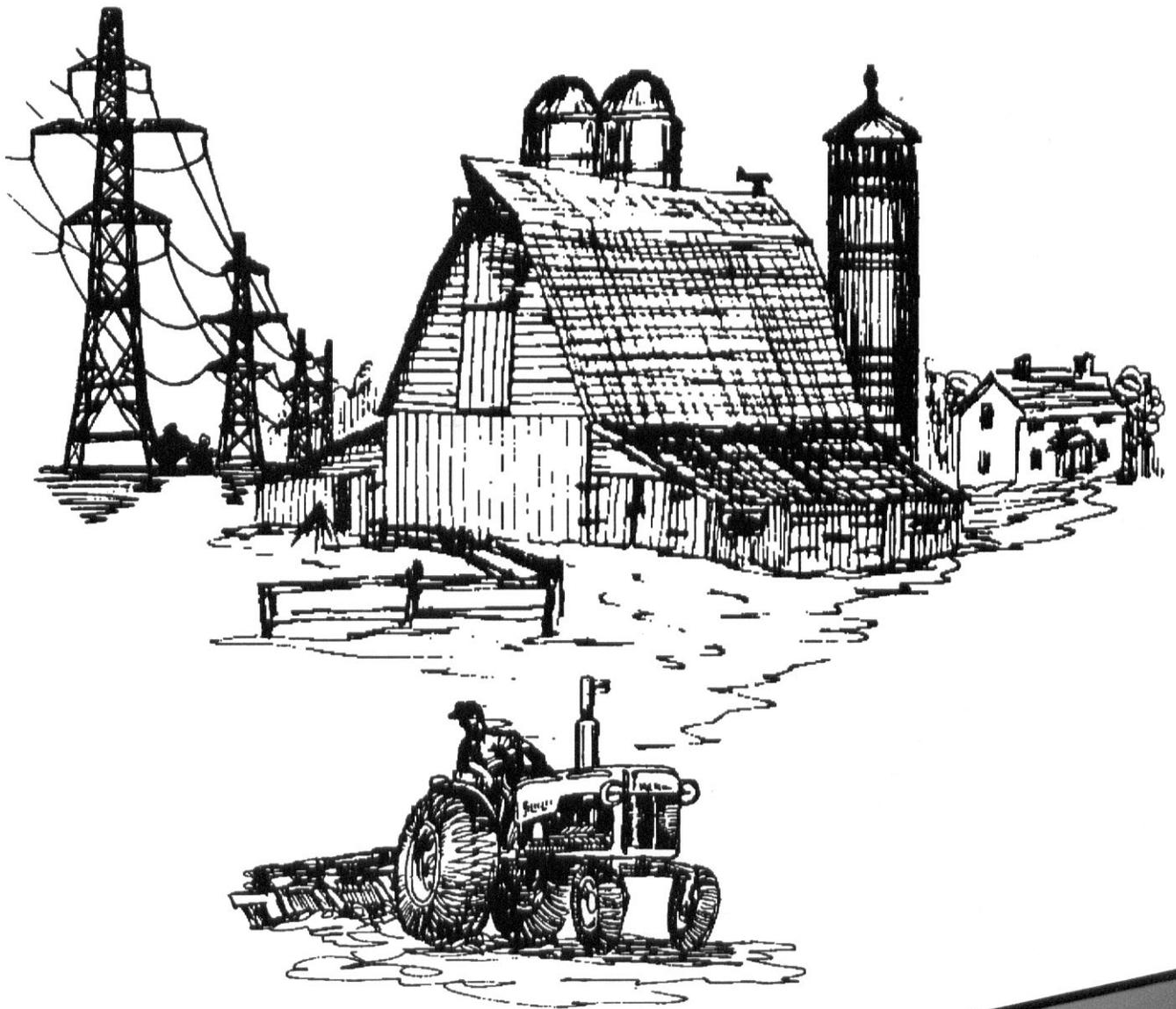


RURAL COMMUNICATION INFORMATION AND INNOVATION IN FARMING

A Literature Review



1993-1

**BRANDON
UNIVERSITY**

Canadian Cataloguing in Publication Data

Ripley, Diane L. (Diane Lorraine), 1952-

Rural communication

Includes bibliographical references.

ISBN 1-895397-13-8

1. Farmers - Prairie Provinces - Information services.
 2. Communication - Social aspects - Prairie Provinces.
 3. Communication and traffic - Social aspects - Prairie Provinces.
 4. Mass media - Social aspects - Prairie Provinces.
- I. Rounds, R.C. (Richard C.) II. Brandon University. Rural Development Institute. III. Title.

P92.C2R57 1993 302.23'088631'09712 C93-098017-4

RURAL COMMUNICATION INFORMATION AND INNOVATION IN FARMING

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by

**Diane L. Ripley
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**The Rural Development Institute
Brandon University
1993-1**

PREFACE

We are moving rapidly into a new era in which communication of information will be the most critical component of daily life and economic development. Two collateral aspects are involved. First, the amount and precision of information available will increase exponentially. This will create serious problems of not only volume of information but also the appropriateness of specific information in a given set of circumstances. Second, the technology needed to produce, process and deliver information will become more and more complex. This necessitates initial learning of how to use modern telecommunications, as well as continuing education to keep pace with rapid changes. At the same time, traditional means of distributing information through mass media, journals and newspapers, workshops and demonstrations will continue to play a role in transferring information from producers to consumers.

Communication of information to people in rural areas presents different issues to different factions involved. Each rural group of people has traditional patterns of exchanging information and applying new information to effect change. This literature review looks at how farmers and ranchers prefer to both access and process information of significance to rural life and primary production. Traditions play a significant role in communication, both from external sources, and among farmers themselves. The equally important characteristics of the rural people as receivers and processors, and the media as generators and senders of information must evolve in harmony as technology changes the capabilities of all involved.

Here we trace the theory of diffusion of information and resulting innovation among rural people. The roles of change agents, opinion leaders and adapters are discussed in light of methods of transfer of information. Most material relates to the transfer of information to and adoption of innovation by farmers in North America with emphasis on the Canadian Prairies. Specific topics discussed include the following: theories of communication, characteristics of rural people as recipients of information, diffusion of innovation, scientific information, mass media, magazines and newspapers, extension education, the role of public and private agencies, and modern telecommunications.

The authors extend appreciation to the Brandon University Research Committee for financial support for this project. The Manitoba Department of Rural Development assists in the operations of RDI, and the Social Science and Humanities Research Council supported publication of the manuscript through an Aid to Small Universities Grant. Joan Rollheiser, Administrative Assistant at RDI, prepared the manuscript and graphics for publication. We especially thank Stan Yaskiw, the Manitoba Pool representative on RDI's External Advisory Committee for suggesting the project and providing assistance in developing the project.

Richard C. Rounds,
Director,
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SUMMARY OF MAJOR FINDINGS

- 1) Operators of large farms have more contact with agricultural representatives than do operators of small farms.
- 2) Audiences value media that are immediately available and useful to them.
- 3) Provincial extension agencies and universities are the most important sources for production technology, but are of minor importance for market information. Radio and television are the two dominant sources for weather information. Suppliers are the major source of information for purchased farm supplies, and consultants are the most important sources for farm business management.
- 4) Extension services are focused on large successful farms, to the detriment of less affluent farms. (Although this contention is supported by several studies, there are reports that indicate the benefits of information received through extension services by smaller operators may be less tangible, but useful and important.)
- 5) Farm magazines are the source most often used by farmers to obtain farm information.
- 6) There is a need to encourage young people (who are better educated and potentially more efficient) to stay on farms.
- 7) The most important objectives of a farm information communication strategy are to a) introduce proven research to the farmers, and b) evaluate information and advice from various sources to ensure its practicality and suitability for their production units.
- 8) There is a need for more information in the areas of farm supplies and inputs, farm engineering and youth education programs.
- 9) The majority of farmers rate the existing strategies and methods of farm information communication employed by extension agencies as suitable. Some strategies suggested by farmers to make communications more effective are a) more intensive contact between extension staff and farmers, b) more farm programs on radio and TV, c) better use of newspapers for farm information, d) employment of farm correspondents and editors by print and electronic mass media, and e) opening farm information centres at central points in a district.
- 10) Communication of information should be made an integral part of communications policies, not merely an incidental service of mass media.
- 11) Policy should involve primarily programs of non-formal education, of a continuing nature, which could be presented to rural people through mass media and distant education technologies.
- 12) Staff engaged in farm information distribution should receive regular training in communications with respect to collecting, processing and disseminating information in an effective manner.
- 13) Policies have to be based on the economic and social realities of various regions, which may differ from place to place.

- 14) Agencies should try to meet the needs of total farm populations and not emphasize the successful and large production units.
- 15) There is a need to develop a proper linkage between farm research and development. Agricultural scientists working on research should be much more involved in communications than at present.
- 16) A communication program should be structured so that the immediate concerns of the farmer are the focal point. Extension programs focused away from the immediate needs of people are viewed as irrelevant.
- 17) A gap exists between the advance of farm technology and its implementation. The time lag to disseminate new technology to users must be minimized.
- 18) There is a need to make present farm programs carried on radio and TV more technical, scientific and professional. Emphasis should be placed on the information rather than the means of communication.
- 19) There are few trained farm educators or agricultural specialists serving as editors or producers of farm programs. News or farm programs are sometimes irrelevant to local needs, difficult to understand, or both. Mass media is one-way communication and there is no organized arrangement to receive immediate feedback on message content and delivery.
- 20) Interviews with some farmers indicate that while they receive journals containing useful information, they either do not have or do take the time to read them. Similarly, they seldom care to listen to or view the farm programs on radio or TV. There is a need to motivate farmers to benefit from farm programs. Stimulating the audience is required to achieve reception of information by any means of transfer.

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THE BASES OF RURAL COMMUNICATION

Exchange of information is vital in a complex modern society. Rural areas in North America, however, may remain isolated in spite of modern telecommunications, and rural residents often express the need for more frequent and easily accessible information. Either a real or perceived lack of communication suggests that information either is not available, or is not easily accessible. Communication translates into a need to develop an accessible information distribution strategy for rural people.

Conversely, those who produce or distribute information often suggest that there is a glut of information available in many forms and locations. They claim that most of the rural residents are not using information, either because they do not know how to find it or because they are not motivated to search.

Information technology has advanced rapidly, and additional innovations are being developed. A variety of mainframe computers, mini-computers, personal computer networks, data entry devices and services, printers and scanners are being used. The 1990's will witness an unprecedented dispersion of more powerful computer and communication technologies for daily work, education and training, and entertainment. All will be needed to survive in the coming age of new realities (Sekely, 1990).

Telecommunication links help overcome the barriers of distance that have hampered rural development (Hudson, 1985). The information age has had profound effects on rural people by increasing the amount of information available, the speed and distance at which it can be transmitted, and its quality. The information age also has the potential to leave rural areas behind (Dillman, 1985).

Information includes data that is new to the user. Besides having factual, contextual, evaluative and endorsement qualities, information passes through different media or phases and stimulates decision-making (McCreary, 1989). Information normally is provided from two major sources: the public sector (including libraries, Extension Offices, school systems, National (Federal) and Provincial (State) governments), and the private sector (including businesses or not-for-profit organizations that provides information for a fee paid by users, advertisers, or both) (Chartrand, 1982).

Communication is a sophisticated form of information exchange. Monitoring of communication by means of opinion gathering has been crucial to successful adaptation. Our greatest cultural institutions rely on high quality information, and include social organizations such as banks, hospitals, corporations and governments. Communication is an essential prerequisite for collective action (McCreary, 1989), and is no less important to maintenance and viability of the agricultural sector of the economy than to any other sector.

A variety of communication models has been postulated through time. The **hypodermic model** assumes that mass media has an immediate and direct effect on people. The **two step model** theorizes that ideas flow from mass media to certain segments of the population (opinion leaders) and from them to the rest of society (Jones, 1963; Rogers, 1973). The **one step flow model**, conversely, assumes that messages flow directly from mass media to the audience, but everyone does not receive information equally (Rogers, 1973). Most current researchers view communication as a **multi-step flow** of information that incorporates all of the models (Rogers, 1973).

An **innovation** is any idea, thought or practice that is perceived as new by an individual (Colette and Easley, 1978; Jones, 1963; Rogers, 1962). **Diffusion** is the process by which an innovation spreads from its creation to ultimate adoption or rejection (Rogers, 1962). Rogers (1962) believed that diffusion occurred in five stages; 1) awareness, 2) interest, 3) evaluation, 4) trial and 5) adoption. Rejection can occur at any stage. Hagerstrand, who attempted to quantify diffusion, employed the basic tenant that adoption of an innovation is primarily a learning (persuasion) process (see Brown, 1968).

Another idea of innovation diffusion is based on Bayesian learning theory. It says that each person's experience is used to update initial beliefs about the characteristics of an innovation. The accumulation of positive (favourable) experiences will induce most farmers to adopt new technologies (Feder and Slade, 1987). For example, there may be a time lag between the initial availability of a product and its wide spread use (Jones, 1960). Narrowing of a time lag may occur with better communication of information, which may be helped by using change agents. These may be professionals who attempt to influence decisions or opinions, or community residents who influence others through a position earned and maintained by technical competence, social accessibility and conformity to the system's norms (Colette and Easley, 1978; NCRE, 1955; Rogers, 1962).

When conditions of uncertainty prevail, decision-making occurs. When there is an absolutely certain outcome, there is no decision to be made and no need for additional information (McCreary, 1989).

Innovativeness is the degree to which an individual is early or late in the decision to adopt a practice. There are several categories of innovativeness with identifiable differences among members of each category (Alberta Agriculture, 1983; Canwest, 1985; Colette and Easley, 1978; Conghenour, 1965; NCRE, 1961; Rogers, 1962). The personal and situational characteristics of an individual are considered main factors in the adoption of innovations (Colette and Easley, 1978; Jones, 1963).

Also important in the adoption process are the characteristics of the innovation. The five most salient characteristics are thought to be: 1) relative advantage, 2) compatibility, 3) complexity, 4) divisibility, and 5) communicability (Colette and Easley, 1978; Fligel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966). Cultural and social norms also play a significant role in innovation (Rogers and Van den Ban, 1963).

Owing to variation in personal and situational characteristics, and in the characteristics of the innovation, adoption of new techniques requires information from both mass media (including magazines, newspapers, television and radio) and personal sources (including neighbours, friends, relatives, county agents and other professionals) (Jones, 1963; Mason, 1964; Rogers and Shoemaker, 1971).

Agricultural extension has the potential for enhancing adoption of technology and increasing efficiency of production. Extension personnel assemble, organize and interpret market information and simplify technical information for distribution to farmers (Huffman, 1978). Research Stations, on the other hand, were established to gather and distribute technical information to a variety of audiences including farmers, governments and scientists. All these terms and ideas are developed further in following sections of this report.

