Development of Social Methodology : Southwestern Ontario Soil and Water Enhancement Program

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1.0 EXECUTIVE SUMMARY

The focus in this study is the process of change in attitudes and behaviour in rural communities as it relates to landowner decision-making about adoption of soil conservation practices. These changes are needed not only at the individual farm operator level, but also at the neighbourhood level if the proposed program is to take root at the sub-watershed level.

This report begins with a survey of the literature pertaining to an individual's decision-making when confronted by social change - the innovation-decision process. The key social and personal/psychological factors affecting this process are highlighted. This is followed by a discussion of their interaction with other factors, specifically in relation to adoption of soil conservation practices. Current application to the Ontario context was attempted through contacts with a number of agency field personnel and with innovative farmers who have had recent experience with soil conservation practices.

In light of the social and psychological factors identified from the literature, a process for obtaining farmer cooperation and participation was developed. This process recognizes the need for farmers to become knowledgeable about the problems caused by soil erosion and to take personal ownership in them before they can be expected to adopt and implement soil conservation measures. Two alternative processes were also examined to permit a comparison of relative advantages and disadvantages.

A program evaluation component was also developed to permit, in a post-program review, an assessment of whether or not the knowledge that farmers acquired during the sub-watershed selection process was transferred into positive action. An outline for evaluating farmer perceptions of the process used to solicit their involvement, as well as the wider diffusion effects of the program was suggested. A proposed procedure for collecting and analyzing data in the candidate watersheds and associated costs was also prepared.

A process for obtaining farmer cooperation and participation and for process evaluation has been proposed. It is suggested that this process will be applicable not only to the specific pilot watershed program but also has the potential to be used as a model application in other watershed management programs where landowner cooperation and participation is essential.

2.0 INTRODUCTION

Soil erosion, with the accompanying problems of the degradation of the soil resource base and declining water quality, has been a problem associated with North American agricultural systems and practices for much of this century. Barkley (1982) outlines the historical context and describes some of the reasons for which North American soil is eroding so rapidly today despite the recognition since the 1930's that the problem must be controlled. Even in the United States where Soil Conservation Service personnel had long warned of the steady depletion of American farmland, it was not until the 1970's that the breadth and the magnitude of the environmental problems attributable to agriculture were finally recognized for their devastating effects (Buttel *et al.* 1981). The relationship between an average annual topsoil loss in the United States of approximately 12 tons per acre (Pimentel *et al.*, 1976) and sedimentation of rivers and lakes, loss of agricultural chemicals, declining productivity, and the sometimes permanent loss of the land resource base, became an obvious cause for concern and a subsequent stimulus for action.

The Canadian agricultural land base has suffered from many of the same abuses. A recent report to the Senate of Canada concludes that "soil degradation is a serious problem in all regions of Canada", and that immediate corrective action needs to occur within the realms of research and education, technology development and transfer, interagency coordination and cooperation, as well as implementation of remedial measures at the farm level (Standing Senate Committee, 1984).

To date, the harmful effects of soil erosion have been masked by the productivity—boosting effects of agricultural chemicals and plant breeding, setting the stage for the possible unfolding of "the greatest environmental disaster in Canada's history" (Fairbairn, 1984). The goal of short—term productivity increases to satisfy the demand for Canadian agricultural products on the international market was accompanied by the use of larger field equipment, excessive tillage operations and the cultivation of land susceptible to erosion particularly in Western Canada (Seecharan and Culver, 1984). A proportionately small emphasis has been placed on the adoption of soil and water conservation measures to balance the more production—oriented goals currently targeted in Canadian agriculture.

Concern for the mounting soil and water quality problems associated with agricultural lands in Ontario have been expressed in a variety of ways in recent years. The 1980 "Save Our Soils" conference sponsored by the Ontario Soil and Crop Improvement Association, the University of Guelph and the Ontario Ministry of Agriculture and Food enumerated the problems linked to soil erosion. A recent study conducted by the Ontario Institute of Pedology in cooperation with the Ontario Ministry of Agriculture and Food estimate the total annual erosion costs in Ontario attributable to crop yield, soil nutrient and pesticide loss to be $68 million. More than 80% of those

costs occur in the southern and western regions of the province, where annual losses of $30-45/ha are not uncommon (Driver and Wall, 1982).

The Ontario Chapter of the Soil Conservation Society of America has recently issued a position statement recognizing erosion's threat to the security of agriculture, to the quality of the water resource, and to the survival of future generations (Ontario Chapter of SCSA, 1983). Ontario, being in the unique position of containing half of Canada's agricultural capability class 1 lands, (Environment Canada, 1976) has the opportunity and challenge of maintaining these soils in a highly productive state in the interests of provincial and national food sufficiency.

All of these conferences, research projects and reports have clearly pointed toward the need for remedial action to begin immediately. In the midst of severe economic constraints in much of the farm sector, farmers are being asked to think creatively about modifying aspects of their management systems and adopting certain soil erosion control innovations on their farms and in their local watersheds as ultimately that is where ameliorative change must occur to combat nonpoint source pollution caused by erosion.

The Farmer

The farmer fills many roles in his functioning as an individual within society, and in the context of these roles he is asked to consider implementing soil conservation practices. He is a businessman who is expected to make financial and other management decisions which will be of benefit to his farming enterprise in both the short and the long-term. Independent thinking may often characterize the context for his decision-making, yet the farming industry is regulated by numerous government and marketing agencies to which he must conform. He is also composed of a complex of individual and social characteristics which identify his person in relation to his family, to groups, organizations and institutions. In the midst of these realities, the farmer is asked to consider adopting soil conservation measures which are designed to alleviate not just a private cost, but a social cost as well. How does the farmer arrive at the decision to incorporate or not incorporate conservation practices on his farm?

3.0 CONCEPTUAL MODEL FOR THE ADOPTION OF SOIL CONSERVATION PRACTICES

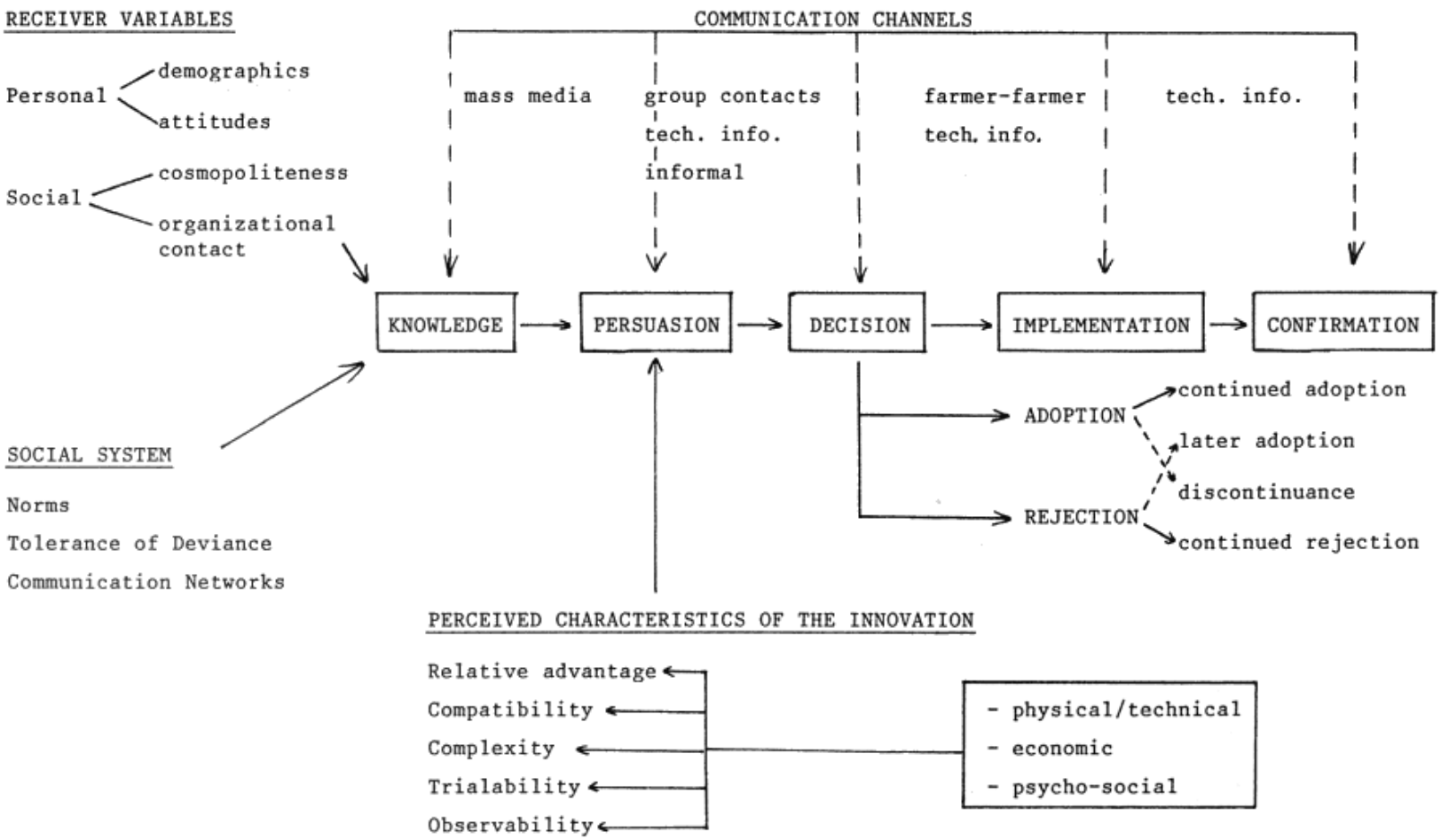
While the magnitude of the soil erosion problem and the private and social costs associated with it in southern Ontario have been estimated (Driver and Wall, 1982), the expectation that the farming sector begin the process of remedial measure implementation has come as a completely new idea to many farmers. Some farmers have become aware of the relationship between their cropping and agricultural land practices and the resultant problems of soil erosion and declining water quality, but generally a slower than desirable rate of adoption of soil erosion control measures has occurred on agricultural lands (SWQEP, draft proposal, 1984).

