.5336/kg. At such time as 113,379 kgs. of production are realized the subsidy will be terminated. These conditions were considered necessary in order to perpetuate the capital fund.

The following sections will briefly examine and discuss alternative approaches to the objective of providing subsidization to all participants in the Southern Indian and outlying lakes fisheries. The alternatives examined represent not only a departure from previous objectives but, as well, somewhat opposite ends of a policy continuum. They are intended, therefore, to provide an initial framework for changes to future programs, if such are considered.

The alternative strategies examined apply to both the Southern Indian and outlying lakes fisheries. The first alternative discussed is a "policy of viability". Under such a policy it might be possible to provide a subsidy only to those enterprises that achieve a minimum level of production on Southern Indian Lake. For the outlying lakes it might be possible to provide a level of subsidy to those lakes that were within the margin of viability, inclusive of the subsidy.

The second alternative discussed might be considered as an "income distribution" policy. Under such a policy it might be possible to limit subsidies to fishing enterprises in the lower production intervals in order that their total costs could be covered. Similarly, the subsidy could be limited only to those lakes requiring a subsidy to cover average total costs.

The above alternative approaches to subsidization are examined on the basis of the conditions that occurred during 1985 and ignores changes that may occur as a result of the conditions of a particular subsidy program.

6.2.1 Viability Alternative

It was noted that during 1985 sixteen (16) sampled enterprises on Southern Indian Lake did not cover total operating costs in spite of receiving 25% of the total subsidy allocated. These enterprises were contained exclusively within the 0 - 2000 and 2000 - 4000 kg. production intervals. This suggests that a minimum level of production is required, in addition to subsidy, in order to achieve economic viability. In order to encourage enterprises to realize a level of production which, at least, approaches that required in order to offset operating costs it might be possible to require an enterprise to achieve a minimum level in order to qualify for subsidy. Based on the 1985 sample a level of 5000 kgs. (the class mark of the lowest viable interval) appears to be a reasonable approximation and is therefore chosen for illustration.

Were all enterprises on Southern Indian Lake to harvest a minimum of 5000 kgs. a subsidy rate of \$.256/kg. would be sufficient to offset the total operating costs of all qualifying enterprises. This rate equals the difference

between the average revenues from sales and freight subsidy and the average total operating costs of the 4000 - 6000 kg. interval.

The sampled enterprises of the 4000 kgs. and above intervals realized 65.6% of the total sample production. If the sample was representative of the population approximately 162,576 kgs. of the total 1985 production of 247,814 kgs. was realized by these enterprises. At a subsidy rate of \$.256/kg. 162,576 kgs. would require total subsidy expenditures of \$41,620. The proposed 1986 program allows for a maximum of 181,416 kgs. at a rate of \$.3808/kg. resulting in total expenditures of over \$69,000. At the lower subsidization rate 269,855 kgs. could be subsidized for the same amount of total expenditures.

The 1985 outlying lakes subsidy program allowed for all but five of the 34 outlying lakes to achieve average revenues in excess of average costs. The conditions of the 1986 program applied to the 1985 fishery indicated that only seven of these lakes would prove to be viable. A subsidy program intended to achieve economic efficiencies would differ from the above programs in that it would restrict subsidy to production on certain lakes only.

Restricting subsidy to production on the seven lakes that can be expected to achieve viability based on the 1986 program would result in total expenditures on subsidization

of \$26,334. paid on 89,383 kgs. The average subsidy, therefore would be \$.294/kg as compared to \$.5336/ kg. as per the 1986 program. Total expenditures on subsidization would be reduced by \$34,165.

Alternatively subsidy could be extended to a greater number of lakes and withheld from those expected to exhibit the largest operating losses. For illustrative purposes the seven lakes expected to produce operating losses in excess of \$.50/kg. are selected. Withholding subsidy from these lakes would result in a reduction in subsidy expenditures of \$4214. Again this money could be used to regenerate the capital fund, or reallocated to subsidize increased production or increased subsidy rates on other more profitable lakes.