The Role of Government in the Generation of Information in Rural North America: Research and Policy

The U.S. Federal government serves three broad and distinct mandates in agriculture: 1) increasing agricultural income, 2) stimulating regional economic development and 3) enhancing the quality of life in small, rural communities. The mandates are fulfilled principally by the U.S. Department of Agriculture (USDA), one of the largest Federal departments (Long, 1987).

The U.S. government supports agricultural research at land-grant universities and sponsors dissemination of research results. It also protects the health of livestock and crops, promotes soil, water, and forest conservation, safeguards food purity and quality, and cooperates with producers in administering domestic markets for some commodities. Besides administering most rural development programs, the USDA participates in both the legislative and executive policy arenas. The Secretary of Agriculture is the executive branch's spokesperson and leader in rural development (Long, 1987).

Shortly after the USDA was formed Congress invoked a series of Acts, which collectively created the land-grant universities system, to transfer some agriculture responsibility and power to the States. The Morrill Act (1862), Hatch Act (1887) and Smith-Lever Act (1914) were created to provide either or both land and funding to each State to support education. Support programs were designed to establish and maintain at least one state college to teach agriculture and establish state agricultural experimental stations. Both were designed to provide useful and practical information, and to carry out a program of extension work to distribute agricultural information (Chartrand, 1982).

Initially farm families could receive newspapers and magazines only when they visited the nearest large town or city. In 1896, rural free postal delivery allowed direct delivery of print material to rural residents at low cost (Chartrand, 1982). Similarly, because of geographic isolation and dispersion of the farm population, the private sector considered telephone service to rural areas to be unprofitable. Initially farmers formed small, cooperative telephone companies to serve their areas. In 1949 loans were made available through a USDA agency to assure adequate telephone service to most rural users (Chartrand, 1982).

Although the first successful radio station went on the air in 1920, few farms had electricity. Farmers were charged higher rates for electrical service, because of the low density of farm populations. Completion of the service network was slow. A 1935 executive order finally financed the distribution, generation and transmission of electric power to unserved rural persons (Chartrand, 1982).

In 1976 about 1 percent of the population received no adequate television services, and 9 percent received service on fewer than three channels. With hybrid systems of cable and translators three channels could be available to all but 150,000 households in the United States. Since it is probable that the areas currently under served by television are the same areas that are under served by print, the implications are obvious. Approximately 9 percent of the population does not have access to vital information sources (Office of Planning and Policy, 1976).

Modern technology allows the transfer of information directly to the user, and computers and television is the most recent tool available to farmers in the search for information (Chartrand, 1982). The wealth of information on agriculture and related subjects has allowed both the public and private sectors to be involved in developing telecommunications networks to process and distribute agricultural data-bases, farm management software, electronic trading systems, videotext systems and electronic message networks (Chartrand, 1982). As with newsprint, radio and television, however, these delivery systems are not easily accessible to those with limited resources. Extension agents, farm associations and USDA officials are trying to correct this imbalance.

The role and structure of federal involvement are different in Canada. Increases in Canadian and world food production occurred in part because of agricultural research and distribution of innovations. Public funding in the Canadian agricultural research sector traditionally has been extensive, but a change in perceived benefits of publicly supported agricultural research has resulted in scrutiny of programs in recent years (Brooks and Furtan, 1984).

Research institutions are supported by the provincial departments of agriculture, Agriculture Canada, university faculties of agriculture, and to a lesser extent industry. The Canadian Agricultural Services Coordinating Committee (CASCC) was established in 1932 to monitor and control federal research. The objective is to promote the most efficient use of professional and technical staff and allocation of monies among and within research institutions (Brooks and Furtan, 1984). Research efforts in 1977 included federal (60 percent), provincial (5 percent), university (28 percent) and industry (6 percent) initiatives (Brooks and Furtan, 1984).

The Canadian Agriculture Research Council (CARC) is an autonomous body formed by the CASCC in 1974. It advises the federal government on the state of agricultural research in Canada, recommends changes, maintains an inventory of agricultural research and development, and advises CASCC on research and development matters (Brooks and Furtan, 1984).

Other organizations also have formed to coordinate agricultural research. The Agricultural Services Coordinating Committees (ASCCs) are seven provincial and regional counterparts to CASCC. They coordinate provincial research efforts and make recommendations to CASCC (Brooks and Furtan, 1984). The Ministry of State for Science and Technology (MOSST) was established in 1971 to advise the federal government on research and development issues. MOSST formulates national science policies and advises federal departments on priorities. Canada Committees were established to advise CASCC through CARC on specific areas such as agricultural engineering or animal production. In 1984 there were 7 Canada Committees consisting of 23 Expert Committees (Brooks and Furtan, 1984).

Farmers, landowners and input suppliers do not directly pay for the production of new technology in the Canadian research sector. Decisions are made by the provincial government for universities and provincial research and the federal government for Agriculture Canada. Demand expressed by farmers to suppliers of research output goes through two channels, 1) direct contact (extension services) and 2) political-bureaucratic channels. Factors that influence communications include the number of farmers, wealth of the group, sector or individual, and expected gains of the individuals in the group (Brooks and Furtan, 1984).

Commodity specific, applied agricultural research is conducted by universities, Agriculture Canada and the provincial governments. Output may be in journal articles, technical publications, improved genetic stock, new production formulas and techniques, chemicals to improve agricultural output or other knowledge that can be useful to producers. The research generated is a public good and is free to any user (Brooks and Furtan, 1984).

The most influential groups shaping agricultural and rural policies in the U.S. are representatives of the major agricultural commodity producers (i.e., tobacco producers) and their interests always are considered. Policy and program decisions are made based on a group's power and need to adapt to important interests. The efforts of individual groups, therefore, may come at the expense of the greater but less well-organized public interest (Long, 1987).

Similarly, the most influential groups in shaping Canadian agricultural and rural policy are the major farm organizations. Their demand for agricultural technology depends on the size of the group, level of organization, form of the technical change, and demand by other interest groups who might lose directly from research, or who are competing for research funds (Brooks and Furtan, 1984).

The relationship between government expenditures and research expenditures says that farmers in productive areas are likely to have more effect on agricultural research than are farmers in poor regions (Brooks and Furtan, 1984). Farmers with extensive properties perceive that they will receive more benefits from agricultural research and their demands will be greater than those of small farmers. They also may be more effective lobbyists. This relationship may suggest that public research institutions are responding to a biased sample of demand for research output, especially if the research needs of large farmers are different from those of other farmers (Brooks and Furtan, 1984).

Information Sources, Responses and Choice of Communication Models

Interpersonal and mass media channels have different and potentially complementary roles in communication. Mass media channels include all means of transmitting messages that involve technology, or mechanisms to reach a broad audience. Newspapers, magazines, film, radio and television all reach a large and often widely dispersed public (Rogers, 1973).

Choice of channel depends largely on the purposes and goals of communication. Mass media can increase knowledge effectively, but interpersonal communication is more likely to be effective when attitude change is the goal. Messages that reinforce prevailing attitudes and beliefs are more likely to be heard. Conflicting messages are filtered through the individual's screen of selective exposure, perception and retention. Selective mechanisms operate in both the interpersonal and mass media communication situations but they are likely to be more important in the mass media context. A person can turn off mass media more easily than another human being (Rogers, 1973).

The **Hypodermic Model** (a one-step flow model) postulates that mass media have direct, immediate and powerful effects on a mass audience. It closely parallels the stimulus-response concepts in psychology. Observers often note a trend toward homogeneity in dress, speech patterns, and values that appear to result from mass media exposure and mass production resulting in mass culture. Further research, however, casts doubt on the validity of the hypodermic model. Although based on intuitive reasoning about historical events, it is too simple and mechanistic to account accurately for mass media effects (Rogers, 1973).

The **One-Step Flow Model** states that mass media communicates directly to mass audiences without the message passing through opinion leaders, but that the message does not reach all people equally and has differential effects on individuals. This model evolved from the hypodermic model and recognized that the media are not all-powerful, screening aspects of selective exposure are operative, perception and retention affect the impact of a message, and differing effects occur among members of the receiving audience. Further, it allows for direct effects of communication from mass media channels (Rogers, 1973).

The **Two-Step Flow Model** suggests that ideas often flow from radio and print to opinion leaders, and from these individuals to other members of the population. The first step, from sources to opinion leaders, is merely a transfer of information, while the second step from opinion leaders to followers, involves the spread of influence as well as information.

Although this model views the population as interacting individuals and places people back into mass communication, it is not supported by research (Jones, 1963; Rogers, 1973). The two-step hypothesis was thought to be inaccurate when researchers found that both early and late adopters use mass media at the awareness stage and personal information at the evaluation stage (Rogers and Van den Dan, 1963). Beal and Meehan (1978) list several criticisms of the two-step flow model including 1) linearity, 2) one way communication, 3) overdependence on scientific research, and 4) lack of interactive communication.

The **Multi-Step Flow Model** is based on sequential relaying that appears to occur in most communication, and neither calls for a particular number of steps nor specifies that the message must flow through mass media. There are many possible relays in the information flow from a source to a large audience. Some members will get the message directly from the source, while others may be several steps removed from the origin. The exact number of steps in this process depends on the intent of the source, the availability of mass media, the extent of exposure, the nature of the message, and its salience to the receiving audience. Most communication researchers support the multi-step concept (Rogers, 1973).

Rogers and Shoemaker (1971) investigated media groups where impersonal and personal communication is enhanced. Media groups are small gatherings of individuals who meet regularly to receive a mass media

program and discuss the contents. The groups were developed in Canada among farm families, and later spread to lesser developed countries. Radio groups are largest in India where approximately 12,000 groups enrolled a quarter of a million people in twice weekly meetings. Farmers are made aware of agricultural and health innovations and encouraged to produce new ideas. Response is allowed for clarification of decisions and questions from the groups. Mass media schools attempt to provide a basic education that includes training for people in remote areas.

Although media groups are used primarily in lesser developed countries they can be used in educational and political campaigns in developed countries. They possess common elements. First, all use mass communication to carry the major role of distributing messages about technical innovations to the discussion groups. Secondly, all work with small groups that are exposed to the mass media message and participate in discussion. Third, all programs appear effective in creating knowledge, forming and changing attitudes and catalyzing changes. The few studies completed suggest that the effects of media channels are greater when coupled with interpersonal communication (Rogers and Shoemaker, 1971).

Innovation and Diffusion in Communication

Although an **innovation** is any idea, thought or practice that is perceived as new by an individual, practices that are modified or applied in new ways also may be regarded as innovations. Agricultural innovations often involve production practices and farm management techniques. If an innovation is not adopted, it will not have economic or social impact (Jones, 1963).

Diffusion is a mental process consisting of five stages. During the awareness stage, an individual is exposed to an innovation, but does not have complete information. This starts the diffusion process. Some encounter the innovation by accident instead of an active search.

The interest stage involves development of curiosity and a person seeks more information about the innovation. An individual usually agrees with the general idea of the innovation, but has not judged it in terms of their own situation. Continued interest leads to application of the innovation to a specific situation, personal evaluation, and a preliminary decision to adopt or to reject. This is the least distinct of the five stages.

During the trial stage an individual employs the innovation on a small scale to decide if it is feasible in their situation. This validity test is important because most people will not adopt a new practice without either trying it themselves, or seeing it used by others. Adoption occurs when an individual decides to continue full use of the innovation, and implies continued use in the future.

Continuous use of most farm practices constitutes a series of decisions to re-use a practice instead of a single decision at the time of initial use (Luethold and Wilkening, 1965). Adoption and continued use are not isolated acts, and usually combine several practices into a workable unit (Silverman and Bailey, 1961). Some innovations are adopted quickly, some are tried and rejected, and others receive sporadic adoption before spreading through the system. There appears a critical point to pass before rapid and wide-spread diffusion occurs (Coughenour, 1965). The decision to stop use and adopt something else often rests with the judgment of individual farmers (Mason and Halter, 1980).

An innovation may be rejected at any stage in the adoption process. An individual may decide at the trial stage that the innovation does not apply to the present situation. Discontinuance, on the other hand, is a decision to cease use of an innovation after previous adoption (Rogers, 1962).

The adoption of new techniques requires information, which generally comes from impersonal sources (mass media) and personal sources (neighbours, relatives) (Jones, 1963; Mason, 1964; Rogers and

Shoemaker, 1971). Impersonal information flows rapidly in one direction, and is the primary source of first knowledge about an idea. Response is rare or nonexistent. Personal communication is a face-to-face exchange of ideas. The process is perceived as credible and detailed information is gained by individuals, but the response is slow to large audiences.

Many studies show that farmers use different information sources at different times, and that different types of adopters use different sources of information. Mass media are most important at the awareness stage of the process and least important in the final adoption stage (Lionberger, 1955; Mason, 1964; Rogers and Shoemaker, 1971). Agricultural agencies and neighbours are used to help in decision-making and to obtain detailed instructions for putting a practice into effect. Commercial sources are expected to provide instruction and first knowledge (Mason, 1964).

Mason (1964) indicates that adoption is not the final stage. Information seeking occurs before and after the adoption stage, and evaluation always occurs before the interest stage. This is contrary to adoption process theory, which places evaluation after interest and information seeking. Coughenour (1965) was unable to determine the starting point of diffusion because it was related not only to how adoption is defined, but also to the scope of the system. This also leads to a problem of identifying the end of the process. Obviously, communication, diffusion and adoption of innovation are on-going processes.

A significant issue facing farmers today is the forced discontinuance of agricultural practices by environmental or health legislation (i.e., discontinued use of DDT). Mason and Halter (1980) looked at the issues of discontinuance and found that there is not always an effective or efficient substitute for the discontinued practice. Risk associated with discontinuance is unknown, so the typical adoption process that stipulates that information and knowledge is related to innovation, may not function adequately in this situation.

Producers may be more resistant to adoptions under forced discontinuance of current technology compared to market oriented transitions. This resistance is greater among risk averse producers who are familiar with less risky, less efficient and perhaps older technologies. Policy makers should be aware of this when innovations are impinged upon by legislation (Mason and Halter, 1980).

Quantifying Diffusion of Innovation

In the 1960's, a quantitative theory of diffusion of innovation was proposed by Hagerstrand. Its basic idea is that adoption of an innovation is primarily a learning (persuasion) process. This implies that one needs only to consider two groups of components: 1) those related to the spread of information about the innovation, and 2) those related to reducing the resistance to adoption (Brown, 1968).

The components related to reducing resistance have received little attention. Hagerstrand assumed that there are five levels of resistance distributed normally throughout the population. The middle levels, therefore, occur most frequently. This agrees with the findings of Rogers (1962). Hagerstrand also assumes that an arbitrary number of message "hits" are necessary to overcome a specific level of resistance, and that resistance may not be distributed randomly in space. Specific factors related to resistance include variation in economic conditions that result in time lags in adoption (given a uniform distribution of information), and farm size (apparently used as an indicator of economic status) (Brown, 1968).