Rogers (1971, 1983) has developed a conceptual framework incorporating the diffusion of innovative ideas and the accompanying innovation-decision processes that occur in deciding whether to adopt or reject a particular practice. He defines diffusion as the "process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1983). The innovation-decision process is "the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers, 1983). Figure 1 represents the framework on which will be based the subsequent discussion of the social and psychological factors and their interrelationship with the economic, physical and institutional factors regarding acceptance of soil erosion control innovations.

Expanding on an earlier 4-stage model of the innovation-decision process (Rogers and Shoemaker, 1971), Rogers (1983) specifies 5 stages of the model consisting of (1) initial knowledge of the innovation, (2) persuasion, or formation of favourable or unfavourable attitudes toward the innovation, (3) decision, or choosing to accept or reject the innovation, (4) implementing or putting the innovation to use, and (5) confirmation as an individual or group seeks reinforcement for an innovation-decision already made. Prior to the introduction of the idea of a new innovation, a number of factors are already in place, including the personal and social characteristics of the individuals involved as well as the structure of the social system provided by its norms and communication networks (Rogers and Shoemaker, 1971). Communication channels, including the mass media and various forms of interpersonal channels impinge upon the decision-making process at each stage along the way.

Agents of social change are ultimately concerned with the rate of adoption or relative speed with which an innovation is adopted by members of a social system; promoters of soil erosion control measures on agricultural lands are no exception. Rogers (1983) identifies the following as variables in determining the rate of adoption:

FIGURE 1. THE INNOVATION-DECISION PROCESS



(1) The perceived attributes of the innovation including its relative advantage, compatibility, complexity, trialability and observability. Each of these categories may contain a psycho-sociological as well as a physical, economic or technical component.

(2) The type of innovation-decision made, whether it be entirely left up to the individual (optional), a group or organizational decision (collective) or a decision made by people who possess power, status or technical expertise (authority).

(3) The communication channels used, including the mass media or interpersonal networks.

(4) The nature of the social system, its norms and degree of interconnectedness.

(5) The nature and extent of the change agents' promotional efforts.

Several authors have recently employed diffusion theory as a means of discussing the factors they perceive as having major impact on farmer adoption or rejection of soil conservation control measures. Most have neglected to incorporate an adequate sociological analysis into their work.

Taylor and Miller (1976) have conducted extensive innovation-decision research in conjunction with the Black Creek soil conservation project in Indiana. While these researchers have recognized the importance of attempting to incorporate the variables of social system norms and tolerance of deviance into their research, their usage of the Amish versus non-Amish dichotomy to operationalize an 'orientation towards farming' variable is criticized by Ervin and Ervin (1982) as being inadequate. Taylor and Miller (1978) recognize the limitations of drawing conclusions of sociological factors affecting adoption of environmental innovations when the Black Creek project also made use of government subsidies to stimulate adoption.

Ervin and Ervin (1982), on the other hand, discuss at length the impact of personal, physical, economic and institutional factors in relation to the decision-making process for the use of soil conservation practices. The only references to social system-oriented variables alluded to in their research appear in the concluding remarks where the authors admit that "noneconomic variables could play important roles, including personal values toward soil conservation deriving from family, ethnicity, and/or religion". In other words, the values and social norms derived from those values, together with the complex of community information processes held by Rogers and others to be instrumental in the innovation-decision process have been essentially deleted from this work.

Social systems theory and analysis, including elements of diffusion and innovation theory have been outlined by several authors (Parsons, 1951 and Merton, 1957) and involves a consideration of values and norms. All social systems, composed of actors in structures, operate on the basis of values which are considered an expression of the desirable, the good and the beautiful. Social norms are the expected behaviours of individuals in social systems (or subsystems) which are intended to assist the individuals, the subsystems, as well as the systems achieve the goals to which they subscribe. Absence of norms or their nonenforcement results in anomie or disorganization.

In the innovation-decision process, this discussion has application to the types of communication networks likely to be established within a social system. The degree to which pairs of individuals who interact are similar in certain attitudes, such as beliefs, education, social status, and the like - a term referred to as "homophily" (Rogers, 1983) - determines the degree of effectiveness of interpersonal communication. Members of the highest status groups (or often the innovators) seldom interact directly with those of lower status (or the laggards). Thus, homophily can act as an invisible barrier to the flow of innovations within a system, thereby requiring intervention by a change agent or the deviance of a group member to inject new ideas into what is a relatively closed system. The abhorrence of a "trashy-looking" field may reflect a field management value held by members of a social system, and its norms would dictate that that field be moldboard-plowed. An individual within that system, however, in seeing the potential benefits of involvement in conservation-oriented agricultural practices will need to weigh the opinions of his fellow social system members in the decision of whether or not to adopt particular practices.

4.0 SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING ADOPTION OF SOIL CONSERVATION PRACTICES

By virtue of being human, an individual is composed of various social and psychological characteristics which determine how he responds to various stimuli in the environment. These characteristics are both antecedent to as well as concurrent with the innovation-decision model as outlined by Rogers (1983). In other words, their impact in relation to the final decision of adoption or rejection cannot be underestimated throughout the entire innovation-decision process.

Personal/Psychological Factors

Numerous studies have shown that increasing age of farm operators is negatively associated with adoption of conservation practices; that is, younger farmers are likely to be more highly educated and perceive soil erosion as a problem (Ervin and Ervin, 1982; Van Liere, 1980; Bultena and Hoiberg, 1983, Seecharan, 1984). In earlier work, Nowak *et al.*, 1980) suggested that older farmers may view protecting the land as an important stewardship ideal, but subsequent work by him and his colleagues concurs with the findings that in practice, younger farmers adopt certain conservation practices more readily (Korsching *et al.*,1983).

Higher levels of education are generally associated with implementation of soil conservation measures (Earle *et al.*,1979; Ervin and Ervin, 1982; Taylor and Miller, 1976; Bultena and Hoiberg, 1983). Seecharan (1984) quotes a source who suggests that education facilitates a farmer's ability to deal with abstract ideas which subsequently assists him in decision-making processes regarding implementation of conservation measures.

The perceived need or the perceived extent of the soil erosion problem in society or at a regional level has generally been found to be highly correlated to willingness to consider soil conservation measures (Earle, 1979; Bultena and Hoiberg, 1983). This factor was one of the most highly correlated to farmer adoption of soil conservation measures in research carried out by Taylor and Miller (1978) and one of the bases on which the critique of Pampel and van Es (1977) was carried out for its non-inclusion as a determining factor. The research carried out by Taylor and Miller (1978) indicates that perceived need for an innovation is positively related to early knowledge of the innovation to a highly significant degree, but that this factor is also significant at the persuasion and decision stages as well.

In addition to perception of the problem, Nowak (1983b) warns of the research which shows a direct relationship between the perceived severity of erosion problems and the distance from one's own farming operation. In other words, "the closer one comes to home, the less likely one is to acknowledge soil erosion as a serious problem". The undue emphasis on highly visual forms of soil

erosion (gully, etc.) by educators has been a factor in failing to inform farmers of the more insidious, but prevalent reality of sheet and rill erosion. Thus, level of awareness will obviously affect adoption of soil conservation practices.

Risk aversion, while closely related to economic factors, also represents an attitudinal dimension of the individual with respect to psychological innovativeness (Pamel and van Es, 1977). Many soil conservation and water quality technologies are relatively new - certainly in the Ontario context - and thus our knowledge of their short and long-term impacts in site-specific locations is unknown, thereby necessitating some risk to become involved. Risk-averse farmers were found to delay adoption decisions until more information was available or until the economic benefits were more adequately quantified (Nowak and Korsching, 1983; Ervin and Ervin, 1982; Bultena and Hoiberg, 1983).

The number of years that an operator has farmed has not been found to have significant impact on adoption of soil conservation measures such as conservation tillage (Korsching *et al.*,1983). Pampel and van Es (1977) found some relationship between number of years of farming activity and an environmental orientation to agriculture. However, the authors have not treated adoption of conservation measures as a process and therefore have not included farmer's knowledge and attitudes which could have made an important contribution to understanding that particular finding (Taylor and Miller, 1978).

A number of studies have been conducted examining attitudes of farmers and their relationship to the broader concept of environmental concern. Buttel (1981) found that farmers in both Michigan and New York States expressing a noneconomic orientation toward agriculture had a statistically significant concern with soil erosion. However, there was no substantiation of how that concern was being implemented on the farm. Use of a conservation attitude index and a farm orientation index (weighing of various reasons for farming) provided inconclusive results in relation to use of soil conservation practices (Ervin and Ervin, 1982). Taylor and Miller (1978) operationalized farm orientation using an Amish/non Amish dichotomous variable, whose limitation has already been cited in this review. Refinement of these indices could enhance their potential usefulness.

In a study of the general American population, Van Liere (1980) discovered that citizens professing a liberal political ideology were positively associated with environmental concern. Buttel (1981), in his study of two farming population, concurs with this evidence as political liberalism was found to be highly correlated with all indices of environmental concern, including that of soil erosion.

Finally, factors indicating the general innovativeness of a farmer must not be overlooked; that is, his orientation toward new ideas and the willingness to change. Such personality characteristics as achievement motivation and entrepreneurship are part of a general psychological innovativeness

expressed by farmers who have either a commercial or an environmental orientation toward agriculture (Pampel and van Es, 1977). This is supported by recent research which indicates that farmers who are most likely to accept commercial innovations on their farms are also most likely to accept the conservation measure of minimum tillage on their farms (Korsching *et al.*, 1983). Rogers (1983) identifies personality characteristics such as a more favourable attitude toward science, a more favourable attitude toward change and risk, and a higher level of educational and occupational aspirations as attributes of early adopters of innovations in various contexts.