6.2.2 Income Distribution Alternative

A program designed to encourage a social objective of distributing income, rather than achieving economic efficiencies, within the primary harvesting sector could provide subsidy to those enterprises or outlying lakes that required it in order to achieve average revenues sufficient to offset average total costs.

In the case of the Southern indian Lake fishery sample the economically unviable enterprises were largely restricted to the 0 - 2000 and 2000 - 4000 kg. production

intervals. In order to assist these enterprises in achieving economic viability a program could be implemented that would provide a subsidy rate equal to the difference between the average variable costs of the two production intervals and the average revenues from sales and freight subsidy. Such a program, therefore, would apply different rates of subsidy to different levels of production. The difference between average total costs and average revenues from sales and freight subsidy of the 0 - 2000 kg. interval was \$1.4506/kg. (\$2.5401 - \$1.0895) and \$.4939/kg. (\$1.5834 - 1.0895) for

TABLE 16

Required Subsidy Rates: Income Distribution Alternative

Production Intervals	Average Total Costs (\$/Kg)	Average Revenues (Sales + Freight) (\$/Kg)	Required Subsidy (\$/Kg)	Total Prod. (Kg)	Total Expenditures (\$)
0 - 2000	2.5401	1.0895	1.4506	12,109	17,565
2 - 4000	1.5834	1.0895	.4939	18,688	9,230
Totals				30,797	26,795

the 2000 - 4000 kg. interval (Table 16).

By limiting subsidy to production from enterprises realizing less than 4000 kgs. expenditures on the 1985 sampled enterprises would be \$26,795. Assuming that the sample was representative of the population in terms of the distribution of production total expenditures would amount to approximately \$74,000.

The obvious deficiency of such a program is that it represents a dissincentive to enterprises to achieve over 4000 kgs of production in that by so doing they would no longer qualify for subsidy. To correct for this the same levels of subsidy would have to be paid to all producers (i.e. \$1.4506/kg. for the first 2000 kgs.; \$.4939/kg. for the next 2000 kgs.). This would result in expenditures on subsidy to sampled enterprises of \$61,796. Applied to the population of 1985 enterprises expenditures would exceed \$171,000. Based on past observations expenditures of this magnitude are clearly not sustainable.

A program intended to encourage income distribution on the outlying lakes might provide a rate of subsidy to each of the outlying lakes that would exactly offset the difference between average total costs and average revenues from sales and freight subsidy.

In order to increase average total revenues of each of the twenty-seven (27) outlying lakes that would fail to generate positive net revenues, according to the conditions

of the proposed 1986 program, to a point where average revenues equal average total costs a subsidy expenditure of \$61,549 would be required. This amount, however, would be partially offset by a reduction in subsidy expenditures on the seven lakes that exhibited positive net revenues. Subsidy in excess of the amount by which average total revenues exceed average total costs in these lakes amounts to \$20,347. The total amount of subsidy required to offset average total costs across all outlying lakes, therefore, would be \$41,202.

6.2.3 Summary

The conditions of the proposed 1986 subsidy program represent a departure from past programs in that the total amount of expenditures are limited. As well subsidy rates under the 1986 program are considerably reduced from 1985. The 1986 program, however, proposes that subsidy continued to be available to all producers.

The research has demonstrated that several of the enterprises active on Southern Indian Lake during 1985 were unable, inspite of subsidization, to achieve economic viability. These enterprises tended to be in the lower production intervals. Similarly several of the outlying lakes generated average revenues from sales and freight subsidy far less than average costs. The amount of subsidy expended during 1985 has also been demonstrated to be beyond

that which can be sustained given the present balance of the capital fund and the range of interest revenues that can be expected to accrue to it.

Alternatives to extending subsidy to all producers and across all of the outlying lakes has been briefly examined. A decision on the part of the SILCFA to adopt any aspects of alternative programs will likely be based on their assessment of the 1986 program. The research suggests that a considerable proportion (64%) of Southern Indian Lake enterprises will experience operating losses and only seven of thirty-four outlying lakes will generate positive net revenues during 1986.

The decision to attach conditions to future subsidy programs in order to achieve an objective requires that some individuals will receive less subsidization than others. This decision would undoubtedly be a difficult one to implement. The research, however, suggests that such a decision may be necessary.