Because more than one exposure is required to overcome most levels of resistance, Hagerstrand postulates the existence of thresholds that must be crossed before adoption occurs. Thresholds may pertain to individuals who are potential adopters or to the whole population, which would consider the likelihood of the entire diffusion not succeeding. For example, if each adopter sends a limited number of messages, resistance among non-adopters is such that several exposures are required. If the ratio of messages to exposures is below a certain threshold value, diffusion will cease.

Hagerstrand describes a network of social communication that is composed of individuals serving both as receivers and senders. Connectivity of the entire network, or of any two individuals within the network, is governed by a series of barriers. This network is the primary operational element in Hagerstrand's conceptual scheme, and diffusion patterns result primarily from the outcome of the characteristics of the network. The "senders" in the network are those who have already adopted an innovation, and they remain senders throughout the process. Receivers may be anyone in the network. The most important barrier to change is the distance between two potential communicants. Termed the "neighbourhood effect," a succinct statement of this barrier is that "the probability of communication between two individuals varies inversely with the distance between them" (Brown, 1968).

Hagerstrand also theorizes the existence of a hierarchy of networks of social communication, one operating at the local level, a second at the regional level, and a third at the international level. All networks have senders, receivers and barriers that control patterns of connections. The importance of various barriers differs by level. For example, in a regional network a sender would talk to the closest receivers within the same network, although they might be further away than local individuals who are not in the higher-order network. An innovation filters through these networks from a city to remote farmsteads. Diffusion among individual farmers, however, depends on a local network of social communication (Brown, 1968). Anyone involved in communication of ideas must be aware of the networks in place.

Bayesian-Based Theory

The Bayesian learning process states that each person's experience is used to update initial beliefs about the characteristics of a new technology. If the innovation is profitable, the accumulation of favourable experiences eventually will induce most farmers to adopt the new technology. Over time new technology may be redistributed from lower to higher pay-offs, inducing farmers to increase use of the new technology (Feder, and Slade, 1987).

Feder and O'Mara (1981) identify knowledge as a factor that reduces uncertainty and induces adoption by risk-averse farmers. Initial knowledge is believed to accumulate without explicit effort by farmers to obtain information. In reality, however, farmers actively gather information when it involves economic return. Thus, the amount of information found during any given period relates to prior information and expected need (Feder, and Slade, 1987).

Owners of large farms allocate more resources to information gathering in the early stages of the diffusion process, because the benefit of small increments in knowledge is greater than for owners of small farms. Farmers who own large land holdings may adopt innovations while others are actively seeking information. Owners of very small farms may neither adopt nor actively seek knowledge. The cumulative information level of all farmers increases over time because of both incremental gain and active acquisition of knowledge. Whereas incremental information may affect all farmers equally, the level of cumulative information is positively related to farm size, and implies that farmers of large land holdings reach a critical level faster. Farmers who have better access to information (e.g., visited by extension agent) will change practices faster because they attain the critical level earlier. Once adoption occurs, further information serves no purpose and does not affect decisions (Feder and Slade, 1987).

Increased extension activity, therefore, may shorten the time to adoption by farmers and induce higher levels of use until the saturation level of information is obtained. Faster adoption provides greater benefits, and this argument is used to support expansion of extension activities and other public information services (Feder, and Slade, 1987).

The personal and situational characteristics of an individual are the main factors determining adoption of farming innovations. Included are farm size, education, income level, age, social status and social origin (Jones, 1963). Farmers most likely to adopt are young, possess a high level of education and operate large farms. They make greater use of agencies and reading material as sources of information that influences their pattern of behaviour regarding new practices. This process credits personal reasoning (Jones, 1960).

Change Agents, Opinion Leaders and Adopters of Innovation

Change agents and opinion leaders are two major groups of facilitators in the communication of ideas. Shortening of the time lag between awareness and adoption of innovation is the major concern of change agents, who are professionals that influence the process (Colette and Easley, 1978; Jones, 1965; NCRE, 1955; Rogers, 1982). Included are county (rural) extension agents, home economists, nutrition aides, vocational and agricultural teachers, representatives of government, salespersons, and commercial dealers (Colette and Easley, 1978). Change agents see their role as one of basic education, and the rate of adoption is directly related to efforts extended (Rogers, 1962). There also is a direct relationship between a change agent's success and the degree of credibility perceived by the client (Colette and Easley, 1978).

A change agent's perception of an innovation may be quite different from that of a client (Kivlin and Fliegel, 1967). When change agents share language, common attributes, values, beliefs, and status with a farmer, communication is more effective and greater success is attained in persuading farmers to adopt new ideas (Colette and Easley, 1978). The most successful change agents are those who disregard the extension bureaucracy and concentrate on local clients (Rogers, 1962). The agent is the last link in the chain passing new knowledge to farmers (Smith, 1960).

Opinion leaders form a communication link between outside sources of new ideas and home communities (Rogers, 1962). They participate in formal organizations (NCRE, 1955), and have a higher social status, better education and more direct contacts with change agents (Colette and Easley, 1978; NCRE, 1955; Rogers, 1962). They usually operate larger commercial farms, earn a higher income, and have greater community prestige (NCRE, 1955).

An opinion leader has the ability to influence informally others' attitudes and behaviour (Colette and Easley, 1978; NCRE, 1955; Rogers, 1962). A position as leader is earned and maintained through technical competence, social accessibility and conformity to the system's norms (Colette and Easley, 1978). Leaders are in positions to supply information to most farmers in their communities (NCRE, 1955).

Individual Characteristics That Influence Adoption

Innovativeness relates to the degree to which an individual is early or late in adopting a practice (Rogers, 1962). Five major categories of adopters are recognized: 1) innovators, 2) early adopters, 3) early majority, 4) late majority and, 5) late adopter or laggards (Colette and Easley, 1978; NCRE, 1961). There are several identifiable differences in the characteristics of members of each category (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

Innovators are the first 2.5 percent of the population to adopt an innovation. They are youngest in age, have high levels of education, possess scientific and venturesome attitudes and can deal with abstractions. They often are leaders in state and county organizations, have high social status, and are wealthy. Often they implement practices that may not be accepted by others, operate the most specialized and efficient farms, and use scientists, other innovators, and technical bulletins as sources of information. They also make greatest use of mass media (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

Early adopters (the next 13.5 percent to accept innovations), have progressive attitudes, above average educations and are leaders in organizations in the community. They enjoy high social status, are opinion leaders, and are looked on by neighbours as "good farmers." Their typically large farms are less specialized than those of innovators. Early adopters maintain the most frequent contact with change agents, and use farm magazines and extension bulletins as sources of information (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

Members of the **early majority** (the next 34 percent to adopt), are more conservative and have traditional attitudes. They consider an innovation only after some peers adopt it. Their slightly above average education is augmented by informal contacts within a community. They have average social status, and operate slightly larger than average farms. Information is obtained by frequent contact with change agents and early adopters, through farm magazines, and socially among friends and neighbours (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

Members of the **late majority** (the next 34 percent to adopt) are sceptical of new ideas, and pressure from peers is needed before they will adopt innovations. They have slightly below average educations, travel little outside the community, and are not active in formal organizations. Although they enjoy average social status, they operate slightly smaller than average farms. Members of this group use friends and neighbours as sources of information, but do not use mass media extensively (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

The **late adopters** or laggards comprise the last 16 percent to adopt an innovation. Members are traditional, oriented to the past, and believers in "agricultural magic" and folk beliefs. They fear debt, are the oldest group, have the lowest level of education, and have difficulty dealing with abstractions. Late adopters maintain few memberships in formal organizations (except church), may be semi-isolates, and have the lowest social status of all groups. They operate small farms, earn low incomes, are seldom farm owners, and use only friends, neighbours and relatives with similar values as sources of information (Colette and Easley, 1978; NCRE, 1961; Rogers, 1962).

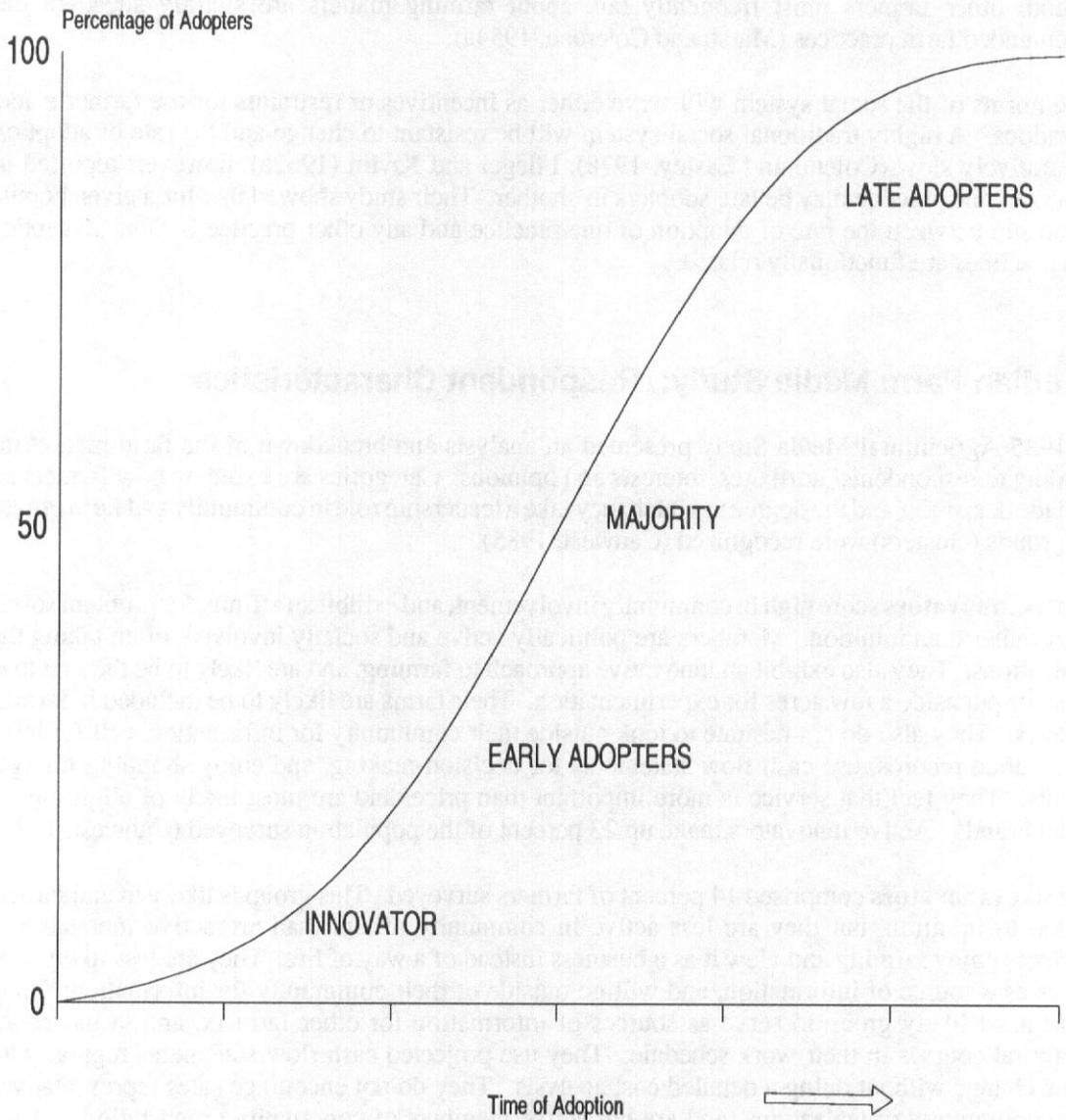
The distribution of the five adopter categories can be represented in an ideal adoption curve (Figure 1). The diffusion curve shows the time of adoption, expressed as a ratio of the number (or proportion) adopting to the number (or proportion) who might have adopted the innovation (Coughenour, 1965). The ideal adoption curve is cumulative so the height at any point represents the percentage of people who have adopted the idea to that time. The early and late majority have been combined to make one majority category containing 68 percent of the population (Colette and Easley, 1978).

Some farmers actively seek new ideas about farming and are not content to get second hand information. Mass media are most effective in communicating ideas to these early adopters (Colette and Easley, 1974). Both early adopters and late adopters use dealers, merchants and salespeople to approximately the same extent. The commercial group is probably the most important source of information. Early adopters rely to a greater extent on personal reasoning, experience and observation as aids in decision making. Relatives and neighbours are more important sources of information and advice to late adopters. Early adopters make greater use of reading material and formal advisory sources (Jones, 1960).

Operators of larger farms generally are earlier in adopting innovations either because of their increased ability to absorb risk or because they have better information and perceive less risk in change. As farmers with smaller land bases begin to acquire information about an innovation, they will consider change if there are no communication or economic constraints to discourage adoption of the innovation. The most innovative cattle farmers, as measured by the number of new techniques adopted and speed of adoption, are those with larger herds, more debt per cow, less tillable acreage per cow, fewer hours of labour per cow and more contact with extension workers (Alberta Agriculture, 1983).

Figure 1

The Ideal Adoption Curve



Source: Colette and Easley, 1978

Opinion leaders are more innovative than their followers, but research shows that they are not necessarily innovators (Colette and Easley, 1878; NCRE, 1955; Rogers, 1962). There also are innovators in all adopter categories, but they are not necessarily leaders. Each adopter category, therefore, is influenced by individuals of either the same or more innovative categories who have slightly higher social status (Rogers, 1962). Marsh and Coleman (1954b) found that in areas of high adoption, those from whom farmers obtain information have a higher adoption rate than the population in general. In areas of low rates of adoption, the adoption rate of leaders was similar to that of others. This implies that farm leaders generally reflect the values and attitudes of most farmers in the neighbourhood. If residents place a high value on innovation they will go to innovators for information, but if the residents are resistant to innovations, the leaders they go to are unlikely to be innovators (Marsh and Coleman, 1954a). This study supported Lionberger's 1953 finding that farmers to whom other farmers most frequently talk about farming matters are slightly ahead in the use of recommended farm practices (Marsh and Coleman, 1954a).

The norms of the social system will serve either as incentives or restraints for the farmer's adoption of innovations. A highly traditional social system will be resistant to change and the rate of adoption will be comparatively slow (Colette and Easley, 1978). Fliegel and Kivlin (1962a), however, reported that early adopters in one practice may be late adopters in another. Their study showed that for a given population the relationship between the rate of adoption of one practice and any other practice is low. Exceptions occur when practices are functionally related.

Canadian Farm Media Study: Respondent Characteristics

A 1985 Agricultural Media Study presented an analysis and breakdown of the farm market in Canada according to respondents' attributes, interests and opinions. Categories are based on how farmers organized and made decisions, and the degree to which they take a leadership role in community and farm organizations. Four groups (clusters) were recognized (Canwest, 1985).