Social Factors

Social factors in this review relate to the nature of an individual's network of relationships with neighbours, organization and institutions which are likely to contribute to a willingness to cooperate with others in implementing measures to enhance soil and water quality.

While the cost associated with erosion of Ontario soils has been at least partially documented, many farmers have not become aware of the subtle nature of soil erosion from their farms (Sadler Richards, 1983). Even in the Thames River Basin where probably the most concerted effort of education and control measure implementation in Ontario has occurred, the conclusion is reached that "soil erosion is not yet perceived as a serious problem by the farming community" (Pharo, 1982). This conclusion, however, was based largely on questions regarding the severity of soil erosion in their townships, for which many respondents may not have had the necessary information to answer appropriately.

Needless to say, mass media is the communication channel generally used to reach a large audience rapidly, create knowledge and spread information, and begin to effect changes in weakly held attitudes. Mass media is relatively more important at the knowledge stage of the innovation-decision process than at other stages (Rogers, 1983). Farm papers and magazines were considered to be the most effective means of relaying general awareness information on soil conservation in the Thames River Basin project (Pharo, 1982).

As cosmopolite (bringing information into the existing social system) is descriptive of the mass media channel, so cosmopolite describes the individual who becomes the innovator or early adaptor and who is most likely to use the new information from that channel within a social system. Interpersonal channels may be either local or cosmopolite but those which are localite by nature will have greater impact at the persuasion stage when neighbours are rubbing shoulders with each other concerning the innovation (Rogers, 1983).

Opinion leaders are individuals "who lead in influencing others- opinions about innovations" (Rogers, 1983), and thus have obvious impact on the innovation-decision process within a social

system. If a social system is oriented to change, opinion leaders are innovative; if norms oppose change, the opinion leaders will also reflect this. Opinion leaders are often characterized by their higher exposure to external communication sources, they are more cosmopolite by nature, of somewhat higher social status, and are usually more innovative depending on social system norms (Rogers, 1983). Taylor and Miller (1976) identify farmer contact with opinion (influential) leaders as a significant factor in the spread of soil conservation innovations. Opinion leaders thus act as legitimizers for an innovation-decision to be taken within a collective or group context (Lamble, 1984).

Contact with organizations, agencies and professional personnel are factors generally viewed as encouraging the diffusion and adoption of innovations within the farm context (Taylor and Miller, 1978; Wilson, 1979). Organizational involvement related directly to the adoption of conservation tillage measures in Iowa (Korsching *et al.*, 1983). The nature of the organizations cited was not analyzed, but rather actual attendance and holding of an office was documented to show degree of involvement. The recognized lack of a lead agency in coordinating a response to soil erosion problems in Ontario has often left farmers confused as to whom they should ask for assistance (Standing Committee, 1984), and therefore, farmer contact with any one agency cannot be used as an indicator of soil erosion control awareness or practice except within a very localized watershed. The Ontario Ministry of Agriculture was identified by the largest proportion of farmers in the Thames River Basin as the agency which should take the leading role in the area of soil conservation (Pharo, 1982).

In attempting to discover farmers- willingness to cooperate with others, Wilson (1979) employed an attitudinal scale identifying an independent versus a group action orientation to farmer thinking. Results of this study showed that commercial farmers as compared with limited resource farmers were more group action oriented and therefore more willing to cooperate in the farm context. This may have implications for achieving cooperation at a watershed level as Korsching *et al.*, (1983) substantiate the commonality of variables describing those who practice conservation tillage and those who are commercial farmers.

Only recently has a soil erosion-related study linked the importance of social norms with the adoption of a soil erosion control measure - conservation (reduced) tillage (Bultena and Hoiberg, 1983). These researchers showed that high perceived level of community support for reduced tillage as well as high perceived extent of actual adoption of reduced tillage in the community were highly correlated with those who had adopted reduced tillage practices themselves. Farmers do regard the thinking and practices of neighbours as highly important in their own decision-making regarding adoption of soil conservation practices on their own farms.

Other social factors have been suggested in the literature as influencing concerns for the environment and affecting adoption of soil conservation practices. These include place of residence - urban versus rural - where urbanite have been shown to display a positive association with environmental concern, whereas rural folk tend to have a more utilitarian approach to the environment and often express less concern (Van Liere, 1980). Ethnicity has been a part of several studies in only limited ways (Taylor and Miller, 1978; Bromley, 1980) but it may be a factor in forming values toward soil conservation.

4.1 Interrelationship of Social and Psychological Factors with Other Factors

Other factors identified as influencing farmer decision-making regarding the acceptability of soil conservation practices include the economic, the institutional, the physical (ecological), and the technical.

A wide variety of economic factors have been shown to affect the adoption of soil conservation practices. Farm size has mostly been shown to relate positively to the adoption of soil conservation practices. Operators of larger farms exhibit more flexibility in their decision-making, have access to available capital, have more opportunity to experiment with implementation on a small scale basis, and are better able to deal with the risk and uncertainty associated with new agricultural practices (Seecharan and Culver, 1984; Nowak and Korsching, 1983; Wagener *et al.*, 1981; Bultena and Hoiberg, 1983). High farm income levels and low debt levels are positively related to the use of conservation practices as those with high debt levels are forced to grow more erosion-prone row crops and find it harder to finance conservation structures (Nowak and Korsching, 1983; Ervin and Ervin, 1982; Bultena and Hoiberg, 1983).

Off-farm income has been suggested as an economic variable, but more information is needed on the reason for the off-farm work. It could reflect the need for supplements to meet basic family needs and as such would provide little extra to initiate unfamiliar practices (Ervin and Ervin, 1982).

Those owning land as opposed to renting land have generally been found to employ conservation practices as they are more likely to reap the long-term economic benefits (Seecharan and Culver, 1984). Lower discount rates and longer planning periods usually associated with conservation investments appeal to those who maintain a longer term attachment to the land (Ervin and Ervin, 1982). However, recent conservation tillage work by Bultena and Hoiberg (1983), has shown that tenure status made no significant difference, as those who rented also were amongst the younger and larger operators who were more favourable to implementing conservation practices.

Institutions have an educational and technical assistance role to play at all stages of the innovation-decision process, as alluded to by Ervin and Ervin (1982). Nowak and Korsching (1983)

point out that those who are integrated into institutional networks are more likely to exhibit conservation behaviour. Technical assistance related to newly developing programs is usually conveyed to farmers by some institutional means. Sadler Richards (1983) identifies the need in Ontario for more cost-benefit analysis of various tillage options as well as the need for increased technical assistance at a local level. The lack of a lead agency or institution to promote social conservation practices in Canada has already been identified in this report as a constraint on effective programming (Standing Senate Committee, 1984).

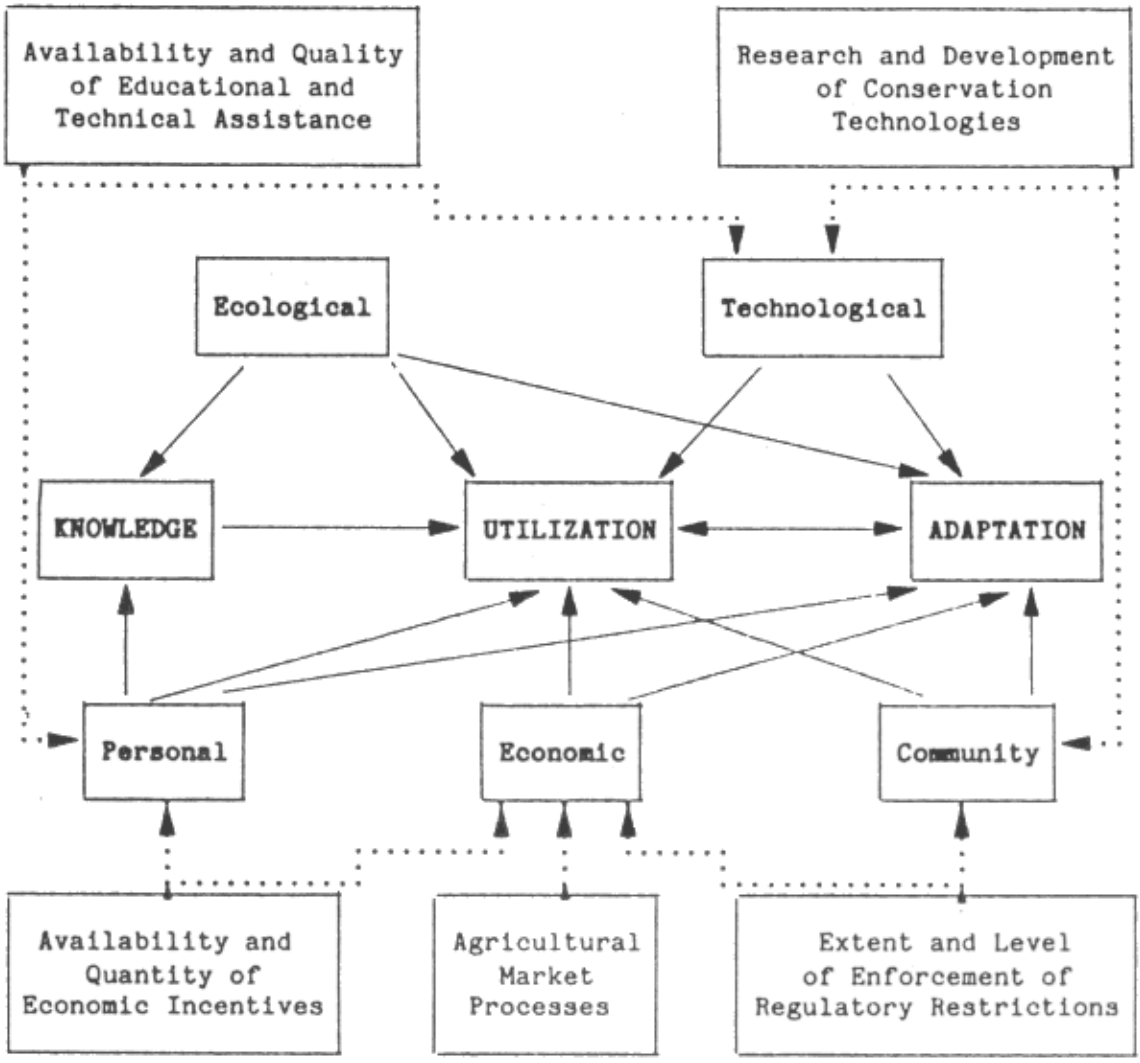
Any analysis of soil conservation practices used must take into consideration the heterogeneous characteristics of the land including topography, soil type and climatic conditions (Seecharan and Culver, 1984; Ervin and Ervin, 1982; Nowak and Korsching, 1983). Conservation needs will vary accordingly from farm to farm and watershed to watershed, thus largely eliminating blanket recommendations on a physical (ecological) basis, not to mention the interplay of other factors. Ervin and Ervin (1982) also found a negative relationship between cash grain farmers and soil conservation practices in their Missouri study. Crop rotations with forage crops were not considered relevant options in their cropping systems.