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Appendix A

SAMPLED ENTERPRISES: 1985 INCOME STATEMENTS

Enterprise no.	1	2	3	4
Production (Kgs)	136	335	424	504
Deliveries	1	4	5	8
Revenues				
Sales	\$80.76	\$301.46	\$250.67	\$399.80
Est.Final Payment	\$26.21	\$159.27	\$64.76	\$141.11
[Total Sales Revenue]	\$106.97	\$460.73	\$315.43	\$540.91
MPFS	\$25.76	\$33.67	\$86.89	\$80.01
[Sales+Freight Subsidy]	\$132.73	\$494.40	\$402.32	\$620.92
SILCFA Compensation	\$60.02	\$130.19	\$186.10	\$217.31
Total Revenues	\$192.75	\$624.59	\$588.42	\$838.23
Variable Costs				
Supplies	\$55.40	\$151.47	\$138.15	\$47.48
Labor	\$34.40	\$137.60	\$172.00	\$275.20
Provisions	\$95.98	\$203.23	\$144.56	\$143.33
Transportation	\$24.55		\$76.13	\$13.37
Ice	\$8.18	\$17.75	\$25.37	\$5.17
Fuel	\$96.60	\$133.70	\$206.08	\$129.87
Total Variable Costs	\$315.11	\$643.75	\$762.29	\$614.42
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$4.32	\$7.21	\$7.92	\$9.02
Total Semi-Variable Costs	\$14.32	\$17.21	\$17.92	\$19.02
Gross Operating Profit (Loss)	(\$136.68)	(\$36.37)	(\$191.79)	\$204.79
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$1,622.81	\$1,954.34	\$2,073.59	\$1,926.82
Net Operating Profit (Loss)	(\$1,430.06)	(\$1,329.75)	(\$1,485.17)	(\$1,088.59)

Enterprise no.	5	6	7	8
Production (Kgs)	823	835	900	966
Deliveries	12	10	11	7
Revenues				
Sales	\$523.07	\$460.31	\$500.77	\$516.70
Est.Final Payment	\$324.79	\$277.88	\$230.34	\$144.90
[Total Sales Revenue]	\$847.86	\$738.19	\$731.11	\$661.60
MPFS	\$119.21	\$132.79	\$177.29	\$198.43
[Sales+Freight Subsidy]	\$967.07	\$870.98	\$908.40	\$860.03
SILCFA Compensation	\$322.34	\$325.75	\$387.68	\$424.95
Total Revenues	\$1,289.41	\$1,196.73	\$1,296.08	\$1,284.98
Variable Costs				
Supplies	\$307.28	\$215.54	\$182.04	\$308.19
Labor	\$412.80	\$344.00	\$378.40	\$240.80
Provisions	\$93.67	\$132.85	\$40.08	\$148.07
Transportation	\$146.52	\$134.44	\$158.60	\$173.84
Ice	\$57.99	\$48.42	\$54.60	\$57.95
Fuel	\$161.45	\$331.16	\$259.99	\$365.18
Total Variable Costs	\$1,179.71	\$1,193.56	\$1,073.71	\$1,294.03
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$12.82	\$11.34	\$12.45	\$9.14
Total Semi-Variable Costs	\$22.82	\$21.34	\$22.45	\$19.14
Gross Operating Profit (Loss)	\$86.88	(\$18.17)	\$199.92	(\$28.19)
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$2,495.91	\$2,508.28	\$2,389.54	\$2,606.55
Net Operating Profit (Loss)	(\$1,206.50)	(\$1,311.55)	(\$1,093.46)	(\$1,321.57)