Active innovators score high in community involvement, and exhibit an affinity for problem solving based on fact rather than intuition. Members are politically active and socially involved, often taking the lead in organizations. They also exhibit an innovative approach to farming, and are likely to be the first to try a new product or put aside a few acres for experimentation. Their farms are likely to be included in farm tours and field days. They also do not hesitate to look outside their community for information, call for information, keep detailed records, use cash flow statements for decision-making, and enjoy shopping for agricultural products. They feel that service is more important than price, and are most likely of all groups to switch product brands. Active innovators make up 23 percent of the population surveyed (Canwest, 1985).

Passive innovators comprised 14 percent of farmers surveyed. This group is likely to emphasize facts as opposed to intuition, but they are less active in community affairs than are active innovators. Passive innovators enjoy farming and view it as a business instead of a way of life. They are less likely to use other farmers as a source of information, and will go outside of their community for information. They are the second most likely group to serve as sources of information for other farmers, and to incorporate short agricultural courses in their work schedule. They use projected cash flow statements regularly and never make a change without doing a detailed cost analysis. They do not encourage sales representatives to take part in community organizations, and are not active members of community organizations. They do not discuss important decisions with other people, are less politically involved, and are more likely to feel that the government is too involved in agriculture (Canwest, 1985).

Active traditionalists are involved in leadership roles and politics in their communities, but their approach to farming is based on traditional values and intuition. They do not enjoy keeping records or shopping for farm supplies, and are less likely to look for alternatives. Active traditionalists feel that farming is a way of life rather than a business. They comprise 33 percent of respondents (Canwest, 1985).

Passive traditionalists are less likely to become involved in their communities, and operate farms based on traditional values and intuition. They are brand loyal and least likely to be used as sources of information by other farmers. They are least likely to use projected cash flow statements and detailed cost analyses regularly before making a change in their farm operation. Passive traditionalists rely on instinct, experience and traditional farming practices to make decisions. They do not go outside their local communities for information, are least likely to discuss important decisions, least active in community organizations, and do not make an effort to know people in their neighbourhood. They also are least likely to use a few acres for experimentation, try something new or take agricultural training. Despite these traits, passive traditionalists are more likely to show commitment to farming as a way of life (Canwest, 1985).

Several patterns are evident (Table 1). Farmers in the active and passive innovator categories are younger, have more years of schooling and higher gross farm incomes than those in the traditionalist categories. There are no significant differences in relation to farm acreage, but subsidiary information on the number of farm vehicles suggests that farm operators in the innovative categories use more intensive farming practices (Canwest, 1985).

Passive innovators were most distinctive in gross farm incomes (Table 1). Almost half claimed a gross farm income more than \$100,000. This compared to less than one-third of the two traditionalist categories. Passive traditionalists had the highest average age and lowest gross income.

Membership in the four categories varies by province. Alberta has a high percentage of farmers in the innovator categories, and Saskatchewan has the largest share of active traditionalists. Most passive traditionalists are in Ontario, while two-thirds of the passive innovators are located in Ontario and Alberta.

Active innovators are more likely than members of the other three categories to listen to the radio, and almost half say they listen while on their tractor or combine. They also are more likely to watch television news. Few differences, however, were found among groups in the use of new communication technology including home computers, video cassette recorders and satellite receivers (Canwest, 1985).

The greatest difference in readership among farm publications is the level of interest in selected editorials and feature topics. Innovators are more likely to be interested in topics associated with farm management and agricultural policies of government. Traditionalists are more likely to show interest in classified advertisements and weather reports. Farm publications do not specifically target any of the recognized groups (Canwest, 1985).

Adoption and Characteristics of Innovations

The characteristics of innovations also determine spread of adoptions (Rogers, 1962). The five most salient characteristics are 1) relative advantage, 2) compatibility, 3) complexity, 4) divisibility and 5) communicability (Colette and Easley, 1978; Fliegel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966).

Table 1. Characteristics of psychographic groups in Canada, 1985

Characteristics	Innovator		Traditionalist	
	Active(%)	Passive(%)	Active(%)	Passive(%)
Age				
< 34 years	31	28	25	23
35 - 54 years	46	55	54	50
55 years +	16	16	21	27
Education				
Grade 8 and/or high school	73	70	79	78
Tech school and university	27	30	20	21
Farm Acreage				
<320 acres	25	31	25	35
321 - 640 acres	22	24	23	21
641 - 1120 acres	25	21	20	19
1121 acres +	28	24	31	28
Gross Farm Income (\$000)				
\$25 - \$49	28	26	32	35
\$50 - \$99	27	23	33	31
\$100 +	27	31	22	22
Province				
Ontario	29	35	29	38
Manitoba	11	10	12	15
Saskatchewan	37	24	40	30
Alberta	23	31	19	17

The **relative advantage** of an innovation relates to perceptions of it being better than the idea or practice that it is designed to replace. Advantage often is described in economic terms as greater profit, initial cost reduction, immediacy of reward, or long term cost effectiveness. It also can include reduced labour requirements, lower risk, and efficient use of time (Colette and Easley, 1978; Fliegel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966). Singh and Warlow (1966) report that financial return and cost recovery are positively and significantly correlated with adoption, a lower but significant correlation occurred with initial cost, and no significant correlation occurred with labour saving. They also report that labour saving, initial cost, and operating cost are significantly interrelated.

Compatibility describes the degree to which a new idea is consistent with the existing values and experience of potential adopters. An idea that is not compatible with cultural norms will not be adopted readily, and it is easier to accept new ideas that make minor changes than it is to accept new ideas that require major changes in attitudes and values (Colette and Easley, 1978; Fliegel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966).

Complexity relates to the degree to which an innovation is easy or difficult to understand and use. Although all ideas may be classified on a complexity-simplicity continuum, some are intuitively clear while

others are not. When individuals perceive a new idea or practice to be difficult to understand and use, they will be slower to adopt it (Colette and Easley, 1978; Fliegel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966). Singh and Warlow (1966) found a significant negative correlation between complexity and adoption.

Divisibility signifies the degree to which an innovation may be tried on a limited basis. New ideas that can be implemented incrementally may be adopted more readily than innovations that are not divisible. The importance of divisibility decreases as more people adopt the innovation, and early adopters find trials more important than later adopters. The late adopters are surrounded by peers who already use the innovation, and peers act as the trial (Colette and Easley, 1978; Fliegel and Kivlin, 1962a; Rogers, 1962; Singh and Warlow, 1966). Singh and Warlow (1966) found a significant positive correlation between degree of divisibility and adoption.

Communicability refers to the ease with which information or results about an innovation can be distributed to others. Visibility of the innovation is particularly important in affecting the rate of adoption; the easier an innovation is to observe, the more likely it will be adopted (Singh and Warlow, 1966). Landowners are more likely to believe that demonstrated farm practices are practical for their own farms if they know the demonstration farmers, or have visited the demonstration farm. Intuitive verification of experimental results is less likely to persuade farmers to adopt innovation than is a method that enables farmers to make their own decisions (Alberta Agriculture, 1983).

Cultural and Social Norms and Intergenerational Transfer of Information

Cultural and social norms play a significant role in the innovation of new ideas. Rogers and Van den Ban (1963) compared differences in diffusion between the Netherlands and The United States. Researchers in The Netherlands pay more attention to building theoretical models of adoption and to analyzing the relationship of farmers' goals and their cultural values. The Dutch stress differences in the norms between local groups because farmers living 15 kilometers apart may have different subcultures and styles of farming. Knowledge of what happens outside their own village is limited and outsiders are regarded with distrust.

They offer two explanations for this. First, geographic isolation may retard the acceptance of a modern cultural pattern. After many years of isolation, new contact with urban centres did not increase the use of new practices because the gap in the modernization of their culture is too large. Second, the intellectual development of the elite is usually devoted to the classical tradition rather than to the solution of technical problems needed by traditional farmers. Social distance between elite and peasant is great and ideas are not communicated (Rogers and Van den Ban, 1963).

Clark and Abell (1966) noted a differential adoption rate between Canadian farmers and Dutch farmers who had left the Netherlands and settled in Ontario. They found that Dutch immigrants appear to be homogeneous with respect to their low degree of concern with owning their farm debt free, and their high degree of concern with the value placed on traditionalism and hard work. Use of existing agricultural services is not extensive among Dutch farmers. They do not display a strong tendency either to attend important agricultural meetings in the county or to seek advice from local agricultural representatives. This might be based on their attitude toward extension services in the Netherlands, the lack of relative differences in social status in Canadian society or lack of knowledge about services available.

Within Canada there are regional differences in development of agriculture. Karagiannis and Furtan (1990) compared farming practices of Ontario and Prairie farmers. The two regions have different price factors, particularly in land and production values. Farmers are induced to save on the more expensive input costs through substitution. Labour is relatively abundant and land relatively scarce in central Canada, while land is relatively abundant and labour relatively scarce in Prairie agriculture. Technology in both regions is

directed toward saving the relatively scarce factors, which are different in the two regions. Technological change appears to be consistent with relative price movements and suggests that farmers respond to changes in prices by finding technologies that relate to the more expensive factors of production (Karagiannis and Furtan 1990).

Karagiannis and Furtan (1990) suggest that agricultural policies, such as input subsidies, may not be appropriate for Canadian farmers because they divert farmers from optimal behaviour. However, an organization that reflects farmers' preference for technology, such as a basic research station, may increase the rate of technological change as well as the rate of adoption and diffusion of innovation. This will result in a faster expansion of production.

Studies suggest that 80 percent of agricultural producers are children of active farmers and either assume operation of the family farm or begin farming with assistance from their parents. While the system does not ensure success of the beginning farmer, it does allow for financial assistance when the operation is at its greatest risk. The physical technology in the form of equipment may be passed from one generation to the next (Kisko and Haigh, 1989).

Often it is assumed that young farmers will be successful because they learn farming practices while growing up. This is not necessarily the case, however, because parents have to be both willing and able to share information needed to carry out farming practices, and to assist in learning of technical skills necessary for production (Kisko, and Haigh, 1989).

The structure of the farm family, therefore, is important to the transfer of information and technological skills. In an intergenerational farming situation, the parent managing the business is likely to be the main source of information before younger family members gain personal experience. Younger farmers develop an understanding of practices used and become technically competent. Learning continues until the young person can work without regular supervision. During this process, attitudes toward different ideas and practices will develop (Kisko and Haigh, 1989).

Most family members share similar attitudes toward the adoption of innovation. Family attitude decides in part how young individuals process information from the parent. Usually operators who farm with other family members are more innovative because their ideas are shared through interpersonal channels of communication that are the most common and effective method of diffusing information. Two generations, therefore, compare new and old practices, and decisions are made more carefully as individuals pool knowledge and ask each other questions to improve understanding (Kisko, and Haigh, 1989).

Conversely, information transfer and adoption of change are slowed if the older generation is not willing to change practices (late majority or laggards) or to share information with their children. They also share less information because their knowledge is limited. Innovativeness is minimal as efforts by other persons are discouraged. Because agriculture is changing so rapidly the ability to explore alternatives and make choices is important (Kisko, and Haigh, 1989).

THE TRANSFER OF INFORMATION IN RURAL NORTH AMERICA

Farm income depends on accurate, up-to-date information for effective decision-making. Necessary information includes 1) news and community service items, 2) weather forecasts and related emergency or disaster warnings, 3) crop and livestock production news, (including pest management, irrigation water management and feeding recommendations), 4) marketing trends, (including current and future prices), 5) selling of farm products, 6) purchasing farm and home supplies, 7) banking services, 8) business management (including record keeping, budgeting and planning), 9) farm and public policy (including regulations) and 10) personal education and entertainment (Chartrand, 1982).

Farmers are not always confident about the accuracy and reliability of the information they receive from government. It frequently is seen as politically biased. Available information often does not apply to a particular type of farm or geographic area. Also, it is often general or vague, too old or outdated, or too costly or difficult to obtain. The private sector then becomes a major contributor to agricultural information, and commercial enterprises have developed to serve the information needs of agriculture. Businesses provide information for a fee, as private newsletters, consultants and commodity brokers play a part in distributing information. Most farmers believe that their production and marketing problems would be eased if they had access to the exact information they need (Chartrand, 1982).

Four classes of rural counties typify the diversity of rural conditions in the United States: farming dependent, manufacturing dependent, retirement and persistent low income (Long, 1987). A similar classification can be derived from the Canadian Census. In the U.S., farming dependent counties account for 29 percent of all non-metro counties, but only 13 percent of the population. Half are in the North Central region, especially in the Northern Great Plains immediately south of the Canadian Prairies. Nearly half the counties have no incorporated place of 2,500 or more people, and most are not next to a metropolitan area. They are not poor communities nor do they typically exhibit other characteristics of underdevelopment such as low educational attainment. The social and economic profile of farming dependent areas shows them to be low in population and population density, remote from urban opportunities, and with little local economic activity not closely linked to farming (Long, 1987).

Sparsely settled areas dependent on agriculture create characteristic patterns in residents. For example, when looking for machine parts and service, Manitoba farmers travel an average of 24 kilometers, while Saskatchewan farmers travel even greater distances. Slightly over half the Prairie farmers live more than 80 kilometers from the nearest major city and over half live more than 32 kilometers from the centre in which they do most of their shopping. Visits to a city are frequent as 66 percent visit once a month or more for items other than groceries (AgDecision, 1990).

These same time-space factors affect the flow of information in rural areas. A 1985 study in Minnesota suggested that many difficulties rural communities have in obtaining key resources are related to difficulties in gathering information and communicating their concerns to others. The ability to generate and maintain reliable information flows helps a community make responsible decisions. More detailed and reliable information results in more effective and autonomous decision making. The ability of a community to obtain secure economic resources, a strong institutional base, and adequate services are dependent upon the information the community receives and sends (Harmon and Krile, 1986).

Respondents to the Minnesota survey consisted of representatives from the mass media, local government, professions, industry, finance, agriculture and neighbourhood constituencies. Respondents discussed three issues: 1) how and where their organizations obtain and distribute information, 2) the information needs and concerns of people they represent, and 3) how their own group concerns compare with those of other groups in their locality (Harmon and Krile, 1986).

The majority of people surveyed, including the most information dependent groups (libraries, educators, medical workers etc.), were likely to go outside the local area to get information. These same organizations, which one might expect to be disseminators of information, were less likely to provide information to areas outside their local community. This suggests that the flow of information is into rather than out of rural areas. Universities, colleges and government agencies are the most frequently used sources of information, along with an "other" category, including professional associations, trade groups or specialized agencies. This suggests that information coming into the community does not come from other rural communities, but from centralized, metropolitan areas (Harmon and Krile, 1986; Olien et al, 1982).

Local and long distance telephone and mail/package services are the major means of transmitting information. Long distance telephone was the only service more likely to be used to receive rather than to deliver information. Local telephone was most often used to give information. This shows that information is gathered from a wider area than is delivered to.

Information sources are centralized so information is not evenly distributed. The uni-directional information flow suggests that control of information is located in metropolitan areas. Decision making in rural areas, therefore, is not autonomous. Many local communities, however, can gather and use information effectively for local needs, even though it originates outside the area.

