Social Impact Analysis of a Forest Management Program

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A Manuscript Report Prepared for the Canadian Environmental Assessment Research Council
March 1987

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Acknowledgements

I would like to acknowledge the guidence of my thesis committee -- Paul Brown, Ray Cote, Bill Freedman, and Peter MacQuarrie.

This work was made possible by a CEARC Graduate Student Research Contract.

Table of Contents

1. Introduction 1

1.1. Rationale 1

1.2. The forest resource 3

1.3. The small woodlot sector 5

2. Social Considerations in the Management of the Small Woodlot Sector 9

2.1. Woodlot owners 9

2.2. Societal perspective 14

2.3. Economic perspective 16

2.4. Summary 18

3. Case Study-A Socio-economic Impact Assessment of the Group Venture Program on Cape Breton 20

3.1. Background 20

3.2. Methodology 23

3.3. Results 27

4. Conclusion 33

References

Abstract

The incorporation of social analysis in renewable resource management follows from a recognition of the interdependent relationship between human social systems and the natural environment. The relevance of this relationship to resource management is demonstrated historically and by the present use and role of Cape Breton's forests. In particular, the role of the small woodlot owner and some of the social variables invoked in the management of the small woodlot sector are described. The methodology and results of a socio-economic impact assessment of a federal/provincial program to increase the productivity of Cape Breton's small woodlots are presented as a case study. The conclusion, on the basis of this evaluation, is that social analysis, whether undertaken as part of program design or evaluation, or within the context of an environmental impact assessment, can contribute to more effective resource management.

Résumé

L' incorporation de l'analyse sociale dans la direction des resources renouvelables suit la reconnaissance de l'interdependence entre les environnements humaines et naturelles. La pertinence de cette interdependence est démontrée par l'histoire et par la présente utiiisation des forèts de l'île du Cap Breton. En particulier, ce rapport décrit le rôle du proprietaire des lots boises et des variables sociales impliqués dans la direction des petits lots boises. Cet etude met à point la méthode et les résultats d'une évaluation socio-éconmique du programme initie par les gouvernements fédérales et provinciales pour améliorer la production des lots boises. La conclusion de l'étude est que l'analyse sociale, qui elle en soit utiliser pour la planification ou l'évalution d'un programme, ou l'évaluation des impactes environnementales, peut contribuer à une direction de resource plus éfficace.

1. INTRODUCTION

1.1. Rationale

The management of renewable resources has traditionally relied on bio-physical and economic information as a basis for planning and decision-making. Resource management programs must then fit within government policy that is determined by social and political factors. A lack of analysis of social variables during the design and evaluation of resource management programs may result in unforeseen social problems and ineffective programs. The information required for effective resource management includes social analysis as well as bio-physical and economic data. Infact, investigation of social questions may be more crucial to the success of a program than those considered by natural sciences and economics (Burch & DeLuca, 1984: 15; Osgood, 1984; 1985). This is particularly the case in rural areas where forestry, farming, fishing and other resource uses have social as well as economic importance.

The relationship between social and natural systems is poorly understood and therefore, the focus for management decisions usually remains on the technical components. To improve the situation, those involved with the management of renewable resources should recognize the symbiotic relationship between human society and the natural environment. This relationship is described by Naveh and Lieberman (1984: 89):

> We can thus view [people] in a cybernetic way as occupying a position of mutual causality -- as a receiver of vital inputs from the biosphere and geosphere, but at the same time as a modifier of the biosphere and geosphere.

It follows from this view that, social systems are both affecting and affected by the bio-physical environment. Naveh and Lieberman explain that it is "this dichotomy of dependance and

independance [that] is one of the reasons for the . . . . confusion about the . . . . relationship between natural and human ecosystems."

Since the implementation of the National Environmental Protection Act in the United States (1970) and the Environmental Assessment and Review Process in Canada (1973), researchers, planners and resource. managers have begun to investigate methods for incorporating social analysis in the environmental assessment process and in the management of renewable resources (Finsterbusch & Wolf, 1977; Lang & Armour, 1981; Tester & Mykes, 1981; Finsterbusch et. al., 1983; Burch & DeLuca, 1984; Wenner, 1984; 1985). The following rationale for the integration of the natural and social sciences in environmental impact assessment, which is also applicable to resource management, is presented by Lang and Armour (1981: 11):

> The natural/social impact distinction proved difficult to make for projects in rural and resource areas where resident lifestyles were closely tied to the natural setting, and in urban areas where problems of air, land and water pollution are mixed up with and often dominated by complex people issues. The public, increasingly involved in environmental assessments did not experience "the human environment" in separate social and natural categories.

There are several renewable resource management problems in Atlantic Canada that demonstrate the symbiotic relationship between social and natural ecosystems. Managers of the east coast fishery require social analysis as well as biological and economic information to make decisions. In agriculture, recent economic conditions have encouraged a growth in farm and machinery size and an increased reliance on chemical fertilizers, herbicides and pesticides. In potato farming areas, the result has been increased rates of soil degradation and contamination of ground water. The solution of these problems will require programs that incorporate social considerations. In forestry, there are serious questions as to whether the resource can continue to supply the existing industries with fiber. The forestry sector is now looking to improve production from the small privately owned woodlots in the region as one way of increasing supply, Programs designed

to motivate woodlot owners to manage their properties for forest production must respond to the social factors.

Lack of investigation into the social variables may result in programs that place pressures on resource harvesters and/or owners to undertake activities that produce unintended ecological impacts. However, recognition of the link between social and natural systems implies that the value of social analysis to resource management decisionmaking and impact assessment is increased when undertaken as part of environmental analysis (Holden, 1984). This paper will attempt to contribute to the development of an interdisciplinary approach to renewable resource program design and evaluation. In the following sections, a rationale and methodology for incorporating social analysis in the evaluation of a forest management program will be presented.

1.2. The forest resource

Among the bio-physical factors which determine the formation of a region's forest are climate, soil, topography, geograhic location, and species composition. Impacts of natural and human-caused disturbances to the ecosystem will also influence the forest's development. Socio-economic factors including the demand for forest products, community attitudes and the local employment situation will play an important role in determining the human impacts on the natural environment.

The interdependance of social and natural systems is demonstrated in the development of Cape Breton's forests. Early European settlers found large trees of both hardwood and softwood species on the Island. In response to the prevailing socio-economic condition the forests were cut for ship building, cleared for agriculture and harvested for lumber and pulpwood. Over time, high quality trees of all species became more difficult to obtain and the remaining forests were utilized primarily as a source of pulpwood. A cumulative impact of this human activity was to alter the species composition and age structure, so that by 1970, mature and over-mature stands of

balsam fir and white spruce dominated.[1] It is just such a homogeneous forest that is susceptible to destruction by disease or insect attack.

The spruce budworm has inhabited the forests of northeastern North America for thousands of years In the mid 1970's a budworm infestation began in the northwest portion of Cape Breton and over the next few years spread throughout the Island (Kettala, 1983). Many foresters and industry representatives proposed controlling the infestation with the aerial application of chemical insecticide, as was being done in New Brunswick. However, in response to social concern over the safety of this proposal, the provincial government established a policy of not utilizing chemical insecticides. The budworm infestation was allowed to run its course. Although the importance that impact assessment played as part of this decision is unknown, some attempt has been made, after the fact, to measure the present and potential bio-physical and socio-economic impacts of the infestation (Env. Canada, 1985; Woodlands, 1985).

The result of the epidemic was that 29.5 million cubic meters (13 million cords) of softwood were left dead. This is equivalent to more than 75% of the previously existing merchantible volume on the Island and is more than five times the annual harvest of softwood in Nova Scotia (Woodlands, 1985: 73). In addition to the bio-physical impacts that resulted from the budworm infestation, the destruction of the forest resources of Cape Breton will have socio-economic impacts. The most severe impacts are predicted to occur between 2020 and 2040 when the forest industry on the island will suffer a shortage of harvestable timber.