Having identified numerous personal, psycho-social and other factors just cited from the literature, one readily comes to the conclusion that conservation behaviours are influenced by a very complex and dynamic set of factors. Tt is far easier to create a list of factors associated with conservation behaviour than it is to rank them and determine their relative efficacy in influencing behaviour, which is more relevant to creating good conservation policy (Nowak, 1983c). Sociologists, economists, technologists and ecologists must recognize the interdisciplinary nature of the problem at hand and must seek to work together at both coordinating and implementing the appropriate responses as socio-economic and ecological contexts change (Seecharan and Culver, 1984; Nowak, 1983c).

The literature pertaining to the use of soil conservation practices contains many articles attempting to identify specific factors affecting farmer adoption of those practices within a particular regional/watershed context within a particular time frame. Rarely is the researcher given the opportunity to reflect on the overall possible interrelationship of all those factors and then be able to choose a selection of those factors as determined by the particular characteristics of the target watershed.

Nowak (1983b) presents a modified innovation-decision model which has evolved directly out of his extensive work involving farmer use of soil conservation practices. His model (Figure 2) entitled, "Micro/macro influences on the use of conservation practices" follows:

FIGURE 2. Micro/macro influences on the use of conservation practices.



The core of the model, identified as the knowledge, utilization and adaptation stages represents the flow of the decision-making process as outlined by Rogers (1983). Adaptation incorporates the concept of re-invention found in Rogers' implementation stage, allowing for one's management system, the technology, or both, to be adapted to increase overall utility. This allows for more flexibility than what is inherent in the dichotomy of adoption or rejection. The reality of the non-existence of pre-packaged "conservation machines, cookbooks or other forms of quick technological fixes" (Nowak, 1983b:87) makes adaptation both advisable and necessary.

The ecological, personal, economic, community and technological factors represent micro influences and affect the core stages to various degrees. These in turn are impacted on by the macro influences representing market forces, institutional arrangements, research, etc.

Refinement of a model such as this will certainly need to occur as soil erosion control research and implementation is begun on Ontario agricultural land. Much of the American research, particularly associated with conservation tillage, has taken place in the Midwest on particular soil types under particular cropping systems and within specific institutional arrangements. What are the micro influences - community and personal, for example - which affect farmer cooperation in Ontario watersheds? Do they impact on the rest of the model differently in Ontario than what has been documented in American studies? What can be applied to the Ontario situation regarding institutional input and coordination at the beginning of a new soil conservation thrust? These and other questions seek answers within the Ontario context.

4.2 The Ontario Context - Factors in the Selection of Watersheds

This section is an attempt to apply the findings from the literature regarding factors affecting adoption of soil conservation practices to the reality of the Ontario context. To assist in this process, a number of open-ended questions (through phone interviews) were asked of innovative farmers and agency personnel (Appendix A) who have had some experience in implementing soil conservation practices and/or experience in achieving some degree of farmer cooperation in soil conservation efforts. Several American researchers and practitioners, working largely within the Great Lakes drainage basin, were also queried as to the specifics of their involvements in organizing farmers in the beginning stages of soil conservation projects and the constraining factors encountered in promoting these projects.

Due to the limited number of both interviewees and the questions asked of them, the results are discussed primarily as trends which help to confirm or negate the findings from the literature. No attempt is made to rank the importance of the factors affecting adoption of soil conservation practices, as wide variation in the Ontario context was found depending on site-specific

characteristics. Rather, the factors are clearly identified to ensure their consideration in the implementation of any non-point source pollution abatement programs at a watershed level.

Personal/Attitudinal Factors

A prerequisite for innovators in Ontario to begin implementing soil erosion control practices on their farms was a definite acknowledgment that their farm had problems. This awareness was often stimulated by visual, physical phenomena on their farms; sandblasting of young crops, a heavy rain event causing rill or gully erosion, yields dropping on monocropped lands and knolls, or the fact that they remember their father having recurring 'washout' problems. In other cases, innovators had access to American literature which indicated the benefits of soil erosion control both in the short and the long term. Others became interested when Conservation Authorities or other agencies showed that their farm or watershed was contributing to the deterioration of water quality downstream. Innovators have been quick to perceive the problem and quick to take remedial action when other constraints, particularly technical, have been removed. Soil conservation programs designed for a wider farm population must be accompanied by educational programs to increase the conservation information base, allay the fears generated by certain economic misconceptions and provide **a** level of understanding for those who have heard of, or have had negative experiences themselves (Sadler Richards, 1983; Taylor and Miller, 1978).

While the specific questions of age and education were not asked of innovators, there were some trends indicated which appeared consistent with the findings in the literature. Agency personnel suggested that younger farmers are generally more likely to consider changing management or cropping systems to incorporate conservation practices, especially if they have had formal agriculture-related training. The younger farmers with less formal education are reported to sometimes exhibit a more cocky attitude towards extension personnel ideas, preferring to rely on their own ideas which may have stronger roots in the status quo than in innovative thinking. Several innovative farmers stated that middle-aged farmers are in a better financial position to consider taking the perceived economic risks associated with certain conservation practices, and still have enough farming years left to see the benefits of the investment. In other words, those whose age represents neither the extremes of young or old are apparently more likely to implement soil conservation practices.

Several farmers expressed their spirit of innovativeness as the motivating force behind their involvement in conservation practices. Those who are less inclined to express their innovativeness in terms of modifying equipment or management systems will need to be shown systems that work in order for them to consider adopting appropriate practices.

Social/Community Factors

Innovators were asked, "What comments or reactions did you get from your neighbours regarding your implementing soil conservation practices?" Invariably, the response described a high degree of initial skepticism regarding the technical or economic feasibility of such action. However, in locations where a group of farmers had implemented soil conservation measures concurrently and consistently over a period of four or five years, innovators reported increasing peer pressure to adopt minimum tillage practices. Local opinion leaders seemed to want to make certain conservation practices a popular issue. In other areas, agency personnel reported fairly strong opposition to minimum tillage practices, possibly as a result of initial expectations of project results being raised higher than they should have been.

Innovators and agency personnel reported the following social norms that impede the adoption of soil conservation practices:

1) Farmers in general, still prefer to maximize yields rather than carefully analyze net income. This latter approach would allow incorporation of lower-cost tillage practices and offset somewhat lower yields, if that were to occur.

2) There is a certain amount of pride in the farm community pertaining to clean-tilled fields (moldboard plowed), straight rows, and weed-free crops which is discouraging adoption of certain practices.

3) Agricultural land close to urban centres and leased to farmers on a short-term basis compounds the soil erosion problem. The Waterloo Federation of Agriculture has recently written a position statement offering some alternative ideas on lease agreements which they presented to the Waterloo Municipal Planning authorities. Some agricultural land in southern Ontario is said to be abused by canning companies which exhibit minimal concern for its long term viability.

4) Terracing of farmland is a conservation practice many farmers consider to be too drastic, even though it may be warranted in particular localities.

5) Farmers who are well-off and not morally/ethically motivated tend to exhibit a lot of complacency with regard to conservation practices.

6) Organic farmers are generally good allies.

7) There is an element within the farm community which takes a rather cynical view of government's efforts to promote soil conservation practices. This cynicism is fed by the perception that research institutions are too slow and inflexible to be helpful, that government programs are too short-term and by the wider perspective that government can at times be unaccountable to the people if mistakes would be made in the course of program development.

Norms based on ethnicity or religion, which could help or hinder soil conservation efforts in Ontario did not surface in the telephone interviews. Conservative Amish, Mennonite or other ethnic religious minorities are present in certain parts of Ontario, but given a sensitive approach through their leadership people, cooperation can be expected as was realized by Taylor and Miller (1978) in Indiana.

Innovators within a local area are generally linked together through some organizational structure, indicating their willingness to work together with others. They have also found that organizational membership facilitates information pooling as well as being more readily recognized by funding bodies. Conservation Tillage groups within the Soils and Crops Improvement Associations have attracted innovators in counties where S.C.I.A. have proved to be active. Other groups have chosen to associate with Conservation Authorities while others have remained completely separate in order to maintain their freedom to lobby any government agency.

Economic Factors

There is considerable debate amongst farmers and agency people as to the cost in relation to the benefits associated with implementation of soil conservation practices. Depending on the structure or practice implemented, there will be an initial cost not accompanied by an immediate benefit. However, most agency personnel and innovative farmers speak of perceived economic costs because of the following advantages of conservation practices:

1) You save tillage passes over the field with conservation tillage. In addition, you ease the labour bottleneck in the spring.

2) With crop rotation, there is better soil tilth, improving workability.

3) Management becomes easier, as anyone can drive a mulch tiller through oddly-shaped fields.

4) With no-till planters, you save on implement replacement in the future.

5) When I see the neighbour's erosion problems, I know T am not losing money. To work with soil, you need stable soil.

Many innovators insisted that soil conservation controls and techniques should be sold to the public on the basis of the economic benefits associated with them.