Enterprise no.	9	10	11	12
Production (Kgs)	1146	1271	1551	1583
Deliveries	6	13	18	13
Revenues				
Sales	\$1,257.76	\$837.49	\$862.76	\$961.19
Est.Final Payment	\$554.23	\$343.29	\$502.57	\$301.39
[Total Sales Revenue]	\$1,811.99	\$1,180.78	\$1,365.33	\$1,262.58
MPFS	\$99.10	\$216.84	\$262.61	\$310.07
[Sales+Freight Subsidy]	\$1,911.09	\$1,397.62	\$1,627.94	\$1,572.65
SILCFA Compensation	\$476.01	\$526.35	\$630.63	\$675.91
Total Revenues	\$2,387.10	\$1,923.97	\$2,258.57	\$2,248.56
Variable Costs				
Supplies	\$124.45	\$85.81	\$24.53	\$203.44
Labor	\$206.40	\$447.20	\$619.20	\$447.20
Provisions	\$40.25	\$362.89	\$52.85	\$173.83
Transportation	\$197.24	\$206.43		\$276.53
Ice	\$64.91	\$125.99	\$85.99	\$145.35
Fuel	\$242.05	\$221.96	\$187.40	\$387.92
Total Variable Costs	\$875.30	\$1,450.28	\$969.97	\$1,269.35
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$12.97	\$17.37	\$18.18	\$20.30
Total Semi-Variable Costs	\$22.97	\$27.37	\$28.18	\$30.30
Gross Operating Profit (Loss)	\$1,488.83	\$446.32	\$1,260.42	\$948.91
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$2,191.65	\$2,771.03	\$2,291.53	\$2,593.03
Net Operating Profit (Loss)	\$195.45	(\$847.06)	(\$32.96)	(\$344.47)

Enterprise no.	13	14	15	16
Production (Kgs)	1635	2175	2473	2692
Deliveries	19	23	15	31
Revenues				
Sales	\$1,198.33	\$1,202.18	\$1,758.01	\$1,718.42
Est.Final Payment	\$687.83	\$547.03	\$845.75	\$695.83
[Total Sales Revenue]	\$1,886.16	\$1,749.21	\$2,603.76	\$2,414.25
MPFS	\$216.97	\$401.38	\$354.26	\$473.69
[Sales+Freight Subsidy]	\$2,103.13	\$2,150.59	\$2,958.02	\$2,887.94
SILCFA Compensation	\$637.69	\$900.73	\$988.73	\$1,130.37
Total Revenues	\$2,740.82	\$3,051.32	\$3,946.75	\$4,018.31
Variable Costs				
Supplies	\$265.46	\$153.80	\$265.18	\$272.68
Labor	\$653.60	\$791.20	\$516.00	\$1,066.40
Provisions	\$149.86	\$376.36	\$469.08	\$492.61
Transportation	\$260.88	\$368.49	\$208.60	\$462.45
Ice	\$90.96	\$5.00	\$145.20	\$158.16
Fuel	\$582.24	\$985.25	\$1,268.33	\$1,242.27
Total Variable Costs	\$2,003.00	\$2,680.10	\$2,872.39	\$3,694.57
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$26.41	\$25.19	\$31.87	\$36.48
Total Semi-Variable Costs	\$36.41	\$35.19	\$41.87	\$46.48
Gross Operating Profit (Loss)	\$701.41	\$336.03	\$1,032.49	\$277.26
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$3,332.79	\$4,008.67	\$4,207.64	\$5,034.43
Net Operating Profit (Loss)	(\$591.97)	(\$957.35)	(\$260.89)	(\$1,016.12)

Enterprise no.	17	18	19	20
Production (Kgs)	3705	3707	3936	4159
Deliveries	26	26	31	26
Revenues				
Sales	\$2,310.52	\$2,312.74	\$2,380.27	\$3,373.63
Est.Final Payment	\$858.45	\$813.53	\$997.97	\$1,919.42
[Total Sales Revenue]	\$3,168.97	\$3,126.27	\$3,378.24	\$5,293.05
MPFS	\$698.90	\$699.36	\$699.88	\$484.34
[Sales+Freight Subsidy]	\$3,867.87	\$3,825.63	\$4,078.12	\$5,777.39
SILCFA Compensation	\$1,566.95	\$1,567.43	\$1,669.56	\$1,612.47
Total Revenues	\$5,434.82	\$5,393.06	\$5,747.68	\$7,389.86
Variable Costs				
Supplies	\$656.65	\$1,004.32	\$945.81	\$510.96
Labor	\$894.40	\$894.40	\$1,066.40	\$894.40
Provisions	\$734.49	\$620.70	\$579.99	\$561.03
Transportation	\$648.99	\$649.16	\$716.12	\$659.66
Ice	\$313.74	\$313.97	\$243.68	\$238.89
Fuel	\$551.89	\$501.66	\$961.55	\$1,471.01
Total Variable Costs	\$3,800.16	\$3,984.21	\$4,513.55	\$4,335.95
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$44.06	\$44.09	\$43.85	\$55.90
Total Semi-Variable Costs	\$54.06	\$54.09	\$53.85	\$65.90
Gross Operating Profit (Loss)	\$1,580.60	\$1,354.76	\$1,180.28	\$2,988.01
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$5,147.60	\$5,331.68	\$5,860.78	\$5,695.23
Net Operating Profit (Loss)	\$287.22	\$61.38	(\$113.10)	\$1,694.63