This example clearly demonstrates the interdependance of natural and social systems in the development of a forest resource. Bio-physical and scio-economic factors are potentially either a causal agent of an impacted component and a particular factor may, over time, alternate between

[1] The **increase in the proportion of balsam fir and white spruce** can be traced through the provincial forest inventories. **(Femow, 1912; Hawboldt, 1958; DLF, 1970;** 1966).

the two roles. Effective management of this resource must be based on an understanding of these relationships. It is also apparent that forestry policy and programs can have significant impacts beyond the forestry sector on the region's natural and social environments.

1.3. The small woodlot sector

Forest lands may be categorized by ownership into three sectors. They are:

- the publicly owned sector
- the large private sector and
- the small woodlot sector.

In most of Canada close to 90% of the forest land is publicly owned; however, in the eastern provinces the private sectors are relatively more important. Nova Scotia has the largest percentage of privately owned forest lands. In this province the small woodlot sector controls more than half (52%) of all forest lands and the large private sector has 21%, while public ownership accounts for only 27% of the total.

Although individual holdings in the small woodlot sector are typically small (e.g., in Nova Scotia the average woodbt is only 45 hectares (Johnson, 1981)). certain characteristics of the sector enhance its regional importance. In a comprehensive study on the relationship of forestry and community devebpment in Canada, the Canadian Council on Rural Development (CCRD, 1977: 10) explains the potential of the small woodbt sector as follows:

> The private woodlands are, in the main, either in agricultural areas or in relatively settled parts of the country on the forest fringe. Such forest areas have high potential because of their ready accessibilii and cbseness to markets; they also tend to occupy more productive land and the availability of people and equipment make it possible to harvest the forest crops without major capital' investments in roads and accomodation for workers.

The validity of this statement is borne out in Cape Breton where lands with the highest capability for forest production are generally within the small woodlot sector. On the other hand, publically owned lands are in remote areas and have required the construction of roads and work camps to facilitate their harvest. For whatever reason, most of the impact assessments of forestry programs, to date, have focused on the public sector, where the social variables are less complex.

Because of the inclusion of individual woodlot owners with their diverse attitudes and objectives, the sodio-economic factors infuehcing the small woodlot sector are more complex than those affecting other forest land ownership classes. The socio-economic factors (e.g. markets for forest products, tax sysem, employment options, and community values) and bii-physical factors (e.g. soil capability, forest composition, and insects/disease) influence each other through a network that includes the woodlot owners, the lands within the small woodlot sector and the total forest land in the region. A diagram illustrating this network is presented in Figure 1.

As is indicated on the diagram, forestry programs may be designed to influence any of the components of the network. The interaction and linkages between social and natural systems within the small woodlot sector are such that optimizing the benefits of a program depends on influencing the woodlot owners. Some programs (e.g., tax incentives) utilize an indirect approach to encourage woodlot owners to manage their properties for forest products. Extension forestry services which educate and organize woodlot owners are examples of a more direct approach. In addition, forestry programs targeted at other ownership sectors or at components of the natural systems will affect the supply of forest products and may thereby indirectly affect the small woodbt sector.

Woodlot owners respond to the socio-economic situation as well as influencing it by such activities as negotiating a regional pulpwood marketing agreement. The woodlots are influenced by both the owner's forest practices and biophysical factors. In turn, the state of the woodlot will

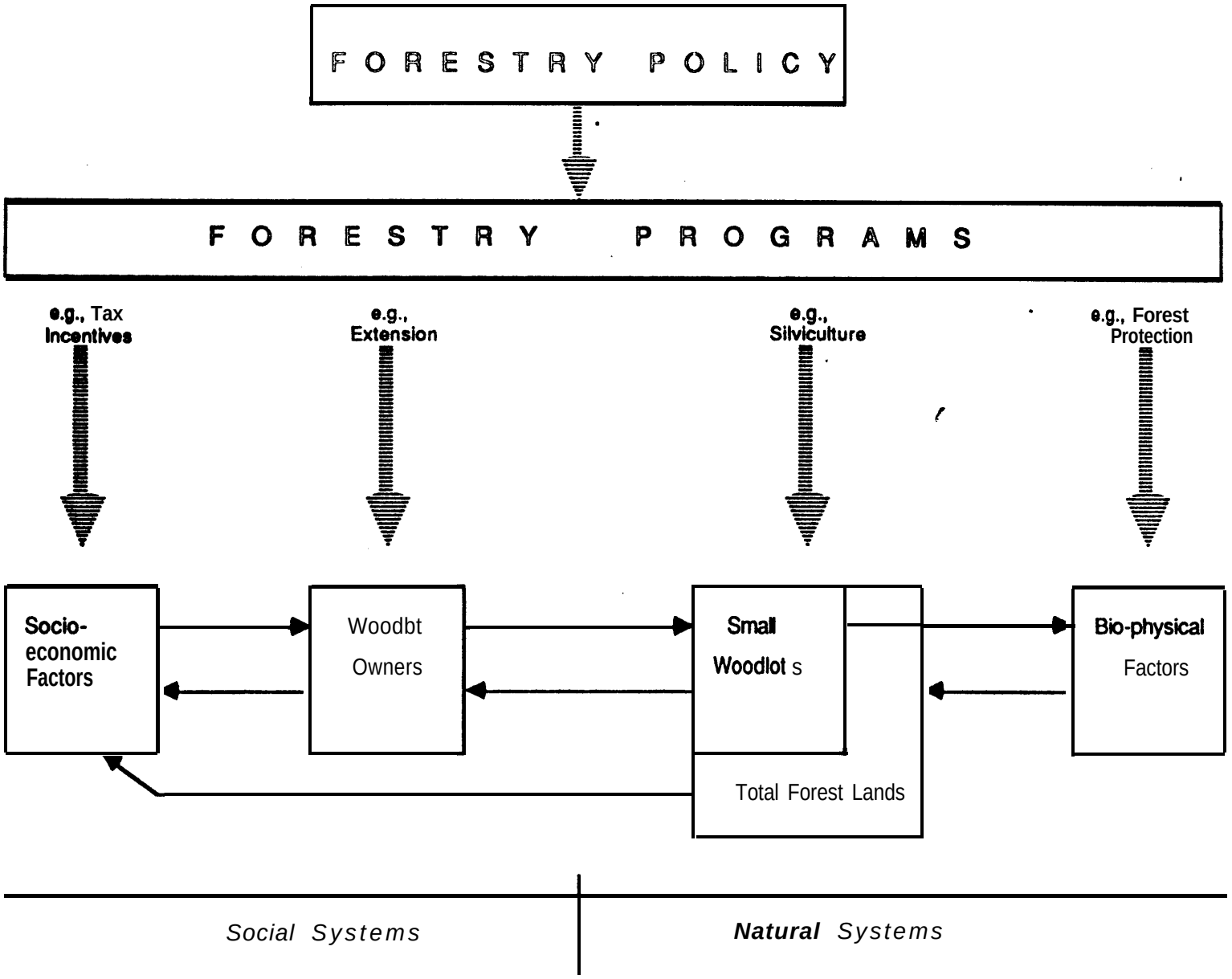


Figure 1: Diagram of the small woodlot sector management network.

be a major determinant of a owner's actions and what products if any are havested. The region's total forest land will affect the flow of forest products and thus affect the socio-economic conditions. The small woodlot sector network is an open-system operating within the framework of the larger social/natural network.

The following section will discuss components on the social system side of Figure 1 that are important in the design, assessment and evaluation of small woodlot sector forestry: programs.

2. SOCIAL CONSIDERATIONS IN THE MANAGEMENT OF THE SMALL WOODLOT SECTOR

2.1. Woodlot owners

A major consideration in the design of programs to improve the productivity of the small woodlot sector is that of motivating the many diverse landowners. Individuals may have become owners of forest land by inheritance or purchase; they may live on, near to or far from their woodlot; they may intend to market forest products or they may value their property for reasons other than wood production. In fact, a study of woodlot owners involved in a management program in Massachusetts attributed greater variance in forest yield to differences between the individual owners than to differences in woodlot location (Harou, 1984; 1985). Nevertheless, by understanding the attitudes and objectives of individual owners, programs can be designed to increase the quantity and quality of management on private forest lands. While it is unrealistic to assume that all woodlot owners can be encouraged to manage their forests for maximum productivity (Meeks, 1982), a program's level of success will depend on its ability to meet the objectives of the individual landowners (Kessler, 1978).