It is generally acknowledged that certain economic incentives are required, however, for the majority of farmers to consider implementing soil conservation practices. A few farmers who like to be innovators, or who feel an ethical commitment to the land, or who like the attention received from extension personnel, will act on their own initiative. Others will require either proof beyond a doubt that soil conservation practices provide a short and long-term economic benefit, or a direct subsidy or grant. As the former is generally difficult to prove (beyond a specific micro-location), some reliance is placed in the latter as a motivating force in Ontario watersheds.

Much caution was expressed by both farmers and agency personnel concerning over-reliance on economic incentives. The Stratford-Avon project (U.T.R.C.A.) witnessed approximately 60% of project participants reverting back to pre-project practices following termination of the program and its economic incentives (personal communication, Paul Fish, U.T.R.C.A.). The type of economic incentive which should be offered was also disputed, with some suggesting direct grants for a short period of time to give visibility to a program, and others suggesting that municipal tax breaks be given for implementation of certain structures, or rapid depreciation allowances be permitted on conservation tillage equipment. Whatever economic incentive is given, it must be towards a program that is feasible within the cooperator's management system and should ideally be accompanied by an educational program designed to encourage the development of a long-term conservation ethic.

Ecological/Physical Factors

It has already been noted that innovators perceive there to be a soil erosion problem on their farms and have chosen to implement remedial measures accordingly. Terracing of farmland was the most drastic remedial measure encountered by the researcher. The innovator seemed quite satisfied that, given his particular soil type and topography, this measure was warranted. Other micro-locations will require completely different solutions to erosion problems.

Many innovators suggested that the most worthwhile agency initiatives were those which emphasized demonstration sites on individual farms. Because of the diversity in soil type and topography between adjacent farms, measures applicable to one farm may well be inappropriate for the neighbouring farms. Developing a soil conservation 'farm plan' for individual farms is a much sought-after service offered by the Upper Thames River Conservation Authority. Understanding site-specific ecological characteristics is essential to developing the appropriate remedial measure.

The challenge regarding ecological factors rests in convincing farmers that own relatively flat farmland that sheet, rill and wind erosion still cause significant soil losses and impact on water quality. Losses from this type of farm can only be estimated using the best scientific techniques available, so one can hardly expect the farmer to be aware of this soil movement (Nowak, 1983b). Educational programs are needed to alert farmers to the often subtle nature of soil erosion (Sadler Richards, 1983).

Technological Factors

Contacts with American soil conservation project personnel indicate that in many of their early programs, technical assistance personnel were just not available. Later on, when soil conservation practices became more socially acceptable, then the technology itself in the form of equipment was not available in sufficient quantity.

Similar constraints appear to be occurring in the Ontario context. Several innovators have gone to the United States for both the technical assistance in the form of information and personnel, as well as the actual equipment itself. More recently, certain of the Conservation Authorities have made mulch tilling equipment available, certain farm implement dealers are selling some conservation tillage equipment, and some conservation tillage groups are sharing equipment or modifying existing equipment.

Technological constraints seemed to apply in three different areas. The first was in relation to the difficulty of working conservation tillage into cropping systems on even marginally different soil types (i.e. silty clay loam versus clay loam). Technology needs to be applied in an on-farm context so the farmer can see the results and better understand the modifications to the technology that are required. Second, according to some [a]gency people, farmers are tending to put in "structures", as when its done, its done! It's something visible that the farmer likes to see, but without accompanying cropland/residue management programs, the structures will not achieve their full potential. Third, drainage contractors are becoming more aware of erosion control measures that can effectively compliment subsurface drainage systems. However, agency personnel stated that any program that requires farmers to pay engineering fees for design of soil erosion structures is not likely to have much popularity as some farmers apparently dislike paying fees to engineers.

Institutional Factors

The role of institutions, both governmental and private sector, is a crucial factor in the diffusion and adoption of soil conservation practices in Ontario. Many innovators have expressed some frustration at the lack of informational and technical support forthcoming from Canadian institutions,

and yet at the same time, they recognize those same institutions as holding the key to whether or not soil conservation becomes a popular concern in both the urban and rural sectors of Ontario.

The institutional role can be broadly separated into three areas; educational, research and communication/coordination.

i) Educational

It is important to recognize the extent and strength of the informal, farmer-initiated soil conservation practice networking in Ontario that has already occurred with American individuals/institutions and the subsequent self-taught movement concerning implementation and modification of implements and field management systems by the innovators. Where willing, these innovators should be invited to share of their own experiences in the presence of those in earlier stages of the innovation-decision process.

Institutions should be aware of the great variation of soil conservation experience across the province and within a local area - from the innovators to the unaware - and develop educational programs accordingly. If the educational thrusts are accompanied by the appropriate technical assistance, the institution hopefully experiences farmers coming to them because they perceive a problem and want to do something about it. Even then, the need for education exists in achieving a balance between cropland residue management and the appropriate soil erosion control structures to achieve the greatest possible effect from each practice. Institutions can help create peer pressure at the grassroots level for farmers to conform to certain soil erosion control practices.

ii) Research

Institutions need to know what kind of research can best compliment that which individual innovators are carrying out. Innovator criticisms in the past have been aimed at institutional research which is too rigid or too short-term in terms of on-farm demonstrations.

Agribusiness is taking a more active role in promoting soil conservation practices in the United States where government programs have terminated (personal communication with Dr. Steven Lovejoy, Purdue University). In Ontario, seed companies, farm equipment/implement dealers, drainage contractors and chemical companies have all expressed some interest in associating themselves with the spread of soil conservation practices. Government institutions can help ensure that agribusiness is constructively contributing to the solution of soil erosion problems and can chose to support those initiatives deemed most helpful.

iii) Communication/coordination

Innovators and agency personnel readily admit that inter-agency communication and coordination is severely lacking in Ontario. It appears that generally, Conservation Authorities have taken the initiative in approaching farmers about soil conservation from a water quality perspective. OMAF, until recently, has not had a 'conservation mandate' as such, and thus has waited for farmers to approach them.

There seems to be a general consensus that OMAF, through the related Soils and Crops Improvement Associations, together with the Conservation Authorities should provide the personnel in forming a lead agency whose mandate it is to coordinate a serious soil erosion control effort.

Innovators in the States have been shown to belong to institutional networks (Nowak and Korsching, 1983), and generally, the same appears to be true of the Ontario situation. Agency-farmer communication can likely be enhanced by institutions who have had success working with farmers, continuing to do so. Some innovators expressed concern at the possibility of yet another kind of letterhead crossing their desks which represents for them a form of bureaucratic overload. Farmers are impressed with agencies that work together, and this should be evident within a given candidate watershed.

Summary

The key factors for the selection of watersheds in Ontario have been outlined including the personal/attitudinal, the social/community, the economic, the ecological/physical, the technological, and the institutional. As such, their interrelationship and their impact on the innovation-decision process experienced by individuals or groups concerning adoption of soil conservation practices in Ontario conforms largely to the model (Fig. 2) as outlined by Nowak (1983b). The macro influences as outlined in the model are assumed present within the discussion of institutional factors.

5.0 PROCESSES FOR OBTAINING FARMER COOPERATION AND PARTICIPATION

The current soil erosion control initiative as outlined by Agriculture Canada, represents a relatively new approach to addressing the problem of soil erosion and sediment control. That is, 100 percent of the landowners, most likely farmers, are being asked to participate in a cooperative venture on the basis of having potentially only one thing in common that can be verified - that being excess surface or sub-surface water emptying into a common drainage basin. It is possible that no previous cause or event has drawn the farmers in a particular sub-watershed together as a group with a common task.

For this reason, plus the fact that erosion and sediment control may in itself be a relatively new concept for many farmers, considerable effort must go in to preparing the groundwork for farmers to see the need for solving the problem and the benefits to acting on it cooperatively.

Figure 3 presents a comprehensive process for obtaining farmer cooperation and participation during the selection of sub-watersheds and one which will most likely translate into farmer implementation of remedial measures to control soil erosion on individual farms and subsequently throughout the sub-watershed.

Following presentation of the rationale for the steps outlined in Figure 3, a brief discussion of two alternatives to this process and their advantages and disadvantages is presented.

5.1 Rationale for Steps Outlined in the Sub-Watershed Selection Process

The following discussion identifies the rationale for each step outlined within the sub-watershed selection process, as well as whose responsibility it is to carry out that particular step. It should be noted that this process, as it is described, attempts to maximize farmer cooperation and participation by assisting them in understanding the nature of the soil erosion/water quality problem and subsequently facilitating their taking some ownership in the problem at the farm level.