Important needs in communication were identified. They include a lack of information sources and telecommunications services and technology, and the high cost of gathering information. Rural communities and citizens are unable to use existing sources and technology effectively. Many either do not know what information is available, or do not know how to use available information gathering technology to its fullest (e.g., computers and phone systems) (Harmon and Krile, 1986).

Types of Information Needed by Rural Audiences

Agriculture needs three types of information: 1) scientific information from a world system of respected scientific journals, 2) extension or applied information that in Canada and the U.S. is heavily oriented to the print media, and 3) information on trade (Esslinger, 1985). Science is a problem-solving enterprise that often produces technical information. Applied research, on the other hand, leads to less scientific progress than does basic research because applied scientists do not often develop theories. Applied research, however, may help solve day-to-day problems. Generally, society asks social scientists to address more problems and more diverse problems than it asks physical scientists to address (Grunig, 1980).

Scientists seldom talk directly to audiences. Instead, they communicate through public relations and media science writers, media editors and interpersonal correspondents such as change agents, extension workers, salespersons or community leaders. Science audiences are more specialized, more educated, have higher incomes and are consistent users of the media for all types of news. They do not, however, usually consist of people with advanced scientific training (Grunig, 1980).

People read science news either out of curiosity, or because the news affects them in some way. They read about science in mass media more often for curiosity and in specialized media for functional purposes. Evidence suggests that most people do not actively seek information. Rather, they passively take in information that the media places on the public agenda. This may explain why most people have only a superficial knowledge of issues but are aware that they are important. They process information emphasized by the media but, because of low involvement, do not seek it out or think much about it (Grunig, 1980).

The distinction between information seeking and information processing is important in choosing a medium and communication strategy. When a person is processing information, the most effective channel is mass media, which people use when they have time. Style and creativity are important because the message

must get the person's attention and keep their interest. If people are seeking information, specialized media such as booklets, magazines, seminars or interpersonal contacts are most effective. Content is more important than style of writing, use of colour, and readability level in these publications, because the person is making an effort to obtain and understand the message. The average person seldom makes use of scientific information unless it relates directly to their own life (Grunig, 1980).

A knowledge gap exists in society. People who are familiar with a subject will gain most from additional exposure, and information poor individuals will learn something but not as much. Donohue (1975) found that the knowledge gap in a local community exists only on issues from outside the community. When an issue directly affects the community, nearly everyone is well-informed about it. The knowledge gap develops when only a few people find the information functionally relevant (Grunig, 1980).

Science Writing Style and Purpose

Both lay audiences and scientists prefer simplified writing to complex writing of science articles. Simple well-organized writing, however, will not ensure an understanding of technical information, because shorter sentences and simple words do not provide an easy solution to explaining science to the layperson. Researchers have found that tables and graphs rather than text alone improves comprehension of science. Also, it is recommended that scientists use scientific terms if they want to increase their audiences' understanding of the topic. Style of a science story is less important than the content being perceived as relevant by the reader (Grunig, 1980).

Content researchers address the problem of whether or not science articles are less accurate than general news articles. Tankard and Ryan (1974) found 6.2 errors per science story, compared to 0.77 to 1.17 errors in general news articles. Only 8.8 percent of science stories are error free, compared to 40-59 percent of general news stories (Grunig, 1980). Accuracy, therefore, presents a problem in technical publications.

The spread of new or advanced agricultural technology depends on getting accurate information into an effective distribution system that must be built into the design and implementation of research and extension projects. It is important to recognize and use existing information systems rather than to develop new networks hastily (Esslinger, 1985). Distribution schemes that are included in proposals or grants are meant to establish or strengthen the extension component of research. People writing project documents, papers, and requests for technical proposals may approach problem solution by introducing new technologies. Often, insufficient attention is placed on disseminating adaptive and effective technologies, and to the social sciences, in drafting problem statements and project papers. Many projects address problems and offer solutions only from the physical and biological sciences (Esslinger, 1985). Important human dimensions of technical issues may not be addressed.

Every publication should include a literature review to find out what is known about the subjects under investigation. Proposals should include assessment of information flow to decide what is working and should be known among farmers. Individuals submitting proposals should consider how the results or products will be used by and distributed among potential clients. A researcher also should obtain responses from farmers concerning their needs, and descriptions of on-farm situations and problems (Esslinger, 1985).

Since 1957, the Louisiana Agricultural Experimental Station has published a semi-scientific quarterly magazine called "Louisiana Agriculture." It presents information on the Station's research to public officials, members of the agribusiness sector, science-oriented farmers, agriculture and science teachers and libraries. The magazine is sent free of charge to individuals who request it (Holmes, 1988).

A 1987 survey determined readers' occupations and subject interests. Of the 1200 respondents, 66 percent were Louisiana residents, 20 percent lived in other states, and 13 percent were foreign residents, universities

or libraries. Approximately 61 percent of Louisiana residents and 27 percent of non-residents were farmers and agribusiness owners/operators, 27 percent were academic professionals, and 31 percent were high school classrooms. Of the Louisiana respondents, 52 percent read all or most of the articles, 65 percent preferred articles that gave general information on a subject, and 52 percent of responding teachers and researchers preferred technical information about research projects. In order of preference, the top ranked subjects were beef cattle, wildlife management, vegetables, plant disease and pests, catfish and crawfish, environmental protection, fruit crops, economics, forestry, machinery, and animal diseases and pests (Holmes, 1988).

The Mass Media and General Information

The print media of the United States show a level of understanding of rural issues close to that of the general public. For example, "farming" and "rural" usually are treated as synonyms, leaving the impression that rural areas are inhabited by farmers and farm implement dealers. Farmers generally are not differentiated by farm size, commodity produced or region. The image reinforced by the press is one of farmers besieged by weather, corporations taking over family farms, bankers seeking foreclosure, commodity speculators cleverly exploiting farmers, and protectionist foreign governments blocking markets. The public seldom is reminded that many farmers gain most of their income from jobs off the farm, that the spouse and family members contribute to family income, and government payments provide significant income protection for many farmers. The financial press treats farming like other businesses. Some local newspapers give farm and rural topics more balanced coverage, and television networks occasionally provide more sophisticated coverage, but routine treatment of farm problems returns to comfortable and familiar themes (Long, 1987).

Radio and television are useful for increasing awareness of events, and for making immediate superficial reports to announce an incident. Newspapers supply more details than do newscasts, and report more events than broadcast documentary or special reports. Magazines provide even more in-depth information than that presented briefly in broadcasts and newspapers. Broadcasting is swift, but sometimes ignores significant stories (Rivers, 1973).

Newspaper readers may scan headlines in minutes or devote hours to reading an entire paper. Television news, however, must be viewed in a single sitting and is not repeated for the benefit of those who did not understand the first time. Because of its transient nature, television is more difficult to analyze. Newscasts are limited to the widest, if not the lowest common denominator. They transmit less information per unit of consumer's time because people read silently much faster than a newscaster reads aloud. Combined with time limitations, speed limitations render television news inherently less thorough than newspaper news.

The public, however, does not perceive TV news to be either inadequate or incomplete. In fact, when ranking both, TV was rated significantly more thorough than newspapers. This may result from TV's ability to convey more non-verbal information (eg. motion, colour, detail) (Philpot, 1973).

The limiting dimension of newspapers is space, while the limiting dimension of television is time. A publisher easily can expand the space of a newspaper by adding pages, but the minutes of broadcast are finite and expanding means subtracting from usually more profitable entertainment programs.

Those who cannot read can use television, and television is likely to be the major source of public affairs information for people with little education, females, non-whites, and farm and blue collar workers. The print media are likely to be the major sources of information for the highly educated, whites, males, professional, managerial and white-collar workers, and high-income groups (Philpot, 1973).

Patterns of communication among residents of a predominantly rural county in Ohio were analyzed in 1975. Researchers looked at the extent to which rural people rely on mass media for information and their

attitudes toward mass media. Respondents were predominantly white and male and about 45 percent were either full-time or part-time farmers (Ross and Napier, 1978).

Results suggest a high level of use of mass media for all types of information, and general satisfaction with the media. Reliance on mass media is a dominant pattern of communication within the county. There is a low level of perceived credibility in television news (Ross and Napier, 1978). Overall, farmers view print media as the best source of information on input costs, farm news and local events, and television as a source of entertainment. It appears that print is the best medium to use to influence what farmers think as well as to provide useful information (Canwest, 1983).

A 1986 Manitoba Farm Media Study (Canwest, 1986) ranked the media sources on various attributes (Table 2). Newspapers and magazines rate highest in four attributes and second highest in two others. Overall, therefore, the print media are by far the most important sources of information. Radio is used slightly more than print for commodity prices, and television provides more enjoyment and current news.

The Rural Press in the United States

Publishing a newspaper is a right guaranteed by the First Amendment to the Constitution in the United States. Only economic factors counteract an unlimited number of newspapers operating in a community. Originally controlled by church, then by government, newspapers now are embedded in private business (Rivers, 1973). A sizable urban area may have one or two metropolitan newspapers and more than a dozen suburban dailies serving specific geographic areas (Philpot, 1973).

Seventy-eight percent of all Americans 18 years of age and older read a daily newspaper, and 33 percent read two or more papers every day (Simmons Associates, 1969). Older people read more (82 percent between 35-64 years of age), than do young people (73 percent between 18-24 years of age). Readership levels increase with level of education from 87 percent of those who had attended college for one year or more, to 83 percent of high school graduates, and 64 percent of those who did not attend high school. Readership also is higher in higher income groups (Rivers, 1973).

Popular magazines with wide circulations originally were successful because advertising paid most of their costs. This became clear when television became the chief medium for general information and lured advertising away from magazines. Before mid-century, there were a dozen weekly magazines of general appeal. Few remain today. As the popular magazines weakened and disappeared, special interest magazines that cater to specific publics have strengthened (Rivers, 1973).

The relationship between information sources used by consumers and the media was measured for the Magazine Publishers Association by Opinion Research Corporation in 1982. In major fields of interest, magazines make the greatest contribution to overall knowledge and usable ideas in every field except "food" for men and "automobiles" for women. There is a significant trend toward greater dependence on magazines among young, better educated, more affluent, executive and white collar workers. When asked specifically about the contribution of various media to overall knowledge of farming, gardening and landscaping, magazines are by far the most significant source (Figure 2).

Residents of three rural counties in Wyoming were surveyed regarding sources used for general news and agricultural information (Wright, 1976). Availability of information varies among the counties with high media availability (High-MA) for 33 respondents, medium media availability (Medium-MA) for 35 respondents and low media availability (Low-MA) for 34 respondents. A total of 102 of the 112 respondents to questionnaires are involved in agriculture.

Table 2. Rating of attributes of media sources by Manitoba farmers, 1986.

Attribute	Media source (percent use)				
	Newspapers magazines	Radio	T.V.	All	None
Best source of news about farming	75	9	12	3	1
Best source of news about commodity prices	38	42	12	3	3
Favourite source of enjoyment	16	13	58	9	3
Source of current news used most often	26	25	41	4	1
Most informative ads for farm equipment	84	6	6	3	2
Most enjoyable ads for farm equipment	58	5	19	2	7
Has the most influence on what farmers buy	57	7	11	10	7

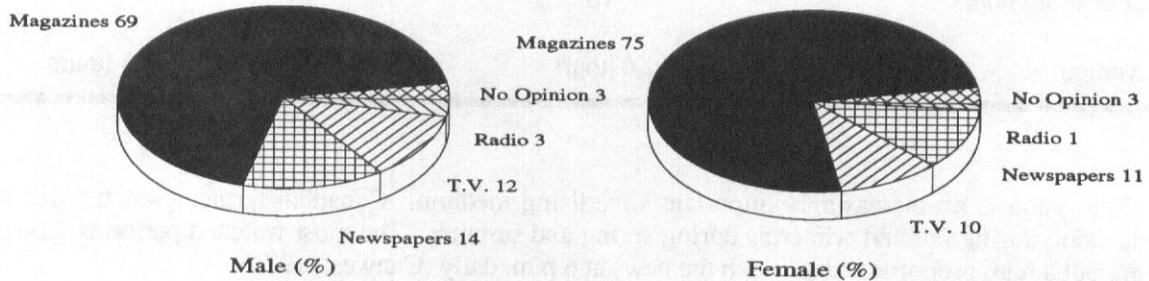
Results indicate that magazines are the primary source for agricultural news (84.3 percent). This greatly exceeds use of other media, especially in remote areas (Low-MA areas 91.2 percent). In High-MA areas, however, radio (84.8 percent) is used more frequently than are magazines (78.8 percent) (Wright, 1976). When allowed a single exposure magazines are preferred (36.3 percent), with television a close second (31.4 percent).

Magazines also are reported to be the most believable source of agricultural information (27.4 percent), with the specialized nature of magazines cited as the reason. Farmers are least inclined to believe radio, especially if they receive conflicting reports.

Magazines appear to be a more powerful medium for diffusing an agricultural idea than are newspapers, radio or television. For example, some respondents state that they often became aware of a new idea from radio, television or newspapers, but reserve judgement until agricultural magazines report on the idea. It is possible that a lack of immediate neighbours prompt some Wyoming farmers to use agricultural magazines in lieu of one-to-one communication (Wright, 1976).

Figure 2

**Mass Media Sources Used for Information
on Farming and Related Activities, 1982**



The Broadcast Media

Broadcasting in Canada and the United States is a privilege granted by the federal governments through the Canadian Radio and Television Commission (CRTC) or Federal Communication Commission (FCC). A license to broadcast does not involve the same rights and privileges given to print media, because there are a limited number of television licenses available in each community or region. When a station's license is due for periodic renewal, the public may present evidence to show why the license should or should not be renewed. In this manner, owners and managers of broadcast media are accountable for presentation of a balanced and impartial account of events. Almost all stations are assigned to a central city and their signals cover wide areas. This may result in the suburban and rural areas receiving little coverage from television news (Olien et al, 1982).

Although many stations make a profit on news, most can make more money by substituting a program that costs less. Station managers schedule news programs because they think it helps their station's image, keeps them on good terms with the regulatory agencies, and in some cases, management operates with a sense of obligation to the community (Philpot, 1973).

Although farmers listen to radio year round, many listen to the radio for more than six hours every day during spring and summer (Table 3). During fall and winter, most farmers listen to the radio between one and two hours daily. Listening is most frequent during the early morning, with nearly all farmers saying that they regularly listen to the radio at this time of day. The noon period also is a popular time for radio. By far the most likely location for radio listening is on a tractor or combine for Prairie farmers, and in the home for Ontario farmers. The majority of farmers listen regularly to farm market reports and farm news, although recall of specific programs is low. General news and talk shows are the second and third most popular choices. The results indicate that radio is a very important medium to farmers across all provinces and age groups (Canwest, 1983).