Worrel and Irland (1975) identified five obstacles that may prevent woodlot owners from practicing forest management. They are:

1) Lack of knowledge of the possibilties and opportunities available.

2) Lack of interest.

3) Owner's goals are not compatible with timber management.

4) Low profit potential.

5) Lack of some ability necessary for forest management.

A lack of knowledge about forest management is the most common obstacle to improving the management of the small woodlot sector. Once this obstacle is overcome, however, an owner may still not be interested in managing his/her property or be prevented by one of the other obstacles. If the owner's reason for owning property is not compatible with woodlot management practices it is unlikely that any program will be successful in motivating him/her to manage. The fourth obstacle, a tow profit potential, may be caused by high transportation costs, the small size of the holding, or a forest composed of non-commercial species. The final obstacle is some disability that prevents the owner from undertaking the necessary work. These include the physical ability to carry out the work, the finanacial resources to contract out the work, or the technical knowledge of how to manage a woodlot. Programs designed to improve management in a region's small woodlot sector attempt to motivate the woodlot owners by overcoming one or more of the above obstacles.

Table 1 presents the reasons given by Nova Scotia woodlot owners for not Setting forest products. The most common reasons for not selling forest products were "cut for own use" and "want to save for emergency" (MacQuarrie, 1981). Other owners did not harvest for reasons that would fit within Worrel and Irland's first obstacle -- lack of knowledge. These reasons are not necessarily incompatible with woodlot management for production and increased harvesting. Silviculture treatments can often maintain or even increase a woodlot's stock of timber while producing merchantable products. A program that improved the owner's awareness of forest management opportunities and provided technical assistance would most likely be successful in intensifying woodlot improvement activity on these woodlots. Therefore, programs that concentrate on the educational aspects of extension services should improve the management and productivity of Nova Scotia's small woodlot sector.

Table 1: Nova Scotia woodlot owner's reasons for not selling forest products, past and future. Ranked by frequency of response.

Rank	Past Reason	% Owners	Future Reason	% Owners
1	Cut for own use	30	Want to save for emergency	21
2	Don't want woods cut	13	Don't want trees cut	18
3	Not enough wood to be worthwhile	12	Nothing to cut in near futue	18
4	Too busy with other activities	11	Other	13
5	Trees too small	8	If prices improve	11
6	Don't know what or how	7	Don't know what or how	10
7	Other	7	If I find workers	8
8	Can't find workers	6		
9	Prices too low	4		
10	Can't find buyer	1		

From MacQuarrie (1981)

Changes over time in woodlot owner intentions and objectives for their woodlots further complicates the management of the small woodlot sector. A study in Delaware during the 1970's, investigated the reliability of forest owner's intentions with regard to harvesting (Turner et al., 1977). The resufts show that, after 4 years, only 65% of the respondents were consistent in their plans to harvest trees from their land. In 1970 only 1% intended to harvest in the near future, but in 1974 7% had harvested or would within a year. While the proportion of landowners who planned to harvest remained constant (58% in 1970; 59% in 1974)' 17% of the individuals had changed from 'opposition to harvest' to 'planning to harvest' over the four year period.

The changeable nature of owner's intentions has implications for the management of the small woodlot sector. There is an inherent difficulty in working with a changeable population in the management of a resource that matures slowly and requires long-term planning and commitment. The consequences could be impacts on wildlife habitat and the creation of pockets of overmature

stands susceptible to disease and pests. Programs should encourage continuity and follow through in the implementation of woodlot improvements. Nevertheless, Turner et al. (1977) concluded that, in the area studied, the rate of change in landowner intentions Will result in almost all of the growing stock being harvested.

A high correlation between woodlot size and forest management intensity was noted in studies throughout eastern North America (Turner et al., 1977; MacQuarrie, 1981; Roy, 1983; Royer et al., 1983; Gramann et al., 1985; Straka et al., 1984). Research which analyzed data from several studies conducted in Mississippi found a high correlation between woodlot size and management intensity (Straka et al., 1984). Straka et al. also found that the income and asset position of the owner was directly related to both the size of the holding and management intensity. In Nova Scotia the percentage of owners who had sold commercial products in the previous two years increased with the size class of the forest holding; from fess than 15% for woodlots smaller than 20 hectares to 70% for woodlots between 200 and 400 hectares (MacQuarrie, 1981).

Several explanations have been put forward to account for the relationship between woodlot size and management activity. Diseconomies due to the small size may restrict the rate of return on investments in management and thus reduce the profitability of woodlot improvements. While per-haectare returns may be good, the small number of hectares may make the total yield inadequate. Some of the costs associated with forest management are independent of tract size; therefore, the resulting benefit per acre is more economical for larger holdings. Another reason that size is important in determining management practices is that large landowners may find it a financial necessity to practice intensive forest management to offset the costs of holding large areas of forest land (Straka et al., 1984; Royer et al., 1983). Programs which promote larger management units (e.g., woodlot owner cooperatives) may partly overcome the diseconomies associated with small holdings.

Another relationship common to several studies of the small woodlot sector was that, in general, farmers are less likely to make forest improvements yet harvest more frequently than non-farmer woodlot owners (Boyd, 1984; Royer et al., 1983; Irland et al., 1984). It may be that farmers regard the forested portion of their land as peripheral to the business of agriculture and that they harvest forest products to compensate for years of poor crop yields (Boyd, 1984). However, the amount of the small woodlot sector controlled by farmers in eastern North America has been decreasing. In New England, for example, the amount of forest land owned by farmers has dropped from 30% to 10% over the past 30 years (Irland et al.; 1984).

Past experience and beliefs about forest management affected the attitudes, objectives and practices adopted by woodlot owners (Gramann et al., 1985). A study conducted in Wisconsin, found that beliefs resulting from past experience or information about certain forest practices influenced the likelihood of owners adopting these practices in the management of their woodlots. Results indicated that the individuals perception of their ability to maintain control over the activities, particularly when employing professional foresters, was important in acceptance of the assistance. Some practical conclusions affecting program development, which may be drawn from these findings, are:

1) the need to provide adequate information to enable landowners to form realistic objectives,

2) the usefulness of demonstrating the benefits of good forest management, and

3) the responsibility for final decision-making should rest with the woodlot owner.

Because woodlot owners benefit from both timber and non-timber uses of their land, insight Into the social/psychological determinants forming their attitudes toward the forest will assist in the design of appropriate programs. Surveys of small woodlot owners in eastern North America have found non-production objectives[2] to be among the most important reasons for owning fofest

[2] These include financial security, recreational uses and aesthetics.

property (MacQuarrie, 1981; Roy, 1983; Irland et al., 7983; Royer et al., 1984). In order to gain acceptance, forestry programs must be compatible with the woodlot owner's objectves. Programs should increase woodlot owner's knowledge about and awareness of the mangement options by demonstrating their applicability to maintaining such valued features as timber and fuelwood production, wilderness, wildlife, and water quality. The benefits of an informed woodlot owner population are well summarized by Thomas Birch (1986): "[Woodlot] owners who understand the benefits of forest management ..... are the ones most likely to manage their forestlands." A successful program will motivate woodlot owners to continue to manage their lands in a manner which meets their objectives, as well as contributing to the better overall management of a region's forests (Dodge & Burke, 1984).

2.2. Societal perspective

Society recognizes that the influence of each private woodlot, and that of the small woodlot sector as a whole, extends beyond the forest boundaries (Dickson,. 1983). Consequently, in addition to the specific needs of the woodlot owners and forest industry, resource managers must consider rural employment, regional development, national economic factors, tourism, and conservation of the environment, in the design and evaluation of woodlot forestry policy and programs.