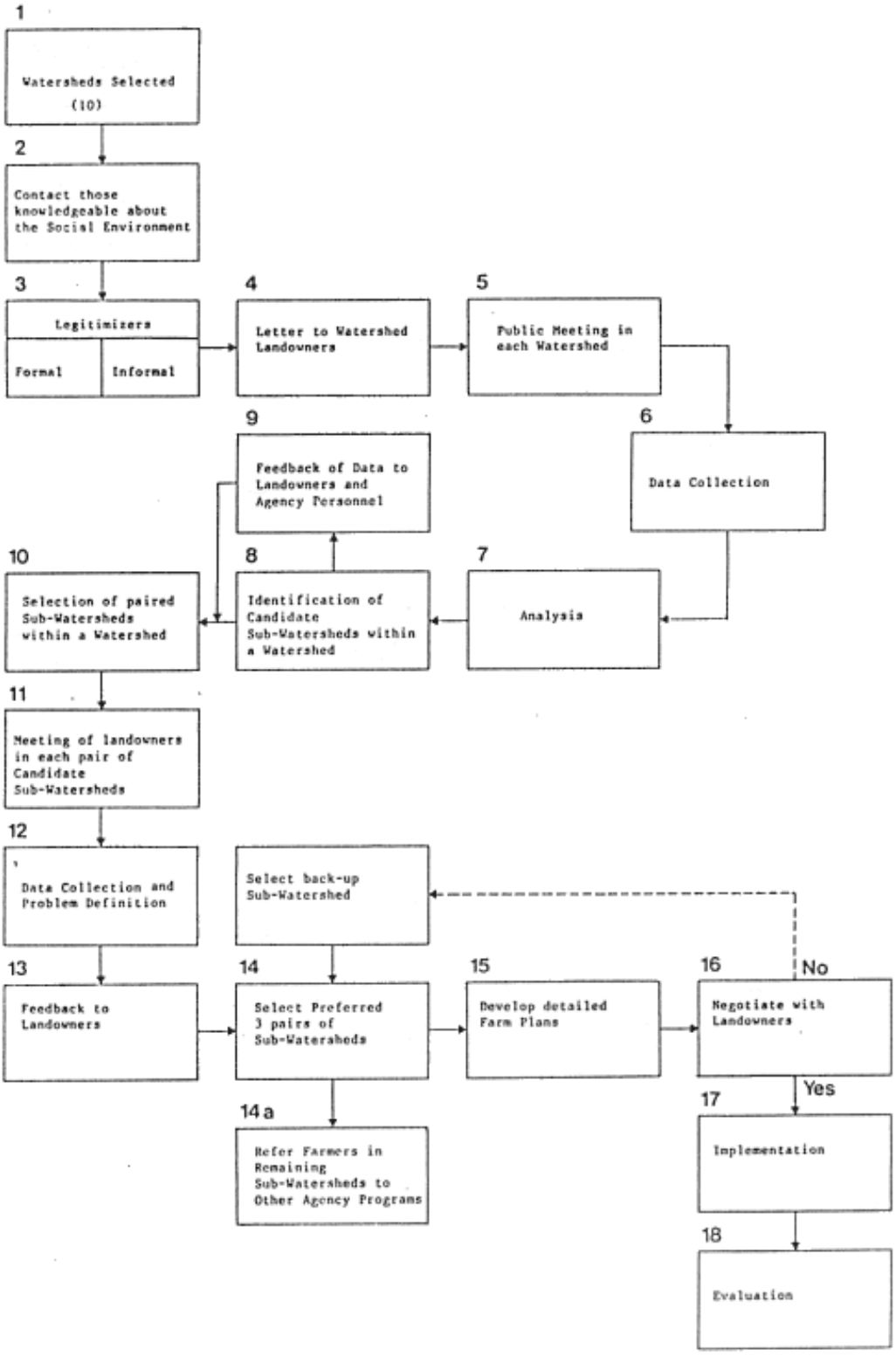
1. Ten Candidate Watersheds Selected

A parallel study, "Evaluation Site Selection" will present recommendations for about ten candidate watersheds. If these are approved by Agriculture Canada, the following steps would ensue.

2. Contacting those Knowledgeable about the Social Environment

A certain degree of knowledge regarding the social environment within each of the watershed areas is critical at the pre-project implementation phase. This knowledge should include a) how the system has responded to previous soil conservation initiatives (if any), b) sub-systems within

FIGURE 3: SUB-WATERSHED SELECTION PROCESS



the social system which are strong, either pro or con, regarding soil conservation, and the reasons why, c) identification of the innovators who have had either positive or negative experiences with soil conservation and the reasons why, and d) identification of the legitimizers.

Those assisting the contractor in obtaining the knowledge within the watersheds could include OMAF representatives, Soils and Crops Improvement Associations, Conservation Tillage Groups, Conservation Authorities, Township Councils, or others identified locally. This type of information will permit the contractor to know who has been involved in which soil conservation initiatives and subsequently how the proposed program initiative will best compliment previous activities and programs.

3. Legitimizers

Legitimizers are individuals, groups or local organizations from whom a stamp of approval should be obtained before any new program involving their community is initiated. The process of soliciting approval should help to inform those who have influence over others regarding program development, and gain some feedback from them which will help to avoid unforeseen program blockages.

Legitimizers may be formal - that is, representing rural organizations, social or service clubs, churches, etcetera - or informal, including opinion leaders, certain influential families or innovators with positive experience. The contractor should attempt to informally interview the legitimizers identified by those who are familiar with the social environment within the watershed area.

4. Letter

The contractor will write a letter to landowners within each of the candidate watersheds, explaining the program rationale and identifying some of the actors involved. The letter will also contain an invitation to the landowners to attend an upcoming public meeting in their particular watershed.

5. Public Meeting in each Watershed

The purpose of the public meeting is to assist the landowners in the watershed to begin to expand their sense of personal ownership in the problem of soil erosion. The agenda would include some educational/informational input presented by an experienced agency person(s) concerning the causes, evidence and effects of soil erosion and the basis on which their's was selected as a candidate watershed. Landowner feedback would be elicited, possibly in a small group context, regarding evidence of similar or different problems within the watershed or on individual farms. Following these discussions, an explanation of current soil erosion control initiatives would be given, followed by an outline of the data collection phase of the project to occur in the weeks following the public meeting.

The contractor would be responsible for coordinating the public meeting in each of the watersheds, ensuring that relevant input personnel are available, as well as group facilitators to lead discussion and document the results of the group tasks.

6. Data Collection

The most extensive set of data to be collected involves interviewing all the landowners in each of the 10 candidate watersheds. The purpose of collecting this data can be viewed as being twofold. First, to assist in sub-watershed selection based on the social and psychological factors affecting the readiness of individuals to participate and cooperate in the project.

Second, the data collected will serve as a baseline for evaluating changes in cooperator knowledge, attitude, and practice throughout the life of the project for those whose sub-watershed is chosen as a demonstration site. For those landowners whose sub-watersheds are not selected, diffusion of ideas and practices into the larger watershed as a result of the demonstration component can subsequently be measured as a means of determining wider impacts of the project.

The contractor will be responsible for compiling the interview schedule and ensuring that the appropriate personnel are available to carry out the interviewing.

7. Analysis

Following data collection, the contractor will be responsible to analyze the results of the interviews, using the appropriate statistical measures to determine the extent of participation and cooperation that could be expected from each sub-watershed.

It is recognized that in some cases, the interviewers themselves could provide a fairly accurate subjective opinion as to whether or not a landowner has any intention at all of participating in such a soil erosion control initiative. However, it could be that a particular landowner may simply be lacking adequate information, for example, on which to base his intentions regarding this program. If this were indeed the case, the information derived from the data analysis would provide more objective clues to the eventual extent of cooperation that could be anticipated from such a landowner.

8 and 9. Identification of Candidate Sub-Watersheds within a Watershed and Feedback of Data

Based on the results of the data analysis, all candidate sub-watersheds within a watershed will be identified by the contractor. Feedback of the data results to agency personnel within the watershed area or even to sub-watershed landowners may be necessary in order to assist in determining which sub-watersheds would be most willing to participate in the soil conservation practice

implementation aspect of the project (experimental sub-watersheds) and which would be most likely to cooperate in the more strictly monitoring aspect of the project (control sub-watersheds).

10. Selection of Paired Sub-Watersheds within a Watershed

The contractor, based on the feedback of local agency personnel, sub-watershed landowners, and other data collected and analyzed, will make a decision as to which two sub-watersheds in each watershed will comprise the pair required for project purposes. Some of the 10 candidate watersheds will likely be dropped from further consideration in the program, based on the physical data, the social-psychological data and other pertinent information concerning sub-watersheds.

11. Meeting of Landowners in each Pair of Candidate Sub-Watersheds

At this point in the sub-watershed selection process, total numbers of candidate pairs of sub-watersheds might number five or six due to the previous screening process. The purpose of this meeting with landowners within the pairs of candidate sub-watersheds is twofold. First, the roles and responsibilities of the contractor, the scientific authority and various agencies monitoring water quality would be clearly explained to the landowners. Questions of what an implementation program could eventually look like within a sub-watershed and the types of compensation that would be available to landowners, would also need to be answered.

Second, permission would need to be received from the landowners for those agencies monitoring stream flow and quality to enter their property as they carry out their tasks and as they assist in pinpointing soil erosion problems which should be rectified.

12. Data Collection and Problem Definition

This round of data collection is required to obtain the specific on-farm details (physiographic characteristics, management systems, etcetera) necessary for farm-plan development for remedial measure implementation. In addition, questions regarding the landowner's perception of program development should be asked to provide an update on his willingness to cooperate with the program.

This interview process carried out by the contractor will help to motivate the landowner to carefully examine his own operation and to further identify and subsequently take personal ownership in the soil erosion problem as it relates to his own farm.

Concurrently, data will be collected on soils, topography and related physical parameters. Analyses will be made of existing and potential soil management and runoff problems. These would be done for the basin as a whole, prior to superimposing property boundaries.

13. Feedback to Landowners

Landowners should be contacted first as a group and then individually regarding the extent of their own particular soil erosion problems on each farm, the inter-relationship with neighbouring properties, and the types of remedial measures available to counteract the problems. Based on the responses of landowners at this point, the three preferred pairs of sub-watersheds will be chosen.

14 and 15. Select Preferred 3 Pairs of Sub-Watersheds and Develop Detailed Farm Plans

On the basis of the most consistently positive landowner response and level of interest expressed in working at soil erosion problems, together with physical-based criteria three pairs of sub-watersheds will be chosen. At this point, detailed farm plans will be developed highlighting ecological characteristics of the farm and remedial measures compatible with both those characteristics and the landowner's management system.

14a. Referrals for Non-Selected Landowners

In the case of sub-basins not selected for participation in the program, there will be farm operators who have become aware of erosion and/or runoff problems and who want to be involved in a remedial program. As one way of responding to this interest, the contractor will encourage existing agency programs to work with these landowners.

16. Negotiate with Landowners

Each landowner must be clear about what his responsibilities are in relation to his farm and in relation to the rest of the sub-watershed. He should be aware of the time frame that the project is working in, the compensation payments that are available, and the activities that the contractor and the monitoring agencies are likely to be involved in. With this understanding, the landowner would be invited to affirm his decision to participate by signing some form of commitment to action or contract. Hopefully, 100 percent or as many landowners as possible would agree to the terms of the project, thus providing the contractor, the relevant agency people and the scientific authority the mandate to proceed with program plans.