Enterprise no.	21	22	23	24
Production (Kgs)	4453	4893	4972	5225
Deliveries	42	34	33	38
Revenues				
Sales	\$2,701.06	\$3,327.66	\$2,807.51	\$3,305.11
Est.Final Payment	\$1,369.85	\$1,259.67	\$1,787.78	\$1,661.69
[Total Sales Revenue]	\$4,070.91	\$4,587.33	\$4,595.29	\$4,966.80
MPFS	\$742.08	\$850.21	\$799.39	\$837.39
[Sales+Freight Subsidy]	\$4,812.99	\$5,437.54	\$5,394.68	\$5,804.19
SILCFA Compensation	\$1,839.68	\$2,063.27	\$1,929.48	\$2,125.97
Total Revenues	\$6,652.67	\$7,500.81	\$7,324.16	\$7,930.16
Variable Costs				
Supplies	\$634.08	\$936.41	\$342.62	\$605.31
Labor	\$1,444.80	\$1,169.60	\$1,135.20	\$1,307.20
Provisions	\$1,367.71	\$491.16	\$789.19	\$894.23
Transportation		\$844.07	\$809.04	\$933.38
Ice	\$305.88	\$398.14	\$274.11	\$333.91
Fuel	\$910.85	\$910.26	\$1,144.22	\$1,341.35
Total Variable Costs	\$4,663.32	\$4,749.64	\$4,494.38	\$5,415.38
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$51.52	\$61.30	\$54.65	\$58.93
Total Semi-Variable Costs	\$61.52	\$71.30	\$64.65	\$68.93
Gross Operating Profit (Loss)	\$1,927.83	\$2,679.87	\$2,765.13	\$2,445.85
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$6,018.22	\$6,114.32	\$5,852.41	\$6,777.69
Net Operating Profit (Loss)	\$634.45	\$1,386.49	\$1,471.75	\$1,152.47

Enterprise no.	25	26	27	28
Production (Kgs)	6642	8357	8483	11556
Deliveries	23	42	47	31
Revenues				
Sales	\$3,828.70	\$5,312.23	\$5,194.75	\$8,126.35
Est.Final Payment	\$1,219.90	\$1,794.91	\$1,974.56	\$2,862.05
[Total Sales Revenue]	\$5,048.60	\$7,107.14	\$7,169.31	\$10,988.40
MPFS	\$1,287.52	\$1,584.15	\$1,514.20	\$1,984.96
[Sales+Freight Subsidy]	\$6,336.12	\$8,691.29	\$8,683.51	\$12,973.36
SILCFA Compensation	\$2,898.44	\$3,646.36	\$3,667.28	\$4,960.99
Total Revenues	\$9,234.56	\$12,337.65	\$12,350.79	\$17,934.35
Variable Costs				
Supplies	\$720.96	\$1,048.41	\$785.16	\$2,890.20
Labor	\$791.20	\$1,444.80	\$1,616.80	\$1,066.40
Provisions	\$974.66	\$862.39	\$473.25	\$1,509.68
Transportation	\$1,171.45	\$1,461.24	\$1,503.01	\$1,995.34
Ice	\$425.24	\$495.60	\$500.08	\$876.50
Fuel	\$759.35	\$1,848.43	\$1,199.13	\$1,842.32
Total Variable Costs	\$4,842.86	\$7,160.87	\$6,077.43	\$10,180.44
Semi-Variable Costs				
Licence	\$10.00	\$10.00	\$10.00	\$10.00
UIC	\$55.54	\$79.80	\$66.02	\$92.66
Total Semi-Variable Costs	\$65.54	\$89.80	\$76.02	\$102.66
Gross Operating Profit (Loss)	\$4,326.16	\$5,086.98	\$6,197.34	\$7,651.25
Capital Recovery Factor				
Skiffs	\$550.48	\$550.48	\$550.48	\$550.48
Motors	\$742.90	\$742.90	\$742.90	\$742.90
Total	\$1,293.38	\$1,293.38	\$1,293.38	\$1,293.38
Total Operating Costs	\$6,201.78	\$8,544.05	\$7,446.83	\$11,576.48
Net Operating Profit (Loss)	\$3,032.78	\$3,793.60	\$4,903.96	\$6,357.87