Forest industries, such as pulp and paper processing facilities and sawmills, are often located in rural areas and may form an essential component in the local economy. These industries and the accompanying settlements were established in areas that had an abundant supply of timber usually from large tracts of publicly or industrially owned forests. Private woodlots are what remained after land was cleared for agriculture. Historically, the woodlot provided fuel, building materials and game for the owner and later became a potential source of income (CCRD, 1978; Dickson, 1983).

In many areas today, the continued viability of forest based industry is becoming more dependent on the small woodlot sector for a supply of raw material. However, the changing demographics of industrial society, increasing specialization of farming, and the pressure for wilderness preservation are complicating the management of private forest land. Research has shown that as industrialization advances, the willingness of woodlot owners to sell timber declines (Riihinen, 1983). This is because the value of the forest to the owners and the public shifts from exploitation for financial gain to conservation for non-monetary values, e.g., the aesthetic value of wilderness and recreational uses. Therefore, forest policy must attempt to balance the steadily increasing demand for , on the one hand, with society's need for maintaining environmental quality and recreational opportunities, on the other.

The social benefits and costs related to the management of privately owned forests include both monetary and non-monetary factors. Among the non-monetary impacts of forest management are changes in environmental quality, forest aesthetics and recreational opportunities (Dickson, 1983; McKillop, 1975). For example, a decrease in wildlife habitat or water quality would be a non-monetary cost; while, improved access to lakes, due to forest road construction, would be a non-monetary benefit.

Monetary impacts may affect the local, regional or national economic situation. Intensified forest management in a region will increase the income of land owners and create employment. Through the multiplier effect, increased income generates economic activity in the region that will benefit the local economy. On a larger scale, by maintaining a strong timber supply, forest management programs help to avoid wood shortages that result in higher prices for forest products. Market analysts in the United States predict that a program of intensive forest management in the small woodlot sector will directly benefit consumers with substantially lower prices for construction materials and paper products (McKillop, 1975).

2.3. Economic perspective

The existence of externalities and market imperfections make it important that the management of the small woodlot sector not be left exclusively to the market. If landowners are going to invest in their forests, economic factors must provide a rate of return on investments in forest management which is at least as good as alternative rates of return (SAF, 1983; Meeks, 1982). The objective of government programs which regulate or assist private forestry is to internalize the external costs so that producing units will have to take them into account (Brock, 1975).

Woodlot management has the potential to increase the quality and quantity of a woodlot's yield of forest products thus increasing the economic value of the property. However, due to the long time period required for the full benefits of forest management to be realized, the returns are often not as great as could be obtained from alternate investments. Therefore, to encourage good woodlot management practices it is often necessary for governments to subsidize silviculture and other woodlot improvements.

The Forestry Incentives Program (FIP) is a United States federal cost-sharing program aimed at increasing the timber output from the small woodlot sector. It is available to landowners with between four and 200 hectares of forest land that must be capable of producing at least 3.5 cubic meters of timber per hectare per year (Harou, 1985). An economic analysis of one type of silviculture treatment carried out under this program in Massachusets found that the benefit-cost ratio was greater than one (i.e. benefits are greater than costs) for discount rates of 4% and 6.625%[3] (Harou, 1985).

[3] At the time of the study, 4% was used by the United States Forest Service and 6.625% was used by the United States Water Resources Council.

Although site selection was properly carried out within the program, results from the Massachusset's study indicate that a more restrictive selection policy would improve the program's efficiency (Harou, 1985). More specifically, elimination Of those owners who would have done the work without the incentive and those who did not continue with management after the initial work would improve the cost effectiveness of the program. While this would seem to indicate that there is a tendency for government incentives to replace the capital investments of the owners, a review of several small woodlot sector programs in the southern United States, including the FIP, found no evidence that cost-share programs reduced the level of owner investment (deSteiger, 1984).

Woodlot owner cooperatives may be more effective than tax incentives in increasing the productivity of the small woodlot sector. Consolidation of the management of an areas' small woodlots into one organization, woodlot owner cooperatives has the potential to achieve some benefits through economies of scale. The process of blocking (managing two or more adjacent properties) promotes cost effective implementation of such woodlot improvements as road construction, silviculture treatments and harvesting. Cost averaging for forest improvement work is possible within a cooperative. Due to site conditions some sites will cost more than others to manage. A cooperative is in a position to average the costs of a particular treatment enabling the improvement of some woodlots that would otherwise not be undertaken. Coordination of woodlot improvement work within the cooperative may provide for improved cost efficiency by avoiding unnecessary transporation of equipment. In addition, cooperative marketing of products may be beneficial in overcoming the diseconomies of scale facing individual woodlot owners.

One example of woodlot owner cooperatives is the Group Ventures operating in Nova Scotia. The Group Venture Program provides funds for administrative costs and financial subsidies for woodlot improvements to owners who have formed management companies or cooperatives. An early assessment of the program in 1980 (Dwyer, 1980) indicated that the cost per hectare for management and marketing within each Group would decrease over the next few years. The

collective nature of the Group Ventures permits them to at least partially overcome the diseconomies of scale encountered by individual woodlot owners. A specific example of the cost efficiency achieved through the Group Venture approach is in the cost of management plan preparation. in 1979/80 the cost per hectare for this operation when done within a Group Venture was only $11 while to accomplish the same task employing a forestry consultant for an individual woodiot would have cost $16.

Economic analyses of small woodlot sector forestry programs indicate the relative cost-efficiency of the different methods for motivating woodlot owners, Program evaluations have demonstrated that those programs which provide education and technical assistance are more cost effective than large scale subsidies for woodiot improvements (Boyd, 1984; Dodge & Burke, 1984). Proper targeting has also been demonstrated to have a significant effect on the benefit-cost ratio of private lands forestry programs (Harou, 1985). Additionally, woodiot cooperatives (e.g., the Group Venture Program) may help to overcome the diseconomies of scale that limit the profitability of the small woodlot sector.

2.4. Summary

Major obstacles in the implemention of programs directed at the small woodlot sector are the divesity of woodiot owner attitudes objectives. Owners benefit from both timber and non-timber uses of their land. Therefore programs that provide opportunities for multiple-use management are more likely to be successful. Multiple-use management should, over the longterm, minimize ecological impacts and optimize the social benefits associated with woodiot forestry. Research indicates that effective programs should provide landowners with adequate information, demonstrate the effects of management techniques, and allow owners to maintain control of activities carried out on their land (Gramann et al., 1985).

Market imperfections and externalities may necessitate economic measures, including financial incentives, subsidies and tax modifications, to ensure that investments in forest management yield an adequate rate of return (SAF, 1983). Nevertheless, programs that provide education and technical assistance have been shown to be more cost effective in improving forest management than are financial subsidies (Boyd, 1984).

In addition to increasing forest productivity and meeting woodlot owner's objectives, programs must consider the associated social and environmental impacts on such factors as rural employment, regional development, tourism, recreational opportunities and environmental quality. The challenge in formulating policy and designing programs directed at the small woodlot sector is to balance the need to maintain forest productivity in order to supply raw materials to industry with the non-timber benefits society derives from forests.

3. CASE STUDY -- A SOCIO-ECONOMIC ASSESSMENT OF THE GROUP VENTURE PROGRAM ON CAPE BRETON

3.1. Background

The Group Forest Management Venture Program was established in 1977 under the Subsidiary Agreement for Forestry of the General Development Agreement (GDA) between Canada and Nova Scotia. The Program was expanded, under the Forest Resource Development Agreement (FRDA) in 1982 and again under the Forest Renewal Agreement (FRA) in 1984. Group Ventures are cooperatives or limited companies, comprised of local woodlot owners, that hire staff to facilitate the management of their woodlots. The objective of the Group Venture Program is to "support the management capacity on small private holdings and to increase the future harvest from private lands by encouraging the assembly of small woodlots into larger operating areas, and to provide for forest management of these operating areas" (Lands & Forests, 1985). To place the Program within the context of Figure 1, it is designed primarily to influence woodlot owners directly, although it does incorporate financial incentives. The intention is that by affecting the social systems of the small woodlot sector network, the desired changes in the natural system (i.e., the woodlots) will occur.