Table 3. Hours of daily listening to radio reported by Canadian farmers, 1983

Duration of listening	Fall and winter (%)	Spring and summer (%)
Do not listen	5	5
One hour	37	34
Two hours	25	15
Three hours	12	7
Four or five hours	12	13
Six or more hours	10	25
Average	2.6 hours	3.8 hours

Television is an increasingly important advertising medium. Canadian farmers watch twice as much television during fall and winter as during spring and summer. The most watched period is 7:00 to 11:00 p.m. but a high proportion also watch the news at 6 p.m. daily (Canwest, 1973).

Radio and television are used most often for weather reports. Farmers criticize the two media for not providing more in-depth information on agricultural issues, and for timing of farm broadcasts. When asked if they want more agricultural information presented on television in the prime-time evening hours in lieu of regular programming, however, the majority said that they would prefer entertainment from television and obtain their agricultural news from magazines (Wright, 1976).

Preferred Methods of Transfer of Information

In rural America, television is listed as the major source for general news (45.5 percent), radio is second (27.7 percent), newspapers third (21.4 percent) and magazines a distant fourth (5.4 percent). Television also is the most believable news source (28.5 percent) although the majority (36.6 percent) answered "don't know" when asked to rate believability. Radio is rated much lower in believability and newspapers are the least believable (Wright, 1976).

Although agricultural news is gained from all sources, magazines are used most often. A majority of farmers said that they would select magazines if they could have only one information source. Television, however, is a close second. Magazines also are reported to be the most believable source for agricultural news. The specialized nature of farm magazines is the major reason many consider them more valuable (Wright, 1976).

A 1984 Canadian survey asked farmers about the current and preferred sources of information about government programs (Table 4). All six specifically named sources of information are used by more than half the farmers surveyed. Only direct mail, however, is listed as the preferred source by more than half the respondents. It is obvious that farmers are receiving much of their information from non-preferred sources.

Table 4. Current and preferred sources of information listed by Canadian farmers, 1984

Sources of information	Current source (%)	Preferred source (%)
Farm publications	80	30
Direct mail	73	56
Radio	72	18
Pools/Co-ops	70	12
Television	65	16
Meetings	55	12
Other	4	3

A 1988 Readex survey of **Country Guide** asked readers to rate the importance of various sources of information. **Country Guide** magazine is published in both Alberta and Ontario. Farm magazines and newspapers receive the highest ratings, but television, radio and ag reps receive positive responses. Company bulletins rate poorly. Television, ag reps and company bulletins, however, all receive more than 20 percent low ratings (Table 5).

Table 5. Important sources of information listed by readers of **Country Guide**, 1988

Source of information	Very important			Not very important	
	5	4	3	2	1
Farm magazines and newspapers	46	31	15	1	1
Television	31	17	12	13	20
Radio	23	25	20	13	12
Government ag reps	20	12	28	10	22
Company bulletins	3	9	26	27	25

A study of farm operators was conducted in two Missouri farm communities (Ozark and Prairie) in an effort to determine how farmers view radio, television, county extension agents, farm magazines, agri-chemical dealers, feed dealers, innovators and legitimators (persons most influential in their own farm practice) (Lionberger and Francis, 1969). Farmers differentiated among information sources (government agencies, mass media, and personal referents), with variations related to the source considered and the community studied (Lionberger and Francis, 1969).

In the community of Ozark, an economically disadvantaged farming area in Missouri, the hierarchy from highest to lowest is legitimator referents, innovators, county extension agents, farm magazines, and television. The differences between these sources are significant ($p < 0.05$). County agents and television are least accessible while legitimators are most accessible (Lionberger and Francis, 1969).

The Town of Prairie is an affluent community in northwestern Missouri, and farmers from the region distinguish more among classes of sources than between specific sources. Ratings from highest to lowest are 1) legitimators, 2) feed dealers, agricultural chemical dealers, innovators and the county extension agents as a group, 3) radio and farm magazines, as a group, and 4) television (Lionberger and Francis, 1969).

In Ozark, younger farmers place a slightly higher value on influential farmers. In Prairie, younger farmers list television as more practical than talking to older farmers, even though it is listed as the least practical overall source (Lionberger and Francis, 1969).

Successful farmers in Ozark are inclined to defer to other highly successful farmers and innovators (viewed their own kind with disproportionate favour). There is a shift from county extension agents to commercial sources, but not to the exclusion of the former. In Prairie, innovators upgrade the expertise of agricultural chemical dealers. Farmers who received farm information from the sources prior to the interview, generally rate these sources higher than farmers who had not received information (Lionberger and Francis, 1969).

In a more recent study (Ford and Babb, 1989) a questionnaire was administered to 2,537 farmers in Illinois (93 percent response), Indiana (90 percent response), and Iowa (84 percent response). The questionnaire also was sent to a group of farmers in the Southeastern United States (39 percent response). Farm magazines, other farmers and family members and relatives are the top three sources of information. Commercial farm management services, brokers and commodity analysts, consultants and computer data bases are used least. Those using these sources, however, operate large farms, and they rely heavily on brokers and newsletters for farm sales decisions. Their use of commercial newsletters is four times higher than that for operators of small farms.

Combined primary and secondary sources of information for decisions on grain sales include farm magazines and United States Department of Agriculture (USDA) news services. Private firms are used for information about livestock sales, and both private firms and cooperatives are primary sources of information for feed (63 percent) and chemical purchase. Livestock farmers rely on a broader set of information sources than do crop farmers.

Family and friends are the primary sources of information for crop decisions, with extension and farm magazines used more by operators of small farms. The use of family and friends is consistent across all commodity, regional, experience and cooperative use categories. Farm investment information is sought primarily from banks (43.4 percent) and family members (28.4 percent) (Ford and Babb, 1989).

Older farmers rely more on cooperatives for information concerning grain sales than do less experienced farmers who use commercial newsletters and commodity brokers. Use of USDA news services and private firms for livestock sales increases with farming experience. Older farmers use fewer sources of information, and younger farmers rely more on family and friends. Other farmers and farm magazines frequently are consulted for sources of information, but county agents are rarely consulted for many farm decisions included in the survey. Extension services may have to adjust to new information markets and develop appropriate niches.

The overall results of this survey apply to all regions, as farmers in Iowa, Indiana, Illinois and the Southeast relied on many of the same sources of information. Farmers show preference for personal, service-oriented information as opposed to written information. It was noted as curious that input purchases (feed, fertilizer and chemicals) require little use of written information. In general, public sources of information are not widely used by the farmers surveyed (fewer than half). This shows a dependence of agricultural clientele on private information markets (Ford and Babb, 1989).

The Information Age

The implications of becoming an information based society may be profound, especially for rural people and places. The potential also exists for rural areas to be left behind urban areas in access to information. Dillman (1985) looked at the potential impacts of information technologies on the interactions among rural people. Rural society has experienced dramatic transformation since 1911 when the direction of road turnings

was used to identify community boundaries, and every connection with the larger society had to be physically transported including delivery of medical care, religious instruction, fuel, machinery repair, and all other products and services. Roads often defined boundaries of social interaction that influenced who communicated with whom about what (Dillman, 1985).

Automobiles, paved roads and telephones expanded the size of the functional populations. Telephone not only expanded interactions, but also increased their speed. Greater wealth increased travel opportunities, and expansion of diverse educational opportunities and military experiences brought rural people into contact with other sections of the country and other countries of the world. The increase of women in the paid labour force brought still more interaction. Television and other media of the expanding society flooded the countryside with messages. Dillman (1985) summarized the essence of the information age by identifying increases of the following parameters:

- 1) the speed by which communication occurs between one place and another,
- 2) the amount of information that can be transmitted,
- 3) the quality of long distance telecommunication,
- 4) the miniaturization of computer and communication technologies,
- 5) the capability to send as well as receive information from any point on earth,
- 6) the range of people and places with which we may make contact,
- 7) the relative importance of telecommunication transmissions compared with those that require physical movement,
- 8) the ability to select the precise information needed from large data banks,
- 9) the ability through artificial intelligence to conceptualize problems and possible solutions in ways beyond individual human capabilities,
- 10) the relative importance of information versus labour and energy in the production of goods, and
- 11) the rate of potential change in who interacts with whom for what purpose

These changes result in three potentially important sociological implications. First, it is plausible for a new structure of social interaction to evolve that is not based to a specific degree on locality. Second, geographically unbound interactions may become a dominant influence on individual behaviour. Third, changes that occur in these interactions may not simply be extensions of the mass society trend observed in recent decades.

Society is shifting from an industrial base to one in which most effort goes into, and most value is produced by information processing activities. Information, to some degree, is being substituted for time, labour, and energy in the production of goods and services, requiring new ways of thinking about resources and resource use. For example, we often view information overload as one of the significant problems of contemporary society because of a massive increase in available information.

Data, however, do support the overload hypothesis. The belief that we have so much information that more cannot be used represents a fundamental misconception of what the information age is about (Dillman, 1985). The information revolution is first and foremost the ability to transmit and receive the information that one needs when one needs it. The achievement of this goal means that it will be helpful to increase the amount and diversity of information in order to find the exact piece one needs. Once information is stored, it can be retrieved repeatedly by different people in different places.

Five kinds of information technology are likely to invade rural localities. First, the telecommunication capability for rapidly sending and receiving large quantities of information is one of the most important features of the rural information infrastructure. For information purposes the distance from Seattle to Stockholm might become no greater or more costly than the distance from a farm to the nearest hardware store.

Second, rural society will gain the ability to use network signals that become available. This requires the acquisition of equipment for receiving, sending, and using telecommunication information including video phones with conference capabilities, computers with electronic mail terminals, two-way fibre optic cables with feedback controls, and video players and recorders. Costs for this equipment likely will be high.

Third, rural residents will master use of information technologies that are embodied in the tools and materials used to produce goods and services for the competitive marketplace. Such products range from microprocessors that serve as guidance systems, to farm equipment, and the products of bio-technology research.

A system for rapid delivery of goods and services will constitute the fourth information technology that invades rural areas. The critical parts of the economic workplace likely will consist of components that cannot be repaired on site. Although mail and other information can be transmitted electronically, most manufactured products cannot. For example, a positive correlation between use of long distance telephone and travel has been noted.

Finally, in order for people to have the capacity to use these technologies effectively, motivation for learning new skills will be required. Whether rural people will accept the challenge of learning these skills is no less important to the success of the information age than the development of the technologies themselves (Dillman, 1985). Rural North Americans traditionally are slower to adopt technologies than are urbanites. The arrival of the information age, however, has potentially enormous implications for rural people by providing the potential to overcome the negative effects of distance in rural space. The use of information technologies may influence who lives in rural North America, their social interaction patterns and the viability of institutions that serve them (Dillman, 1985).

FLOW OF INFORMATION TO FARMERS

Public and Private Extension Services

Information is transferred to farmers from a variety of sources. Public and private extension education can be both formal and informal, and practice and product oriented. Farm and rural newspapers and magazines, agricultural organizations and mass media all have roles to play, and future technology will open new avenues of communication.

Both public and private agricultural extension efforts have the potential to enhance technology and increase efficiency of production. In the public sector, extension personnel assemble, organize and interpret market information and simplify technical information for distribution to farmers. They also demonstrate new techniques and consult directly with farmers on specific production and management problems. The contribution of extension education to production depends on the output of basic and applied research, the quality of extension personnel, the education level of farmers, and the knowledge gap between applied researchers and farmers. Publicly supported agricultural extension should provide information that is objective and oriented closely to aiding farmers, rather than meeting the objectives of private firms (Huffman, 1978).

Four potential sources of bias must be considered when assessing the value of extension. First, all effects of extension cannot be accounted for in a single method of presentation. One type of effect often precludes the estimation of others, and adding effects may create problems of omission and double counting. Second, contact with extension agencies often influences production for longer than the typical one year monitoring period. In the long run, it is not extension contact that affects efficiency, but accumulation of useful information. Third, bias results from the interaction of research and extension. The development of technology and quality of extension information depends on agricultural research. Fourth, private sector information may be related to public sector agricultural extension, but private sector information is excluded from empirical analyses because supportive data may not be available (Huffman, 1978).

The demand for information is likely to increase with increasing farm size, because management becomes a more critical factor and the cost of management errors may become substantial. Information reduces the margin of error. Also, agricultural research primarily is focused on problems faced by large commercial farms, and information from agents may be more suitable for large farms. Finally, there may be economies of scale in obtaining and using extension service information (Bagi and Bagi, 1989).

A farmer's age, education and experience influences the ability to interpret, understand and modify new information. An experienced and educated farmer should be in a better position to formulate and execute a farm plan and adapt information into a useful form in a specific situation. Because information is likely to reduce risk, both experience and education are likely to increase the demand for extension services. However, even operators of relatively small farms make use of extension services, though not as extensively as operators of large farms. This supports the need for and points out the importance of an increased focus of extension services on small farm operations. Demand for extension information is negatively related to the cost of a contact with an extension agent (Bagi and Bagi, 1989).

Small farms are not simply scaled down versions of large farms. They are different because they have limited resources, owners often divide time between farm and off-farm work, and some technology and marketing information is not suitable for their scale of operation. They also have greater difficulty using relevant technology and information and may not have access to appropriate markets.

A large proportion of small farm operators simply may not be able to adopt new technology and market information owing to limited access to relevant information (Bagi and Bagi, 1989). Research and extension needs of farmers with limited resources are different because they are subject to 1) diversified production, 2) lower educational levels, 3) intensive labour, 4) varying markets, 5) non-commercial motives causing conflict, and 6) they are locally-based operations (Alberta Agriculture, 1983).

Farmers in general, and farmers of small acreages in particular, consider the marketing of their products as the most important area in which they need help. Many traditional markets, particularly for fruits, dairy products, vegetables, and poultry are no longer available to small operators. Direct marketing of such products has been increasing in many parts of the United States, but necessary help and guidance from agricultural economists and extension services has not been forthcoming. Small farm operators need technical assistance to help them become more efficient producers as well as retailers. A number of states are using para-professionals and teaching assistants to work directly with limited resource farmers. There is considerable potential for improving management on small farms through such programs (Bagi and Bagi, 1989).

Types of Extension Information

Farm specific information is defined as that which effects only one farm (e.g., soil testing, farm record keeping). General farm information is defined as that which is simultaneously applicable to many farms (e.g., market outlook information, general livestock disease control). Information that is specific to a given farm has little or no value to other farms and constitutes a private good. General information, however, is considered a social or public good. The United States Cooperative Extension Service subsidizes both farm-specific and general farm information, as well as other forms of information and adult education. They pay for the resources required to condense, interpret and distribute technical information. Farmers invest time by obtaining and using the information in farm business decisions (Huffman and McNulty, 1989).

Historically most of the needed information came from Extension and university outlets (Ford and Babb, 1989). However, farmers have bypassed Extension for years, just as county agents have bypassed specialists, and specialists have bypassed researchers. In order for all to be competitive at their jobs they feel that they must bypass one another, and the practice will increase in the developing information age. The important act is not securing information from a particular source, but rather interpreting the information in local context (Dillman, 1985).