Appendix B

ASSUMED INTEREST RATES AND OBSERVED EXPENDITURES

B.1: Observed Expenditures

Year + Season	Southern Indian	Outlying Lakes
Summer 1983	181,144 kgs. * \$.6615 = \$119,827	151,177 kgs. * \$.441 = \$66,669
Winter 1984	64,208 kgs. * \$.154 = \$9,888	
Summer 1984	253,798 kgs. * \$.484 = \$122,838	162,407 kgs. * \$.836 = \$135,772
Winter 1984	32,783 kgs. * \$.374 = \$12,261	
Summer 1985	247,814 kgs * \$.484 = 119,942	258,995 kgs. * \$.836 = \$216,520
Total	\$803,717	

B.2: Assumed Interest Rates

Month/Year	Interest Rate
6/83	9.0
7/83	9.0
8/83	9.0
9/83	9.0
10/83	9.0
11/83	9.0
12/83	9.0
1/84	9.0
2/84	9.0
3/84	9.0
4/84	9.5
5/84	10.0
6/84	10.5
7/84	11.5
8/84	11.5
9/84	11.5
10/84	11.25
11/84	10.5
12/84	9.75
1/85	9.25
2/85	9.25
3/85	9.5
4/85	9.0
5/85	8.75
6/85	8.5

7/85	8.5
8/85	8.5
9/85	8.25
10/85	8.0
11/85	8.0
12/85	8.0
1/86	9.0
2/86	10.5
3/86	10.5
4/86	9.75
5/86	9.00
6/86	8.5

B.3: Remittance of Compensation Settlement

The payment of the compensation to the SILCFA took place over the period May 9 1983 to February 21 1984. The assumption used in the analysis comparing the current balance expected under observed subsidy payments and the actual reported balance was that the SILCFA began deriving interest revenues on the full amount of the settlement on June 1, 1983. This assumption is borne out by fact that although the largest portion of the settlement was not actually transferred to the SILCFA until February 1984 the Association did receive interest revenues on the settlement from June 1, 1983. The following is taken from the Agreement between Manitoba Hydro and the SILCFA;

- The sum of \$250,000.00 as an advance payment on account which was paid on or about May 9, 1983;
- The sum of \$200,000.00 as an advance payment on account which was paid on or about September 23, 1983;
- The sum of \$68,858.60 being interest upon \$2,275,000.00, having been calculated at the rate of 9.5 percent per annum from June 1, 1983, compounded monthly until September 23, 1983, to be paid within 10 days of there having been obtained a Final Order as referred to in paragraph 12 hereinafter.
- Interest upon the sum of \$68,858.60 calculated at the rate of 9.5 percent per annum from September 23, 1983, compounded monthly, until payment has been made, within 10 days of there having been obtained a Final Order as referred to in paragraph 12 hereinafter.
- The balance of \$2,075,000.00 together with interest thereon at the rate of 9.5 percent per annum from September 23, 1983, compounded monthly, until payment has been made, within 10 of there having been obtained a Final Order as referred to in paragraph 12 hereinafter.