Each Group Venture prepares woodlot management plans for its members and coordinates the implementation of the plans, marketing of forest products and related activities. The operating costs of the Group are funded by the province and forest improvement activities are funded by the federal government through the Canadian Forestry Service (CFS). Operating costs funded by the Province include salaries for three employees -- a manager, a forester and an office supervisor-- plus the non-personnel operating expenses e.g., office supplies and rent. The Canadian Forestry Service provides financial assistance for the following forest improvement work (Anon., 1985: sec C-II):

1) Building forest access roads and fire ponds;

2) Boundary improvements; and

3) Silviiltural treatments.

In return for funds received, the company/co-op incurs certain obligations with respect to the province. The Group agrees to (Anon., 1985: sec C-II; Dwyer, 1984):

1) Sign a forest management and marketing agreement with its shareholders and inventory 'their woodlots;

2) Draw up woodlot management plans which determine if and where roads and fire ponds should be built, if boundaries require upgrading, and prescribe silviculture treatments;

3) Coordinate the implementation of these plans;

4) Market forest products and collect a 5% commission on all wood sales from its shareholders to be used to offset operating costs; and

5) Maintain adequate records subject to an annual audit.

With respect .to the federal government, the Group Venture must ensure that the quality of the work done on properities under its management meets the required standards.[4] The standards relate to maximizing the benefits of the work to the woodlot while minimizing associated environmental impacts. To ensure that quality is maintained all woodlot improvements implemented through a Group Venture are subject to random inspection by the Canadian Forestry Service.

Before any forest improvement work on a member's woodbt can be eligible for assistance, there must be a legal agreement between the Group Venture and the member. This is the Managing and Marketing Agreement. The company/co-op agrees to have a forest management plan

4 Guidelines for silvicultural treatments are set out in the Manual of Procedures and Standards -- Private Lands in section L and for services in section M. It is up to district DLF staff to approve the eligibility of silvicultural treatments for financial assistance.

prepared for the property and to assist the landowner in the implementation of the plan. The landowner agrees to manage the property through the Group Venture in accordance with the plan. The landowner appoints the company/co-op as sole marketing agent for commercial products from the property and agrees to pay a specified commission on all wood sales. The agreement remains effective for 10 years and is automatically renewed at the time at which financial assistance is claimed for forest improvement work (Anon., 1985: sec Q).

The Group Venture Program has-enjoyed considerable growth over the past ten years. Two Groups were initially established in 1977. This number had grown to eight after only 12 months and to 17 at the end of 1986. There are now over 1000 Group members in the province with more than 60,700 hectares of forest land under management. Five of these Group Ventures had been established on Cape Breton Island as of August 1986 are:

- Baddeck Valley Wood Producers Cooperative Ltd., established in 1978:
- North Inverness Forest Management Company Ltd., operating since October, 1984:
- Denysdale Wood Producers Cooperative Ltd. ; and
- Route 223 Forest Management Cooperative Ltd., both approved in December 1985:
- Celtic Isle Forest Management Ltd., approved in July 1986.

3.2. Methodology

3.2.1. ***Introduction*: This section** describes the methodogy used in an assessment of the socio-economic impacts of the Group Venture Program on Cape Breton Island. The study was both an evaluation of the Program to date and an assessment of potential impacts. Its objective was to determine what the effects of the Program are on **woodlot** owners, their properties and the communities of Cape Breton Island, particularly with respect to the following criteria:

- Effects on **woodlot** owners attitudes toward forest management
- Impacts on **woodlot** management
- Local economic benefits.

The methodology was designed to integrate complementary data obtained from the following study components:

(1) A questionnaire survey of a representative sample of Cape Breton **woodlot** owners, both Group members and non-members.

(2) Interviews with Group Venture managers, foresters and Board members, and others involved in forestry on Cape Breton Island.

(3) A review of records of the Group Ventures, including files of the Department of Lands and Forests **(DLF)** and the Canadian Forestry Service (CFS).

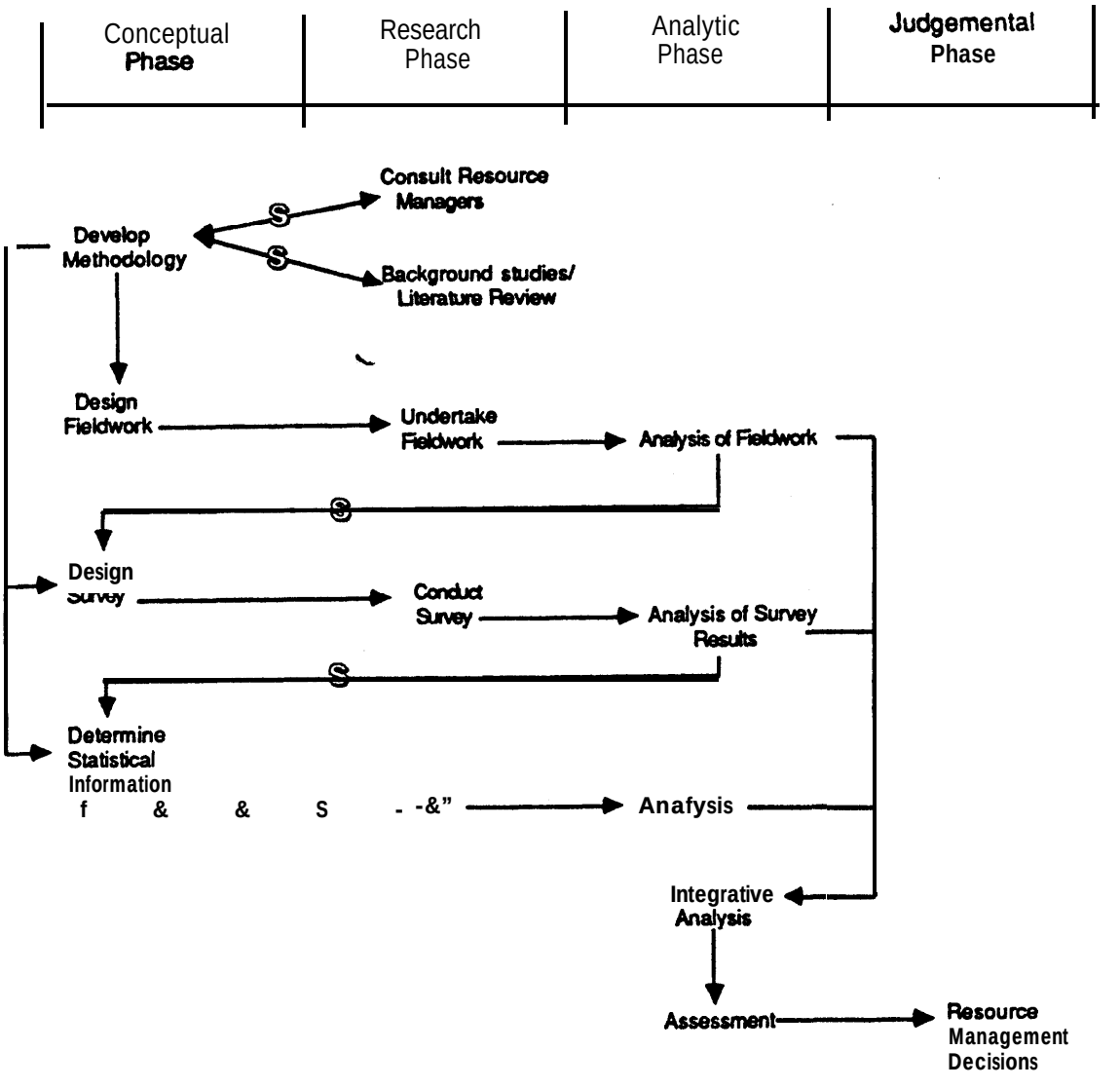
Social impact assessment methods have been found to be applicable to policy and program assessment (Cramer et. al., 1980). As well, the process of renewable resource social analysis may develop through phases similar to those for a **social** impact assessment. Carley and Walkey (1981) identlfied four phases in the social impact assessment process. They are the:

(1) Conceptual phase

(2) Research phase

(3) Analytic phase

(4) 3udgemental phase



S denotes scoping exercises

Figure 2: Flowchart for renewable resource social analysis and relationship to phases of social impact assessment.