Commercial sources of information have developed to serve agriculture. Private newsletters, consultants and commodity brokers all play a part in distributing information. It is important that Agricultural Extension specialists and land grant researchers gauge the use of information sources by farmers and understand the role now being played by the land grant system. Much of the information marketed by the private sector may have its origin in the land grant system. State Extension specialists and researchers frequently publish findings in brochures, research reports, and farm magazines, and information is picked up by news services and private firms. University personnel often are called upon by the news media for expert comments or opinions on current agricultural issues. One farmer may attend an extension program and pass information learned to another farmer by word of mouth. The information that originated in the public sector may not be identified with the ultimate source when transmitted to final users (Ford and Babb, 1989).

Delivery Methods for Extension Information

County Extension agents traditionally use a variety of information delivery methods to influence change among their clientele. Methods range from on-farm demonstration to computer networks. Richardson and

Mustian (1988a) mailed questionnaires to North Carolina farmers to determine both current and future preferences for how they receive information from Extension. Farm groups were separated to identify differences that may exist between the producers of selected major farm products. The surveys contained 30 different communication techniques, and farmers were asked to respond to three questions: 1) identify all of the methods that they currently used to obtain information from Extension, 2) identify five methods they used most, and 3) identify five methods they felt they would use five years in the future (Richardson and Mustian, 1988a).

Results suggest a strong preference for information delivery methods classified as traditional Extension methods. The five considered most important are 1) newsletters, 2) meetings, 3) farm visits (agent to farmers), 4) telephone calls, and 5) on-farm tests and demonstrations. Newer Extension delivery techniques such as teleconferences, video tapes, audio cassettes, cable television and home study courses are rated low as preferred methods. When projecting five years into the future farmers show no significant differences from current preferred methods (Richardson and Mustian, 1988a).

Commodity groups tested for variation in preferred Extension methods include field crops, tobacco, peanuts, hogs, beef cattle, dairy, forestry, poultry, Christmas trees, horticulture (ornamental) and fruits and vegetables. The eleven commodity groups combined rank the five preferred methods as 1) newsletters, 2) farm visits (agent to farmer) 3) meetings, 4) field days, and 5) demonstrations. Newer methods are rated poorly. Weighted rankings of information delivery methods of the eleven groups indicate preferences for 1) farm visits, 2) meetings and newsletters (tied), 4) telephone calls, and 5) field days. Even when weighted, newer techniques fail to receive a top ten ranking by any commodity group (Richardson and Mustian, 1988a).

When projecting five years into the future, traditional information delivery methods continue to be most popular, with the top five being 1) meetings, 2) farm visits, 3) newsletters, 4) phone calls, and 5) on farm tests and demonstrations. Computers place among the top ten methods in eight commodity groups. Video tapes, exhibits and teletip gain top ten status among some commodity groups. Magazine articles and bulletins are expected to decline in importance. Only four commodity groups give bulletins a top ten rating in the future. Currently ten of the eleven groups place bulletins in the top ten. Six groups currently rank magazine articles in the top ten information services while only three groups see magazines as an important delivery method in the future (Richardson and Mustian, 1988a).

Familiarity appears to confirm validity and ensures the future use of traditional methods. A decline in popularity of bulletins and magazine articles will be accompanied by an increase in popularity of computers. Special publications may provide more prompt and specific information and will gain in popularity among Extension clientele (Richardson and Mustian, 1988a).

However, Extension personnel should avoid moving too rapidly into newer impersonal forms of communication. The North Carolina study indicates a desire to receive information directly, suggesting continued use of familiar teaching methods coupled with the introduction or inclusion of newer direct methods of providing information. By being introduced in an incremental approach to using newer, less familiar communication techniques, agricultural producers will have an opportunity to gain familiarity with new techniques, and eventually may prefer newer methods. Producers also will have the opportunity to compare old and new methods (Richardson and Mustian, 1988a).

A second study in North Carolina (Lasley and Fellows, 1990) asked farmers what information and training services they felt they would need in order to continue farming for the next five years. Overall, operators suggest moderate to high needs for information and training across all program areas. Thirty percent or more report a high or very high need for information and training to reduce production costs in the areas of 1) low-input farming methods, 2) using new technologies as they become available, and 3) enhancing marketing skills. More than 20 percent report a high level of need for information and training on 1) government

assistance, 2) use of new machinery and chemical inputs to increase production, and 3) use of appropriate conservation techniques (Lasley and Fellows, 1990).

A telephone survey asked operators of mid-to large-sized farms in Virginia to identify their information needs, evaluate their perception of Extension service programs, and provide information on publications and other media they used. Many farmers (41 percent) are not sure of the type of information of greatest value to them in operating their farms or in planning for the future. When asked how Extension could best serve them 43 percent said by providing marketing information, 26 percent said through production information, and 21 percent listed financial information. Farmers view Extension services as a valuable information source, and they are cited as the most important source by 41 percent of the farmers. Additional information sources are farm magazines and other farmers. Considering the large number of respondents who have no strong opinion on how to solve their problems, there is a need for leadership, rather than reaction from Extension (Warmann and Rice, 1988)

Future of Extension

Extension specialists may concentrate on selected aspects of information exchange in the future. First, they should continue to publish in the popular press, because farm magazines reach more landowners than any other source of information. Since farmers also use unwritten sources of information, Extension efforts may explore VCR's, video disks, and satellite communications. Second, research findings and reliable information often are passed from one farmer to another, and from one family member to another. Farmers recognize useful information, so Extension programs should strive to meet farm level needs for high-quality and useful information.

Third, Extension departments should increase capacity and expand activities toward training professionals in agribusiness. If farmers are seeking information from professionals it is important that they are well-informed. Fourth, Extension efforts should be selective in distributing information in areas where clientele have shown a preference for private information sources. Private firms and cooperatives may be biased by sales motivation and product alliances with firms. Public Extension is in a position to providing objective information for decision-making relating to retail products (e.g., input purchases). Fifth, public Extension must continue to develop and provide information for which there is no economic incentive for development in the private sector (Ford and Babb, 1989).

The public service can more easily use or produce information needed for complex decisions, and has no incentive to bias information. The frequent use of private providers of information may reflect either better quality information or great expertise in its application. Although some competition between public and private sources of information may be advantageous, cooperation and joint ventures often better serve the public. Areas of cooperation include development and evaluation of new communication modes, improvement and expansion of basic data, identification of information needs and gaps, evaluation of the use and value of current information, tests of information reliability, and development of programs to link information and education (Ford and Babb, 1989).

Canadian Farm Magazines and Newspapers

Farm magazines and newspapers are rated as moderately important sources of farming information by Ontario farmers. County programs, staff of the Ministry of Agriculture and Food and commercial and agribusiness representatives also are important sources of information. The 1986 ratings of farm magazines and newspapers and commercial and agribusiness sectors are similar to those in a 1985 study, but are higher than those observed in 1980 (Blackburn, 1987).

The Ontario Ministry of Agriculture and Food (OMAF) began publishing **OMAF News** about ten times per year in 1984. It delivers accurate and timely information to farmers, and had approximately 65,000 subscribers in Ontario in 1986. A survey of Ontario farmers was conducted to find circulation and perceived value of **OMAF News**. The use and perceptions of several other media and programs of the Ministry also were examined (Blackburn, 1987).

Respondents represent a proportionate random sample of farmers in all regions of Ontario. The sample had a greater than expected proportion of farmers with large landholdings and some enterprises (e.g., poultry) (Blackburn, 1987). Ninety percent are full-time farmers, and 60 percent are between 40 and 59 years of age. Most farms are between 51 and 600 acres in size. Gross farm sales of survey respondents lie primarily in two categories: between \$50,000 and \$150,00, and more than \$150,000.

OMAF News is received by more than 80 percent of Ontario farmers, and 62 percent read more than half the publication. Receipt of **OMAF News** is highest among farmers with large acreages and high annual gross sales. Readership compares favourably with most popular farm magazines and newspapers. Readers express greatest interest in farm management articles, front page news stories, research corner features, and the feature (or insert) section. Ratings for the crop insurance and stabilization deadlines section are higher in 1986 than they were in a 1985 survey. About 25 percent keep some back copies or feature pages for future reference. **OMAF News** is read by other family members in slightly more than half the recipient homes.

About one-third of the respondents made general comments or suggestions about **OMAF News**. Supportive comments include reliable information and ease of reading, but some respondents suggest that **OMAF** duplicated other publications, is biased toward government, is not timely enough, and does not carry enough news in some areas (eg. poultry, swine, horses, forecasts, the north, and French). The majority of farmers, particularly full-time and larger operators, are satisfied with the publication (Blackburn, 1987).

Agri-Book Magazines, such as **Corn in Canada** are science-based, crop specific magazines. **Corn in Canada** is published seven times a year for corn producers, the majority of whom live in Ontario (Agri-Book Magazine, 1987). A sample of corn farmers was systematically selected from the magazines circulation list for a survey (Readex, 1987). Eighty-five percent of those surveyed receive **Corn in Canada**. Approximately 20 percent clip articles or advertisements for reference or to show someone else, and 43 percent save previous issues for reference. The majority of subscribers pass their copy to one or two (62 percent) or three or more (14 percent) others. Most are spouses or other household members. About half the readers report that **Corn in Canada** is very useful, while 14 percent are not satisfied (Table 6). All other characteristics are rated as very high or high by between 46 and 69 percent of those surveyed. Bias is the only characteristic that receives less than 50 percent approval.

Table 6. The usefulness and rating of **Corn in Canada** by producers, 1987

Characteristics	Rating				
	Very high	High	Moderate	Low	Very low
Useful	14	35	26	10	4
Easy to read	40	29	5	5	7
Attractive	33	30	18	7	7
Timely	24	27	32	9	2
Unbiased	15	31	32	5	4
Relevant	14	43	24	9	1
Practical	12	43	26	10	4

Respondents were asked what other subjects they would like to read in **Corn in Canada**. Suggestions include features about innovations and technologies, environmental/conservation ideas with emphasis on fertilizers and soil, and financial information with emphasis on input costs and management (Readex, 1987). Ninety-six percent of the respondents also subscribe to one or more of the following publications: **Country Guide** (73 percent monthly), **Farm and Country** (71 percent monthly), **Ontario Farmer** (71 percent weekly), **Ontario Corn Producer** (63 percent monthly), **Agri-Book Magazine** **Beans in Canada** (51 percent yearly), and **Corn-Soy Guide** (33 percent twice yearly). In Ontario, four main publications are received by the majority of farmers: **The Western/Eastern, Ontario Farmer, Country Guide** and **Farm and Country**. Ontario farmers are most interested in commodity prices, markets and the economic outlook (Canwest, 1983).

Western Canadian Farm Magazines and Newspapers

The importance of magazines and newspapers varies regionally. Four farm publications dominate the market for Western Canada: **Farm, Light and Power, The Western Producer, Country Guide** and **Grainews**. Prairie farmers are most interested in information about new farm practices, farm equipment, the weather and agricultural chemicals.

Canwest surveys of Western Canadian farmers involve extensive telephone and mail surveys that are completed every two years. In 1989 a number of focus groups were added. Results are independently supported by surveys from Readex Research and readership research conducted by individual publications. Accuracy of Canwest surveys are determined both intuitively and statistically. **Farm, Light and Power** enjoys widest regional circulation being reported by 87 percent of farmers. Analysis of distribution of **The Western Producer, Grainews** and **Country Guide** shows no discernable difference in regional coverage. Distributional differences among the three are insignificant (Table 7) (Cameron, 1989).

Table 7. Prairie regional and provincial receipt of major farm publications (percent respondents), 1987

Publication ¹	Prairies	MB	SK	AB	Type of farm		Age of reader (yr)		
					Grain	Mixed	<35	35-54	>55
Farm, Light & Power	87	67	89	94	2	1	2	2	1
Western Producer	77	51	92	67	45	39	41	40	48
Country Guide	71	69	68	76	7	8	32	6	8
Grainews	71	60	76	70	31	27	25	31	28
Manitoba Co-operator	18	94	2	2	-	-	-	-	-

¹ Only publications analyzed in depth by Canwest (1983) have been included.

Farm, Light and Power is available in the three prairie provinces through affiliation with the provincial Hydro companies (Readex, 1989). It is delivered to nearly all farmers, excluding only those not serviced by a Provincial utility company (Cameron, 1989). Of the respondents in a 1990 survey in Saskatchewan, 89.4 percent received the free magazine (Readex, 1990). **Farm, Light and Power** publishes articles that deal with electrical safety, energy management and new products and services (Readex, 1989).

Most respondents read all or most of each issue of **Farm, Light and Power**, and clip articles or save copies of the magazine. Readability and the informative nature of articles receive highest ratings. All characteristics are rated favourably by farmers (Table 8).

A survey was conducted to provide editors and advertisers of **Farm, Light and Power** with readership evaluation of selected articles and advertisements (Readex, 1989). The survey includes representation from all three provinces (Manitoba 18 percent, Saskatchewan 32 percent, and Alberta, 49 percent). Men comprise 83 percent of the respondents, and are equally distributed among four age categories (30-39, 25 percent; 40-49 years, 20 percent; 50-59 years, 21 percent; 60+ years, 23 percent). Most have high school or less education (61 percent), but many have attended (12 percent) or graduated from (17 percent) a vocational school or college. Twenty percent of respondents have gross incomes of less than \$25,000, 33 percent have incomes between \$25,000 and \$49,999, 17 percent report income of \$50,000 to \$99,999 and 21 percent list more than \$100,000 per year.

Table 8. Farmer ratings of characteristics of **Farm, Light and Power**, 1989

Characteristic	Rating scale					
	1	2	3	4	5	
Easy to read	49 ¹	29	8	0	0	Difficult to read
Informative	39	34	10	4	0	Not informative
Practical	27	30	23	1	0	Not practical
Timely	22	29	20	4	0	Dated
Original	18	26	23	7	0	Not original

¹ Percent all respondents - not all respondents rated all characteristics.

Respondents were asked which farm publications they subscribe to or receive that are personally addressed to them. **Farm, Light and Power** is most widely listed (84 percent), while **Western Producer**, **Grainews**, and **Country Guide** all are received by half the farmers. All respondents were asked to evaluate the usefulness of the four magazines (Table 9). Most farmers report useful to very useful ratings for all the publications, but caution should be exercised in interpreting the results. Comparison should be made among rating categories for each magazine rather than between publications (Readex, 1989).

Table 9. The usefulness of four major farm magazines among prairie farmers, 1989

Rating	Publication			
	Country Guide	Farm, Light and Power	Grainews	Western Producer
1 - Very useful	15	25	28	21
2	13	17	18	17
3 - Useful	14	30	3	17
4	8	5	3	2
5 - Not very useful	6	6	4	2

¹ Percent all respondents - not all respondents receive all publications.