If for some reason there is widespread hesitation on the part of landowners to commit themselves to action, the appropriate work would need to be undertaken to prepare a backup sub-watershed for involvement in the program.

17. Implementation

The contractor will coordinate on-farm implementation of soil erosion control measures as well as ensure that the accompanying monitoring program is undertaken according to program plan.

18. Evaluation

The contractor will evaluate the process used in obtaining landowner cooperation and participation in the program, as well as the effectiveness of the soil erosion control measures implemented in the sub-watersheds (see evaluation component of this report).

5.2 Alternatives to Consider for the Sub-Watershed Selection Process

Option 1 Contractor Selects Sub-Watersheds on Ecological/Technical Feasibility Basis

This option, as outlined briefly below, describes a process of sub-watershed selection based entirely on the ecological characteristics of the relevant farms, the technical/economic solutions available to counteract the soil erosion problem, and throughout the process, eliciting little if any feedback from landowners. While offering a least-cost approach to project development, landowners are not given the opportunity to become informed and take personal ownership in the project. As such, this option points out what could possibly be accomplished using a strictly technical approach, but is not likely to be considered as a viable process option.

The sub-watershed selection process within this option includes the following steps:

1) Selection of Sub-Watersheds

Three pairs of sub-watersheds would be selected by the contractor, in consultation with the scientific authority, based entirely on the ecological/physiographic characteristics of the sub-watersheds and the feasibility of the subsequent technical solutions to the soil erosion problems.

2) Data Collection

Sub-watershed landowners would be interviewed regarding the physical characteristics of their farms and the type of technical/economic assistance available to implement remedial measures. This data would permit the contractor to develop farm-plans for structure or practice implementation within the sub-watersheds.

3) Implementation

After ensuring that the appropriate technical resources are available for on-farm implementation of soil conservation measures, the contractor oversees the implementation according to program plan.

The relevant agencies would be involved to monitor changes in water quality throughout the life of the project.

4) Evaluation

The evaluation would centre on the technological efficacy of the soil erosion control measures on each farm and the resultant changes in water quality associated with them.

In summary, the approach of this option assumes that a large number of farmers will be ready to cooperate in the project. If they don't express this willingness, there is little or no opportunity to build a level of peer pressure necessary to convince those hesitating, of the benefits of cooperation. The overall diffusion effects of this approach will be severely limited because of the lack of initial educational input to raise awareness of the problem, and because farmers are given little opportunity to individually or collectively, take ownership in the resolution of the problem.

Option 2 Local Landowners/Organizations/Agencies Select Sub Watersheds

This approach can be seen as maximizing the input and involvement of both the local community and the local agency personnel in sub-watershed selection. Following the identification of the 10 candidate watersheds by the contractor and scientific authority, the contractor assumes an advisory role, giving oversight to the following steps as outlined below.

1. Public Meeting in the Watershed

The contractor would call a public meeting, inviting all the landowners, local agency personnel, active rural or farm organizations, church and social groups, and township or county administrators to attend. The purpose of the meeting would be to provide some educational input on the need for soil conservation programs to combat current problems as well as to provide information on the scientific authority's conservation initiative. It would be made clear that the sub-watershed selection would eventually be made on the basis of the strength of a soil conservation implementation proposal submitted by members of their watershed and the evidence of full cooperation within any particular sub-watershed. The meeting would close with the choosing of a task force representing the agencies and organizations, both active and influential within the watershed.

2. Task Force

The task force prepares, in consultation with the contractor, an interview schedule designed to collect the appropriate sociological and technical data in preparation for screening sub-watersheds within the entire watershed. Following data collection and analysis by the Task Force, these candidates are reviewed by the contractor and approval given to the pair of sub-watersheds as selected by the Task Force, providing the criteria of high levels of cooperation and physiographic representativeness are met.

3. Project Proposal

The Task Force then prepares a project proposal for the selected sub-watershed in which the previously collected data are used to develop detailed farm plans. They would outline the proposed implementation procedures, time frame of on-farm implementation, technical expertise required and costs associated with project. The agency responsible for monitoring water quality would also need to be identified.

The contractor, in consultation with the scientific authority, would review the sub-watershed proposals submitted from the candidate watersheds and select the three best suited for demonstration site purposes.

4. Implementation/Monitoring

After notifying the Task Forces in the candidate watersheds of the final sub-watershed selections, permission would be granted by the contractor to the relevant Task Forces to begin implementation of remedial measures.

5. Evaluation

Task Force members, in consultation with the contractor, would conduct the final evaluation, incorporating the results of the remedial measure implementation, cooperator perceptions of program effectiveness, as well as their views on the process used to solicit their cooperation.

In summary, the advantages of this approach centre on maximizing the use of local agencies and organizations who know the candidate watersheds well and as such, should be able to solicit a high degree of cooperation from local land owners. This is especially true if the agencies' previous track record regarding involvement in soil conservation is viewed positively by watershed landowners. Post-project diffusion of knowledge and practice would be facilitated by having the experienced agencies in place.

The potential difficulties of this approach surface, depending on the makeup of the Task Force and their ability to work together, delegating responsibilities, etcetera. Logistically, it may be difficult to coordinate the efforts of that many agencies and organizations, and allocate funds fairly. There would also be a large variability in the proposals written by different Task Forces, depending on a variety of factors, thereby making it difficult to be consistent with the experimental design in each of the selected sub-watersheds. Project time schedules may be more difficult to stick to compared with an approach in which the contractor is more actively involved in delegating responsibilities.

6.0 COMPONENTS OF THE PROCESS EVALUATION

The bulk of the program evaluation will occur after the project has realized the implementation of soil conservation measures on sub-watershed farms. Only at this point can one determine whether or not the knowledge that landowners acquired during the sub-watershed selection process concerning the soil erosion problem was transferred into positive action.

Thus, evaluation of the project could be conducted in three different subject areas. These are outlined, followed by the types of questions required to highlight the criteria for determining project effectiveness.

1. <u>The actual implementation of remedial measures in the field and how the landowners are perceiving the effects of the structures and/or practices</u>

   i) document the soil erosion problem and the remedial measure implemented to reduce the problem. Has the operator maintained the practices according to program plan concerning longevity and maintenance of quality?

   ii) degree of satisfaction of landowner with the structure or practice implemented.

   - Does the landowner perceive the measure to be effective in accomplishing what it was designed to do? Were initial expectations of remedial measure potentials too high or too low?
   - Does the measure compliment his overall management system? In what ways did the system have to be adjusted?
   - Are the compensation levels perceived to be adequate? Why or why not?

   iii) identify aspects of project failure and the reasons for that
   - Does the operator intend to continue with the remedial measure as the project terminates? If not, why not?

   iv) document any practice changes that have occurred on lands owned by those in the control sub-watershed
   - Have they implemented any practices or have they stayed within the monitoring aspects of the project design?

2. How landowners feel about the process used to solicit their involvement

i) landowner perceptions of the public meetings
   - Was new information about the soil erosion problem provided?
   - To what extent did the meetings facilitate taking personal ownership in the problem?
   - Following the meetings, how much peer pressure to cooperate was experienced? In what form did that occur?

ii) change of attitude toward soil erosion as a problem
   - In what ways does the landowner's opinion differ now as compared to the beginning of the project?

iii) how landowners would have done things differently regarding initial approach and process within the watershed and sub-watershed
   - Is outside incentive, from their perspective, a necessary precondition for landowners to become involved in soil conservation work?

iv) extent of contact with others in both the control and the experimental sub-watersheds
   - In what ways did others in the sub-watersheds support the landowner in his own project responsibilities?
   - In what ways did the landowner support others?

3. The diffusion of soil conservation knowledge and practice amongst, landowners adjacent to the pilot project sub-watersheds

i) the extent of contact those outside the sub-watersheds have had with the demonstration sites or the landowners involved
   - Have the demonstration sites given the landowner specific ideas which he has incorporated into his own operation?
   - What knowledge/information have landowners gained through contact with the demonstration sites?

Any evaluation effort at this level will need to screen out the influence from other sources such as the mass media or other agency programs occurring within the vicinity. In light of this, any interviewees selected should be selected within a relatively short radius of the demonstration sites. Alternatively, evaluation design could incorporate a distance factor, in which knowledge and practice implementation would be assessed as to how they would vary with distance from the sites.

7.0 DATA TO BE ACQUIRED AND SUBSEQUENT ANALYSIS

According to the outlined process of sub-watershed selection (Figure 3) data is to be collected at two points; step six and step twelve.

The first round of data collection is designed to yield the evidence necessary for determining the readiness of an individual to participate in the current soil erosion control initiative. Information will be required about social and personal/psychological factors affecting the landowners' willingness to participate. These are outlined below, followed by several general questions of intention. Together, this data should provide strong evidence for determining the outlook of sub-watershed landowners regarding their expected degree of cooperation and participation in the program.

Personal/Psychological Data

1) Age

2) Education
   - highest level achieved
   - agriculture-related

3) Perception of soil erosion as a problem
   - within the township
   - on the individual's farm
   - identification of specific problem areas on the farm
   - any stated intentions of controlling the problems
   - landowner-identified constraints to practice implementation

4) Farm size
   - acres owned/rented
   - gross income

5) Type of farm
   - products sold from the farm
   - product providing largest portion of farm income
   -

6) Degree and nature of innovativeness
   - openness to change or preference for status quo maintenance
   - extent of risk averseness

Social Data

1) Organizational membership and involvement
   - total number landowner involved in
   - offices held (if any) in those organizations
   - involvement of organization with ecological concerns

2) Perception of community characteristics
   - response to local problem situations - do people work together?
   - spirit of unity/disunity
   - perceived extent of community support for soil conservation practices
   - perceived extent of adoption of conservation practices in the community

3) Landowner - identified sources of information regarding soil conservation practices
   - mass media, specific organizations
   - opinion leaders - who are they and has landowner approached them for specific advice

4) Independent versus group thinking and action exhibited by landowner
   - preference for problem-solving on individual basis
   - evidence of cooperation with others in local farm community

5) Nature of family support for long-term viability of farm
   - expectation of farm remaining in family hands after retirement

The additional information which should be collected at this point includes a) documentation of previous soil conservation efforts on the farm (and whether the source of motivation was an agency program or strictly individually-based); b) whether or not the landowner, in the near future, would be ready to implement practices/structures necessary for conserving soil on his farm; and c) whether or not the landowner would be willing to have the water (surface and sub-surface) leaving his farm checked for quality.