Carley and Walkey note that the social analysis process is not necessarily linear but may consist of a series of loops where each phase feeds back to the others culminating in a decision. Figure 2 illustrates the flow of activities in conducting resource social analysis in relation to the four phases and is based on the assessment of the Group Venture Program on Cape Breton. This process is easily adapted to a variety of situations as components may be omitted, added, combined or the sequence altered. As indicated, the initial research and the feedback from primary analyses serve as scoping mechanisms for the later activities. This results in a progressively focused study concluding with a consise assessment of significant impacts that can be incorporated in the decision-making process.

3.2.2. ***Questionnaire survey :*** The objective of the questionnaire was to determine woodlot owner attitudes and perceptions with regard to private lands forestry in general and the Group Forest Management Venture Program in particular. A mail questionnaire survey was chosen as the most efficient method for obtaining data from the woodlot owners and Group Venture members on Cape Breton. This type of survey is well adapted to gathering data on individual's attitudes and perceptions (Chadwick et al., 1984: 101,137).

A large scale survey is not always necessary to provide the information reqired for resource social analysis. Mini-surveys of less than 100 individuals, while not suitable for complex statistical analysis, can provide an indication of trends and determine simple relationships (Finsterbusch, 1977: 291). The Cape Breton study utilized a medium scale survey in which 300 potential respondents were contacted. Potential respondents were selected from two populations: (1) members of the four Group Ventures that were operating as of July 1986; and (2) from the non-member woodlot owner population of Cape Breton.

The questionnaire was based on previous studies of small private forest landowners (MacQuarrie, 1981; Krygier & Deneke, 1983; Roy, 1983). The questionnaire was in three parts. Part One was to

be answered by all respondents and provided a profile of the woodlot owners. Part two was directed at Group members only, and Part three was for non-members. To encourage a high response rate, the questionnaire was kept brief and the questions direct and clear. A closed format was utilized to minimize the number of empty responses and to facilitate analysis. Only three of the questions required a written answer. These open-ended questions provided an opportunity for respondents to express their individual perspective on why they had or had not joined a Group Venture and how Group membership has affected their attitude toward forestry.

3.2.3. ***Interviews:*** The fieldwork in Cape Breton consisted of elite interviews, informal discussions and observation. The objective of this phase of the study was to determine the strengths and weaknesses of the Group Venture Program. Interviews were conducted with the managers, foresters, and directors of the Group Ventures; private silviculture contractors, government forestry personnel, and with representatives of woodlot owner associations and forestry related enterprises. In addition to the established Group Ventures, individuals in areas where no Group presently exists and where applications for Group Venture status have been submitted were also interviewed. Topics included:

(1) The Group's goals and philosophy,

(2) Appropriate functions of Group Ventures,

(3) Strengths and weaknesses of the Group Venture Program,

(4) Impact of the Program on private silviculture contractors, woodlot owners and communities,

(5) Effects on the local economy.

The elite interviews were open-ended but included several questions similar to those on the mail questionnaire. The elite interview process is promoted by Dexter (1970: 5) as one in which the interviewee is given non-standardized treament usually resulting in sessions that are more discussion than interrogation. Dexter describes the treatment as one which stresses the interviewee's definition of the situation, encourages the interviewee to structure the account of

the situation, and permits the interviewee to introduce their notions of what is relevant. **While the elite interview provides relevant** and insightful data, it requires the researcher(s) to be flexible in their approach and open to reinterpretation of the issues.

3.2.4. ***Review*** of records **:** The objective of this component of the study was to set the operations of the Group Ventures within the larger context of total forest management of small **woodlots** on Cape Breton. Tables were compiled from information obtained from the Group Ventures on Cape Breton, the **Nova** Scotia Department of Lands and Forests and the Canadian Forestry Service. The data was **analyzed** to determine:

(1) The development of a Group Venture over time.

(2) The importance of Group Ventures in relation to overall **woodlot** management on Cape Breton.

(3) The intensity and distribution of **woodlot** improvement work undertaken by the Groups.

3.3. **Results**

3.3.1. ***Impacts on woodlot ownefs*** **:** In Nova Scotia, as elsewhere, the major consideration in designing programs to promote the management of small woodbts **is** the problem of motivating the many diverse landowners. The rapid expansion of the Group Venture Program throughout the province and the increasing number of individuals who are managing their properties through Group Ventures demonstrates acceptance of the Program by woodbt owners.

Most Cape Breton **woodlot** owners join a Group Venture to obtain assistance and advice in managing their property and to have forest improvement work done. Some members had already **initiated** management plans **prior** to the formation of the Group. **Nevertheless,** most Cape Breton **woodlot** owners who have joined Group Ventures prefer to receive assistance through their

Group. As well, Group Ventures have been able to recruit some members from among those woodlot owners who otherwise would not be managing their woodlots.

While Group members are more likely to have sold forest products from their woodlots than the typical Cape Breton woodlot owner, membership does not appear to have significantly affected the amount of Income earned from a woodlot. Few members earned more than 10% of their income from their woodlots.

Participation in a Group Venture improves a woodlot owners awareness of potential forest management opportunities, particularly the benefits of silviculture. As well, the Group Venture Program increases the number and availability of foresters to woodlot owners. Many of Cape Breton's woodlot owners obtain professional forest management assistance for the first time as members of a Group Venture.

The study found that Group members and particularly Board members were often concerned with the importance of the local forest resource to the community as a whole. Membership in a Group Venture has increased the interest of many individuals in their property. Thus, by improving awareness, providing professional-assistance, and stimulating interest Group Ventures foster a membership of woodlot owners concerned and involved with the management of their properties.

3.3.2. *Impacts on woodlot management* : The recent spruce budworm infestation has caused widespread mortality of Cape Breton's merchantible softwood on both Crown and private lands. Intensive forest management is now required to lessen the time needed for regeneration of the forests. In budworm damaged forests, it is advantageous to remove the dead trees and replant as soon as possible, before competitive growth becomes well established. In general, the lands with the highest capability for forest productivity on Cape Breton are within the small woodlot

sector. It follows from the above that, the private woodbts of Cape Breton are in need of and will respond well to proper forest management.

Group Ventures have increased the total area of woodbts under management on Cape Breton and will continue to oversee a growing share of the managed woodbts on the Island. This is attributed to woodlot owner acceptance of the program and the increase in personnel that a Group Venture provides to deal with an areas woodbts. By assuming responsibility for the management of most of the managed woodbts in its service area, the presence of a Group decreases the demand on DLF regional staff. The result is that the establishment of a Group Venture improves the ratio of foresters to woodlots in a region; a fact that of itself should lead to better and more intensive managment of the small woodbt sector.

A long-term commitment to management is often difficult to achieve among small woodlot owners, whose priorities may change over time. Group Ventures have the potential to provide continuity and follow-up in the management of a woodlot. While the degree of success in this is difficult to measure, continuity of management may increase the benefits that result from woodlot management. By fascilitating the blocking of adjacent woodbts Group Ventures have promoted common road construction and coordination of forest improvement work.

3.3.3. ***Economic Impacts :*** The total economic impact, direct and indirect, of the Group Venture Program can be estimated through multiplier analysis. The Nova Scotia Department of Development (1966) utilizes an input-output model to determine the appropriate multipliers for various sectors. These multipliers are based on provincial averages and although less precise when applied to a specific region, e.g., Cap8 Breton, still provlde a useful indication of the total benefits. For primary forestry activity the employment multiplier is 1.8912 and the household income multiplier is 2.076. Both are larger than the multipliers assigned to the extraction sector[5]

[5] The extraction sector includes agriculture, mining, forestry and fishing.

as a whole (which are 1.71 employment and 1.74 income) demonstrating the relatively larger indirect benefits that result from inputs to primary forestry activity. The impact on local employment by the Group Venture Program is discussed in the following section.

The total benefits provided by a Group Venture go beyond the forest improvement work it implements to include the value of the woodbt management plans it prepares, the value of wood sold, revenue from other products sold and the value of any job ceation programs it initiates. The economic impact of the Group Venture Program also includes the increased value of managed over non-managed woodlots. The question of evaluating the economic returns on investments in forest management is beyond the terms of this study. For a discussion of the economics of woodlot management and a review of the literature relevant to Atlantic Canada the reader is referred to Huber (1985; 1983).

The small woodlot sector on Cape Breton has been an important supplier of forest products and a fundamental part of the so&-cultural fabric of the Island. To ensure a supply of raw material for the regions forest based industries in the future, the present condition of the Islands forests requires that inputs in the form of silviculture be made on both Crown and private forest lands. In addition to forest products such as firewood, pulpwood and lumber, woodbts provide wildlife habitat, clean water and scenic beauty. Although it is difficult to quantify these benefits, without proper management the lands within the small woodbt sector are likely to fall short of their economic and environmental potential.

3.3.4. ***Impact*** on ***employment*** **:** The employment multiplier (1.897) can be applied to the amount of employment created by the Group Venture in carrying out forest improvement work. In 1985186, the direct employment created by forest improvement work through Baddeck Valley and North Inverness was equivalent to 14 full time positions[6] (CFS, 1986). Applying the

[6] Full time job equivalents are used as a convenient unit, in reality many more individuals are affected each gaining a portion of their income through this employment.

employment multiplier to this, the total employment created is equivalent to 26.5 full time jobs, i.e., 14 direct and 12.5 indirect jobs.

Many rural households on Cape Breton have relied on forestry as a source for at least a portion of their income. The decrease in forestry activity that followed the spruce budworm infestation has caused unemployment to rise in a region already burdened with one of the highest unemployment rates in Canada. Woodlot management activii improves the situation in two ways: First, in the short-term, forest improvement work provides employment. Second, in the long-term, it enhances the forest resourse base of the region that it may continue to support forest based industries.

Although no quantitative data was obtained, the study found that the Group Ventures were considered to have a positive impact on local employment. By increasing the number of woodlots under management, a Group Venture can increase the total amount of forest improvement activivty in an area and therefore create more work for both its own crew and for local silviculture contractors. Additionally, a Group member who chooses to work on his own property receives the benefits of being an employee of the Group, e.g., workmans compensation coverage and unemployment insurance.

3.3.6. ***Impacts*** on ***marketing*** **:** The Group Ventures in Cape Breton have been successful in marketing products from member's woodlots. Pulpwood accounts for most of the wood sold, however, the Group also market sawlogs, studwood and fuelwood. Each Group has made its own arrangements for the marketing of pulpwood. Some go through the local bargaining agency and have an annual quota; others deal directly with the pulp company. In general, Group members, on Cape Breton, are in a better position for selling pulpwood than the typical non-member woodbt owner.

Although sales of sawbgs and studwood account for only a small percentage of the total sales, these products can be significant to an individual owner. The Groups attempt to market the wood harvested at its highest value and when necessary consolidate products from several woodlots into a full load. Do to an abundance of low-grade hardwood in Cape Breton the market. for fuelwood is weak. There may be opportunity for a Group Venture to achieve an advantage in the marketing of fuelwood by maintaining a yard where hardwood could be seasoned and then sold as dry fuelwood.

3.3.7. ***Environmental Impacts:*** In general the small woodbt sector has suffered from a lack of management. The forests of Cape Breton were cleared for agriculture and cut for lumber and pulp with virtually no input in the way of silviculture. As is demonstrated in Cape Breton, unmanaged forests are not necessarily unexploited forests. Rather, unmanaged forests are typically harvested haphazardly when the owner desires to sell the timber. Without planning and management, this usually results in a degraded forest resource and negative environmental impacts, such as, soil erosion, stream sedimentation and loss of wildlife habitat. Research has shown that professional management of woodbts results in benefits to the owner, the community and the environment (Lyons, 1933). While it appears that the Group Venture Program has the potential to minimize environmental impacts, an ecological assessment of intensified forest management in the small woodbt sector is needed to determine the significance of the impacts.

4. CONCLUSION

The interdependent relationship between natural and social systems implies the necessity for the integration of bio-physical and socio-economic information in renewable resource management. An analysis of social variables should therefore be included in the design and evaluation of renewable resource mangement programs. In rural areas where patterns of resource use are often important to the community structure and stability, the investigation of social variables is essential to effective resource management decision-making. Social analysis contributes to program design and evaluation processes similarly to the way social impact assessment contributes to an envirionmental impact assessment.

In the small woodlot sector, individual owners are a major factor in the relationship network between social and natural systems. Among the social variables influencing management of the small woodlot sector are the woodlot owners and their diverse attitudes, beliefs and objectives; the local employment situation; the market for forest products, the social benefits of forests, both monetary and non-monetary; and the economics of forest improvements. Effective management of the sector depends on an adequate understanding of the relationship of these variables to the natural environment.

The analysis of social variables is an essential component in the design, evaluation and modifkatiin of renewable resource management programs. Resource social analysis or social impact assessment proceeds through four phases-- the conceptual phase, the research phase, the analytic phase, and the judgemental phase. Methods for data gathering will vary with the information needs of the specific program. Research may include consultation with resource managers, background studies, fieldwork (e.g., interviews and observation), surveys and

statistical analysis. These activities should be coordinated to focus the process on the most signficant factors.

In the assessment of the the Group Venture Program, data gathering consisted of the following three components: elite interviews, a mail questionnaire survey, and a review of relevant records. Information from each component contributed to the scoping of the remaining research activity. The data was analyzed to provide an evauation of the Programs performance and an assessment of the socio-economic impacts. The results of social analyses, such as this, together with an assessment of the impacts to the natural environment provide decision-makers with an information base from which to evaluate and modify the Program.

The current trend toward the incorporation of social analysis in environmental impact assessment and in renewable resource management should improve the effectiveness of these processes. However, the tendency to emphasize the differences between the information needs of impact assessments, resource management policy and programs, and evaluations and monitoring may prove to be counter-productive. While each situation will have its own set of factors that determine the apporpriate procedures, there is much to be gained through further investigation of the features common to social impact assessments and renewable resource social analyses.

REFERENCES

Anonymous (1985) Manual of Procedures and Standards -- Private Lands, revised April 16, 1985. Canadian Forestry Service, Truro and **Nova Scotia** Department of Lands and Forests, Halifax.

Boyd, **R. (1984)** Government support of nonindustrial production: The case of private forests. Southern Economic Journal. **51:89-107.**

Brock, SM. (1975) Social implications of laws regulating forest cutting practices. Journal of Forestry. **73:294.**

Burch, W.R. and **DeLuca, D.R.** (1984) Measuring the Social Impact of Natural Resource Policies. University of New **Mexico Press,** Alburquerque.

Canadian Council on Rural Development. (1978) The relationship of Canada's forests to rural employment and community stability. Canadian Council on Rural Development, Ottawa.

Canadian Forestry Service (1986) Forest management progress reports. Computer printout, Canadian Forestry Service, Truro.

Carley, M. and **Wakey, A.** (1981) Exploring some key elements in SIA. in Tester, F.J. and Mykes, **W.** (1981) Social Impact Assessment: Theppracticehod and . Detselig Enterprises, Calgary.

Chadwick, B. A., Bahr, H. M., Albrecht, S.L. (1984) Social Science Research Methods. Prentice-Hall, Englewood Cliffs, N.J.

Cramer, J. C., **Dietz,** T. and Johnston, R. A. (1980) Social impact assessment of regional plans: a review of methods and issues and a recommended process. Policy Sciences 12: 61-82.

Dexter, L.A. (1970) Elite and Specialized I-. Northwestern University Press, Evanston.

DeSteiger, J.E. **(1984)** Impact of cost-share programs on private reforestation investment. Forestry Science. 30688.