The second round of data collection (step twelve) within the candidate pairs of sub-watersheds is required to obtain the specific on-farm details for later farm plan development. Questions would centre on the physiographic characteristics of the farm, presence of tile drainage systems, livestock and cropping systems management, etcetera. In addition, questions regarding the landowner's perception of program development should be asked to provide an update on his willingness to cooperate with the program.

Data Analysis

The usefulness of the data collected becomes apparent at three different levels in sub-watershed selection:

1) In providing comparative statistics between candidate sub-watersheds within a watershed

2) In deciding on which sub-watershed within a given pair should be the control and which the experimental, and

3) In making comparisons between selected pairs of sub-watersheds in the candidate watersheds in order to narrow down to the final three.

The data will be analyzed using largely descriptive statistics - mean scores, frequency distributions and cross-tabulations. Statistical tests such as the chi-square test of variable independence can be used to determine statistical significance where necessary.

The data as analyzed will also be crucial to conducting the various evaluation tasks as changes in participant knowledge, attitude and practice are monitored over the life of the project.

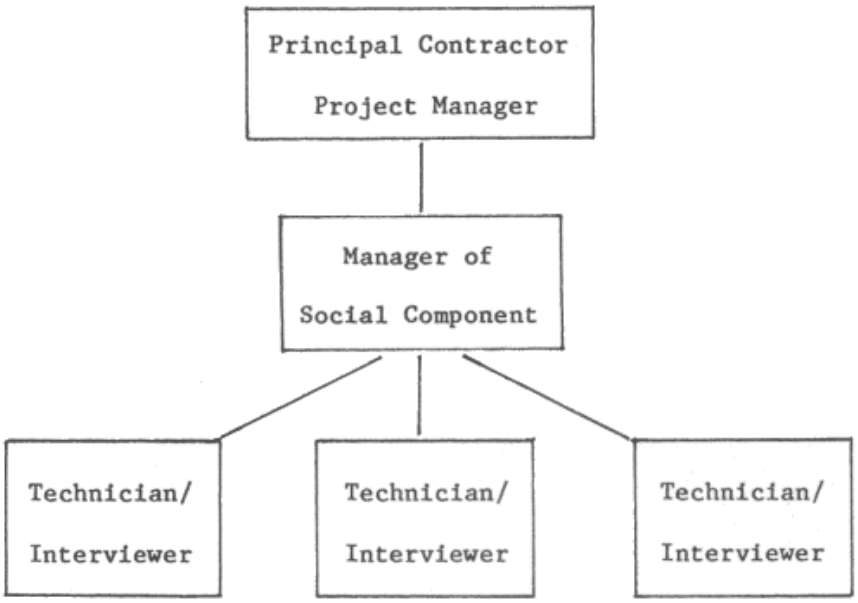
8.0 ORGANIZATIONAL PLAN FOR DATA ACQUISITION

The plan for data acquisition corresponding to Figure 3 is realistic to the extent that certain assumptions about the process are understood. These include, a) 40 landowners are assumed present in each of the 10 candidate watersheds, b) all 10 candidate watersheds are considered viable alternatives through the initial data collection and analysis phase, and c) the process of narrowing down to three preferred pairs of sub-watersheds will be made from a possible total of six pairs of sub-watersheds, the other four having been excluded on the basis of clear non-willingness to cooperate, etc.

The following chart provides a proposed time frame for program development as well as the tasks and personnel associated with the program.

Team Leadership and Structure

The diagram below broadly outlines the personnel required to provide responsible leadership to the program. Those designated as "technicians/interviewers" represent those who will eventually be positioned within the three selected sub-watersheds, but in the meantime, have responsibilities in preparation for that phase.



TIME FRAME	TASK #	TASK	DAYS REQUIRED	PERSONAL REQUIRED
Sept. 1985 - Project begins				
Sept.1	2	- informally interview those knowledgeable with social environment and legitimizers	3 days/watershed x 10 watersheds = 30 days	2 members of the contractor teams who have detailed knowledge of project = 15 days = 15 days
38625	4	- plan for and arrange suitable dates/ location/resources for public meetings in the 10 watersheds	2 days/watershed x 10 watersheds = 20 days	2 contractor members = 10 days = 10 days
mid-Oct.	4	- compile address list	clerical = 10 days	1 clerical = 10 days
		- prepare and send letter of public meeting notice to all landowners in 10 watersheds	2 days	1 contractor waiter =2 days
mid-Nov.	5	- hold 10 public meetings	10 days x 3 people = 30 days	1 Conservation Authority person (educational input) = 10 days 1 Innovative farmer(local to watershed) = 10 days 3 Contractor members a) chair/facilitator = 10 days b) assist group process = 10 days c) assist group process = 10 days
Dec.	6	- prepare interview schedule to collect social and psychological/ personal data from all landowners in the 10 watersheds	10 days	1 contractor member = 10 days
January 1986		- interview 40 people in 10 candidate watersheds = 10 people	4 people/day/person = 100 days	3 persons hired by contractor (Masters level or experienced interviewers) A = 33 days B = 33 days C = 33 days
February				
March	7	Data Analysis - code and input data, run statistical tests	12 days	1 contractor member = 12 days
		- tabulate/summarize data	10 days	1 contractor member = 10 days
April	8, 9 10	- identify candidate sub-watersheds and gain feedback from local agency personnel regarding selection of pairs in each of 10 watersheds	10 days	1 contractor member = 10 days
May	11	- prepare for meetings with landowners	3 days (1/2 day/ sub-watershed)	1 contractor member =3 days
		- meet with landowners in each pair of candidate sub-watersheds (assure 6)	6 days x 2 people	2 contractor members =6 days =6 days
June	12	- prepare interview schedule for data collection	4 days (6 farmers x 2) x 6 sub-watersheds = 72 farmers	1 contractor member =4 days
			2 farmers/day = 36 days	3 contractor members = 12 days = 12 days = 12 days
		- data compilation	6 days	1 contractor member = 6 days
July	13	- feedback to landowners/assess willingness to cooperate	3 farmers/day = 24 days	2 contractor members = 12 days
	14	- preferred sub-watersheds selected	1 day x 2 people	2 contractor members = 1 day
July	15	- develop detailed farm plans		
August				
Sept.	16	- negotiate agreements with farmers	Costs associated with Social Methodology terminate	
Oct.	17	- project start-up		

Estimated Time Requirements and Costs

Personnel	Days	Cost
Project Manager	40	
Manager of Social Component	130	
Technicians	260	
TOTAL DAYS	430	$119,000.00
Administration and Field Expenses		$ 20,000.00
TOTAL		$139,000.00

Option 1 Data Acquisition and Associated Costs

This process, as outlined in Section 5.2, lacks almost entirely a social methodology component. As such, the team leadership structure would not include a "Manager of Social Component". The project manager would give oversight to the data collection, feedback and other talks carried out by the three technicians/interviewers in the three sub-watersheds.

The time estimates and associated costs using this approach are based largely on the information contained within the organizational plan for data acquisition as outlined previously, beginning with the tasks at April, 1986. In other words, the costs associated with the extensive sociological and psychological screening of the 10 candidate watersheds plus the contacts with those knowledgeable with the social environments have been deleted. This is definitely a least-cost approach, but little in the way of farmer ownership of the problem or extensive diffusion effects can be anticipated.

Estimated Time Requirements and Costs with Option 1

Personnel	Days	Costs
Project Manager	30	
Technicians	175	
TOTAL DAYS	205	$ 51,000.00
Administration and Field Expenses		$9,000.00
TOTAL		$ 60,000.00

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APPENDIX A

PERSONS CONTACTED BY TELEPHONE

Americans - Academics and Field Personnel

1. William L. Miller - Professor of Agricultural Economics, University of Nebraska
   - previous work on Black Creek Project, Indiana

2. Steven Lovejoy - Professor of Rural Sociology, Purdue University
   - current work on Black Creek Project, Indiana

3. Peter Nowak - Extension, University of Duluth
   - formerly Iowa State University

4. Gordon Bultena - Professor of Sociology and Anthropology, Iowa State University

5. John Crumrine - Coordinator Accelerated Conservation Tillage Program, Seneca District, Tiffin, Ohio

6. Henry Riechman - Conservation Tillage, Henry District, Ohio

Agency Personnel - Ontario

1. Ralph Cressman - President of the Waterloo Federation of Agriculture

2. Glenn Thompson - OMAF - Agricultural Representative, Waterloo County

3. Paul Fish* - Upper Thames River Conservation Authority

4. Andy Graham* - Technicians, U.T.R.C.A.
   Bob Carswell*
   Brad Glasman*

5. John Schleihauf* - OMAF, Tillage Specialist, Middlesex County

6. Elbert VanDonkersgoed - Research Director, Christian Farmers Federation of Ontario

* visited

Innovative Farmers

1.	Ken Heipel	- Bamburg - recipient of 1984 Waterloo County S.C.I.A. award for Conservation Farming
2.	Robert Lantz	- Shakespeare
3.	John Weber	- Conestogo
4.	Murray Shantz	- Kitchener
5.	Don Hart	- Woodstock
6.	Jack Rigby	- Rondeau Bay
7.	John Maaskant	- Clinton
8.	Ray Hogan	- Lucknow
9.	Bruce Schillinglaw	- Clinton
10.	Don Lobb	- Clinton