Dickson, A. (1983) Motivating **woodlot** management in Europe and North American: A literature review. A background paper for the New Brunswick private **woodlot** resources study. New Brunswick Department of Natural Resources, Fredericton.

Dodge, G. **&** Burke, R. (1984) New Hampshire's approach to public landowner assistance. in **Irland, L.C.** ed. (1984) Improving the effectiveness of public programs for private forest owners. Papers from S.A.F. New England Section. Worcester, Massachusetts, March **1984.** University of Maine at Orono, Technical Note **#91.**

Dwyer, G.D. (1980) Assessment of group management of private lands project. (unpublished) Nova Scotia Department **of Lands and Forests, Halifax.**

Dwyer, G. **D.** (1984) Group forest management venture program. . unpublished report. Nova Scotia Department of Lands and Forests, Halifax.

Environment Canada **(1985)** Biotobical impacts of **budworm** killed forests. Environment Canada, Halifax.

Fernow, **B.** E. **(1912)** Forest Conditions of Nova Scotia. Commission of Conservation, Ottawa.

Finsterbusch, K. (1977) The use of mini-surveys in social impact assessment. in Finsterbusch, K. and Wolf, C.P. eds. (1977) Methodology of Social Impact Assessment. Dowden, Hutchinson and Ross, Stroudsburg, Pa.

Finsterbusch, K. and Wolf, C.P. eds. (1977) Methodology of Social Impact Assessment. Dowden, Hutchinson and Ross, Stroudsburg, Pa.

Finsterbusch, K., Llewellyn, L. G. and Wolf, C. P. (1983) Social Impact Assessment Methods. Sage Publications, Beverly Hills, Ca.

Gramann, J.H., Marty, T. & Kurtz, W.B. (1985) A logistic analysis of the effects of beliefs and past experience on management plans for non-industrial private forests. Journal of Environmental Management. 20:347-356.

Harou, P.A. (1985) Evaluation of forestry programs: a case study of the forest incentive program in Massachusetts. Forest Ecology and Management. 10:251-267.

Harou, P.A. (1984) Evaluation of forestry programs: The with-without analysis. Canadian Journal of Forestry Research. 14:506-511.

Hawboldt, L. S. (1958) The Forests of Nova Scotia. Nova Scotia Department of Lands and Forests, Halifax.

Holden, A. G. (1984) New direction in environmental analysis: implications for socia analysis. in Wenner, L. ed. (1984) Issues in social impact analysis: Proceedings from an interagency symposium. U. S. Forest Service, Washington.

Huber P. B. (1985) Promoting Timber Cropping: Policies toward non-industrial forest owners in New Brunswick. The Institute for Research on Public Policy, Dalhousie Universtity, Halifax.

Irland, L.C. ed. (1984) Improving the effectiveness of public programs for private forest owners. Papers from S.A.F. New England Section. Worcester, Massachusetts, March 1984. University of Maine at Orono, Technical Note #91.

Irland, L.C. (1981) Federal and state assistance to nonindustrial private forest owners in New England, U.S.A.: Issue for the year 2000. Proceedings of a Symposium on Eastern Canada's Small Private Land Forestry. Université Laval, Ste-Foy, Quebec.

Irland, L.C., Rumpf, T. & Dirkman, J. (1984) The market for forestry services and landowner programs in New England. in Irland, L.C. ed. (1984) Improving the effectiveness of public programs for private forest owners. Papers from S.A.F. New England Section. Worcester, Massachusetts, March 1984. University of Maine at Orono, Technical Note #91.

Johnson, W. L. (1981) The G.D.A. incentive program for private landowners in Nova Scotia. in Lortie, M. (1983) Private nonindustrial forest ownership and public programs in eastern Canada. Journal of Forestry. 81382.

Kessler, G.D. (1978) Programs and priorities in nonindustrial private forestry. Journal of Forestry. 76:409.

Kettala, E. G. (1983) A cartographic history of spuce budworm defoliation 1967 to 1981 in eastern North America. Info Rep DPC-X-14, Canadian Forestry Service, Ottawa.

Krygier, J.T. and Deneke, F. J. (1983) Cooperative extension service programs for the education of forest landowners. in Royer, J.P. & Risbrudt, C.D. eds. (1983) Nonindustrial Private Forests Symposium Proceedings, April 19-20, 1983. Duke University, Durham.

Lang, R. and Armour, R. (1981) The assessment and review of Social Impacts. Federal Environmental Assessment and Review Office, Ottawa.

Lortie, M. (1983) Private nonindustrial forest ownership and public programs in eastern Canada. Journal of Forestry. 81382.

Lyons, J.R. (1983) The real problem with nonindustrial private forests. Journal of Forestry. 81:518.

MacQuarrie, P. (1981) A survey of private woodland owners in Nova Scotia. Department of Lands and Forests, Halifax.

McKillop, W. (1975) Social benefits of forestry incentive programs. Journal of Forestry. 73:214.

Meeks, G. (1982) State incentives for nonindustrial private forestry. Jounral of Forestry. 80:18.

Naveh, Z. and Lieberman, A. S. (1984) Landscape Ecology: Theory and application . Springer-Verlag, New York.

Nova Scotia Department of Development (1986b) input-output model and economic multipliers information. personal communication, Policy and Planning Division, Nova Scotia Department of Development, Halifax.

Nova Scotia Department of Lands and Forests. (1985) Annual report. Nova Scotia Department of Lands and Forests, Halifax.

Nova Scotia Department of Lands and Forests (1970) Nova Scotia Forest Inventory: Cape Breton Island. Department of Lands and Forests, Truro.

Nova Scotia Department of Lands and Forests (1986) Forest Inventory for Cape Breton, unpublished data. Nova Scotia Department of Lands and Forests, Truro.

Osgood, B. T. (1985) Introduction: Critical social information needs of natural resource agencies. in Wenner, L. N. ed. (1985) Social science information and resource management: Proceedings form an interagency sympoium. U. S. Forest Service, Washington.

Osgood, B. T. (1984) Integrating social analysis with agency planning and decisionmaking: the soil conservation service. in Wenner, L. N. ed. (1984) Issues in social impact analysis: Proceedings form an interagency sympoium. U. S. Forest Service, Washington.

Riitiinen, P. (1983) Social change and roundwood supply. Royer & Risbrudt, ed. Nonindustrial Private Forests Symposium Proceedings. April 19-20, 1983. Duke University, Durham.

Roy, P. (1983) New Brunswick nonindustrial woodbt owner survey. A background paper for the New Brunswick private woodbt resources study. New Brunswick Department of Natural Resources, Fredericton.

Royer, J.P. & Risbrudt, C.D. eds. (1983) Nonindustrial Private Forests Symposium Proceedings, April 19-20, 1983. Duke University, Durham.

Royer, J.P., Dutrow, G.F. & Kaiser, H.F. (1983) Estimating the response of nonindustrial private forest landowners to investment opportunities and public programs. Forestry Sector Models: Proceedings of First North American Conference. Dec. 2-4, 1981. Williamsburg, Virginia. AB Academic Publishers, Oxford.

Society of American Foresters. (1983) Improving outputs from nonindustrial private forests: A position of the Society of American Foresters. Journal of Forestry. 81:572.

St taka, J.J., Wisdom, H.W. & Mark, J.E. (1981) Size of holding & investment behaviou t of nonindustrial private owners. Journal of Forestry. 82:495.

Tester, F.J. and Mykes, W. (1981) Social Impact Assessment: Theory, method and practice. Detselig Enterprises, Calgary.

Turner, J.B., Finley, J.C. and Kingsley, N.P. (1977) How reliable ate wood owner's intentions? Journal of Forestry. 75:498-491.

Wenner, L. N. ed. (1985) Social science information and resource management: Proceedings from an interagency symposium. U. S. Forest Service, Washington.

Wennet, L. N. ed. (1984) Issues in social impact analysis: Proceedings from an interagency symposium. U. S. Forest Service, Washington.

Woodlands Management Services (1885) The Socio-economic impact of spruce budworm damage on Cape Bteton Island. Prepared for Envionment Canada by Woodlands Management Services,
St. Peters, N. S.