Grainews is published 17 times a year by the United Grain Growers Association. A 1988 random survey of the **Grainews** readers shows that more than 75 percent save the publication, 72 percent refer to an issue more than twice, and 61 percent clip and save articles. When asked if they would renew their subscription, 99 percent say they would, and 98 percent state that **Grainews** is very or somewhat helpful to them (**Grainews**, 1988).

Readers were asked which articles they prefer to read. Most (89 percent) prefer articles written by farmers rather than technical articles written by others. They felt that ideas expressed by farmers are more practical and easier to carry out. Articles about prices, record keeping and other financial information also are of general interest (**Grainews**, 1988).

An independent survey sponsored by **Grainews** was conducted by AgDecision Research and Consulting in 1990. A sample was selected randomly from **Grainews** subscribers and the survey addressed farmers' buying habits, equipment preferences, household items, decision-making processes, and opinions. Respondents were proportional to the distribution of **Grainews** in Manitoba (21 percent), Saskatchewan (47 percent) and Alberta (31 percent). Two-thirds of the farmers are between 35 and 54 years of age. One quarter have completed public school, half have high school diplomas, and one quarter have community college or university educations. Farm products sold by farms normally range between \$50,000 and \$250,000 per year. About 37 percent of respondents farm one or two sections, and 39 percent control more than two sections of land (AgDecision, 1990).

The percent of subscribers and the number who have stopped or who plan to stop subscriptions are assessed for ten farm magazines (Table 10). **Grainews** is well-received by subscribers, as most plan to continue subscription. **Country Guide** reaches two-thirds of the farms, but has high cancellation and planned cancellation rates compared with other magazines. Five of the 10 magazines are subscribed to by between 10 and 20 percent of farmers. Most magazines enjoy reasonable loyalty among readers (AgDecision, 1990).

Table 10. Farm magazine subscriptions held by readers of **Grainews**, 1990

Publication	Percent who subscribe	Percent who stopped subscription	Percent who plan to stop subscription
Grainews	98.5	0.7	2.1
Western Producer	72.4	4.5	1.8
Country Guide	67.2	11.0	6.1
Cattlemen	23.7	8.9	2.4
Manitoba Cooperator	22.2	1.9	1.7
The Giant	19.8	1.7	0.9
Farm and Ranch	15.5	3.0	0.0
World of Beef	11.0	1.9	5.1
Farm Forum	10.8	1.3	1.7
Western Hog Journal	10.1	2.2	7.4

Farmers report that most equipment is owned, and 88 percent repair their own farm machinery. Almost all (95 percent) obtain more than one price quote when buying machinery, with 20 percent obtaining four or five quotes. Most farmers (60 percent) feel that total input costs for farm machinery will increase in the future, rendering commercial information important.

Prairie farmers also are concerned with information concerning personal financial investments. Over 75 percent own life insurance, 58 percent own Registered Saving Plans, and 35 percent have Canada Saving Bonds. Mutual funds are owned by 17 percent of landowners, with high income farmers more likely to own mutual funds. Highly educated farmers are especially interested in investment packages. Overall, farmers express great interest in information about estate planning (63 percent), tax management planning (74 percent), grain hedging (44 percent) and the futures market (49 percent) (AgDecision, 1990).

Grain marketing information is especially interesting to young farmers, and to those with high farm incomes and large acreages. They indicate that they do not understand grain marketing terms very well, in total, but those with large farms and high farm sales, feel that they understood grain marketing better than did those with small farms (AgDecision, 1990).

Almost half of farmers' spouses are involved to some degree in the financial management (47 percent) and record keeping (42 percent) of the farm. One quarter are involved in the everyday farm operations, while 30 percent are involved in the decision to purchase machinery (AgDecision, 1990).

High income farmers are more likely to own ATV's, microwaves, VCR's, satellite dishes, dishwashers, computers, CB radios, motorcycles, and video cameras than are farmers with lower incomes. Half the farmers with incomes of more than \$250,000 already own a computer, and an additional 35 percent are interested in purchasing one in the next two years. Interest in computers is not strong among other farmers (20 percent) (AgDecision, 1990).

The Manitoba Co-operator is a weekly farm newspaper, published in Winnipeg, which reaches 94 percent of Manitoba farmers (Canwest, 1986). A number of Opinion Polls have been conducted by the publication regarding various components of the paper. Opinion Polls used here include those completed in June 1986, August 1986, September 1986, March 1987 and July 1987. All opinion polls are comparable with regard to age, farm type and region of respondents.

In June 1986 farmers were asked to suggest improvements to agribusiness regarding advertisement information content. Forty-six percent did not feel that advertisers put enough farm management information in their ads, and farmers of all ages want more information. Half those 30-39 years of age want more frequent changes of information, half those 40 - 49 years of age want more technical information, and more than 55 percent of farmers in the Northwest region of Manitoba want more localized information (Opinion Poll, June 1986).

In September 1986 farmers were asked to rank sources they use for agricultural information. The rankings were 1) farm papers/magazines, 2) radio/television, 3) local meetings/groups, and 4) ag reps/Government. When asked which media sources they prefer for agricultural information they list 1) farm weeklies (48.1 percent), 2) radio (9.2 percent), 3) television (6.9 percent), 4) monthly magazines (5.3 percent), and 5) newsletters (0.8 percent) (Opinion Poll, 1986).

The September 1986 Opinion Poll also asked farmers to rate various sources of information (Table 11). The farm media (periodicals) receive the best ratings, with two-thirds of farmers showing good or very good responses, and only 6 percent showing poor or very poor ratings. Seminars/workshops and Manitoba Agriculture received 58 percent favourable responses and 10 percent negative ratings. Retailers, universities and person-to-person communication are rated highly by 30 percent of farmers, making them the most divergent among sources of information.

Table 11. Percentage rating of various information sources by Manitoba farmers, 1986

Source information	Rating (% respondents)				
	V.good	Good	Avg.	Poor	V.poor
Farm media	12.2	54.2	26.7	5.3	0.8
Seminars/workshops	9.9	48.1	28.2	5.3	2.3
Manitoba Agriculture	10.7	46.6	28.2	8.4	3.1
Retailers	2.3	34.4	45.0	13.0	2.3
Universities	3.8	23.7	35.9	25.2	4.6

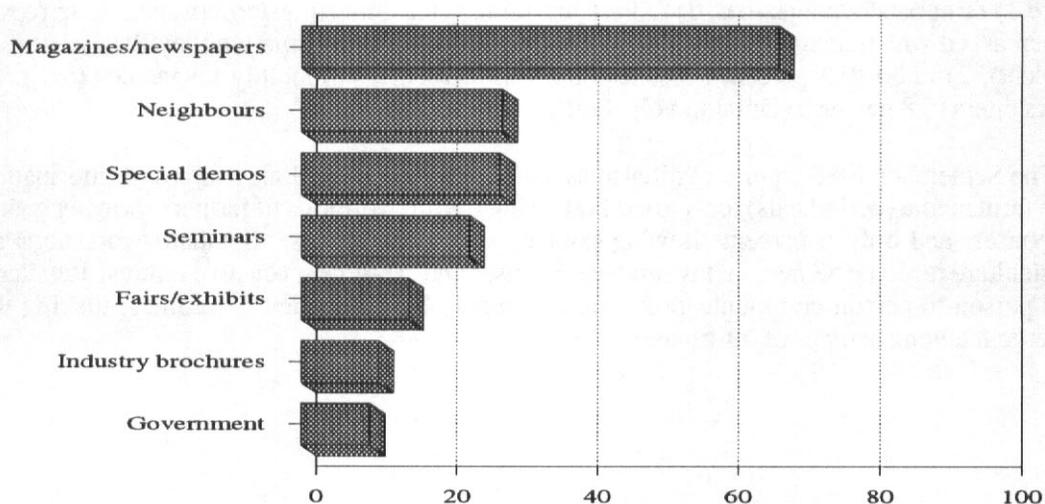
Over half the respondents feel that farm media make the greatest effort to provide useful information, while less than 7 percent feel that government agencies make the greatest effort. Over half also see farm media as the most important source of information for the future. Farm weeklies are received by 95 percent of respondents, farm magazines by 79 percent, community weeklies by 73 percent, newsletters by 47 percent, and daily newspapers by 26 percent (Opinion Poll, September 1986).

A March 1987 survey asked Manitoba farmers where they look for farm management information, particularly relating to zero-till practices (Figure 3). Farm magazines are preferred sources for 68 percent of farmers while government and industry services are used least often (10-12 percent). Most other sources are listed by between 15-25 percent of respondents.

Although all farmers prefer magazines and newspapers, younger farmers (88 percent) look to them more often than do older farmers (63 percent). At the same time older farmers (32 percent) access information at special demonstrations more often than do younger farmers (16 percent). Livestock farmers (82 percent) prefer magazines and newspapers and special demonstrations more than their counterparts in grain or mixed farming (Opinion Poll, March 1987).

Figure 3

Sources of Farm Management Information Suggested by Respondents, 1987



The **Western Producer** is a weekly farm magazine published in Saskatchewan. More than 100,000 farmers and ranchers across Western Canada are subscribers. Among subscribers, 54 percent live in Saskatchewan, 28 percent in Alberta, 10 percent in Manitoba, and 5 percent in British Columbia. Limited readership information suggests that a cross section of farmers are subscribers, as the average size of farms of readers is distributed in a manner similar to that in the 1986 Census of farm size.

Manitoba Community Newspapers

The print media in Manitoba includes community newspapers that serve rural areas and tie the non-metro markets together. The rural market is highly diversified and includes people working in agriculture, food processing, mining, manufacturing and a host of service industries. The community newspaper provides a bond among these people and their communities by relating information and events from the community, creating awareness, and keeping people in touch with local issues that are important in their daily lives (MCNA, 1990).

The community newspapers in Manitoba have a combined circulation of 207,363 with a total of 486,629 readers. The Manitoba Community Newspapers Association (MCNA) commissioned a survey in 1989 by an independent research firm. The survey shows that the community newspaper is kept in the home for a long time (almost 60 percent keep them for a week or more), has multiple readers per copy, and the readers refer to the newspaper more than once while the paper is in their home (MCNA, 1990).

Farm Organizations and Research Stations

Although more than half the respondents of a **Manitoba Co-operator** Opinion Poll say that there is at least one farm business group or crop club in their area, only 25 percent are members of one. This is true even in areas where 90 percent say there is a group available. Seventy-five percent of the farmers who belong to an organization are under 40 years of age (Manitoba Co-operator, September 1986).

The Saskatchewan Wheat Pool commissioned Canwest Opinion to conduct a survey of its general membership in January 1990. Just over half the respondents agree that the Pool's presence helps farmers control their own destiny. Three out of four say that the Pool should be involved more in educating the general public about agricultural issues. The majority approve of either or both staff and financial contributions for providing educational services such as farm management information and training courses, school curricula and support for 4H and co-operative youth programs. Also mentioned are community leadership information and training courses, development of agricultural courses or facilities, and discussion about women in agriculture (Canwest, 1990).

The majority of respondents (62 percent) feel that Sask Pool keeps them well informed about its operations and actions. The major sources from which farmers receive information about Pool operations are **The Western Producer** (79 percent), the newsletter **Pool Today** (43 percent), and Pool staff (31 percent). The two most often received publications are **The Western Producer** and **Farm, Light and Power** (Canwest, 1990).

Respondents would like to see Sask Pool provide either more or improved information about markets and market forecasts (57 percent), crops and crop production (39 percent), selection and use of fertilizers and chemicals (34 percent), and soil management (33 percent). If the Wheat Pool decides to publish current research, the topics members perceive as most useful are new grain varieties (55 percent), new advances in wheat development (51 percent) and herbicide use (50 percent). Between 50 and 60 percent of the members identify herbicide and fertilizer testing, breeding new crop varieties, and fertility and yield testing as areas

of research that Pool is involved in. Only one in four, however, identify tillage and cultivation (Canwest, 1990).

The research stations in the United States are associated with Land Grant Universities while those in Canada are sponsored by the Federal Government. Canadian research stations were established to provide research and development and to gather and distribute information for the agricultural sector. Extension services on the other hand, are responsible for educating the rural sector. For example, the Brandon Research Station's (Manitoba) concerns are divided into plant (barley, corn and forages) and soil science, and animal science (beef cattle and swine). The Station's 16 scientists provide written material for the public, farmers, government officials and other scientists. The staff works with other research stations and provincial and university scientists and extension specialists (Ag. Can. Research Branch, 1990).

The Brandon Research Station produces printed materials designed to reach a variety of audiences. The Station's brochure is available to the public and is handed out at fairs and to visitors. An Annual Report contains technical information that is sent to the government, Agriculture Extension Offices, the universities and media that have rural audiences. Research Branch Reports are written especially for other scientists and report ongoing research. "Newsnotes" are published for farmers as one page information bulletins, released monthly, that contain either specific one time information or general information. "Newsnotes" also are sent to all media, the USDA, other Research Stations, and agriculture extension services. The media often use "Newsnotes" when writing articles about agriculture (Brandon Research Station 1990).

Information in the form of Technical Bulletins may be produced in Brandon, but published by Agriculture Canada. "Agri-Food" contains articles written by scientists from a number of stations, with priorities for articles established in Ottawa. Agriculture Canada publications are technically specific and can be used as teaching tools for university, college or extension personnel (Brandon Research Station, 1990).

The Brandon Research Station provides a number of other services. The Research Station Library contains a large number of research journals, reports from Ottawa and other stations, and a variety of agricultural newsletters, pamphlets, and newspapers. If information is not available, the librarian can find the material and have it sent to the Station or to a local public library, usually at no charge. Information at the library is accessible to the public.

Station scientists present lectures to peers, agri-business personnel and in professional meetings. They also are invited by local farm groups and college agricultural programs to speak on specific issues, and provide news stories to the media. Scientists also provide a seminar series for invited media, government officials, and professors from universities and instructors from colleges. The Information Officer distributes material at various fairs and trade shows in the area, and the Station holds an annual open house for farmers and the general public (Brandon Research Station, 1990).

Research stations are visited frequently by some farmers who are primarily, but not necessarily, large scale producers. Specialists see some producers only when there is a need for specific information about a specific item. For example, farmers may bring in an insect for identification and to assess potential danger to crops. Questions may be handled over the telephone, and if the information sought is not available, it may be acquired elsewhere and provided to the public. Although Research Stations are valuable resources for new technology and research, generally they are not used by farmers, especially to the same extent as are Extension services (Brandon Research Station, 1990).

Modern Telecommunication in Rural Areas

In rural areas, timely information is needed to manage projects, coordinate shipping, improve agricultural output, and obtain the best prices for rural products. By providing information links between urban and rural areas, and among rural residents, telecommunications can help overcome barriers of distance that have hampered rural development. Transmission of information is no longer dependent on transportation that conveys information by moving people or documents. As transportation costs increase, the value of telecommunications becomes even more significant.

Telecommunications may improve management efficiency and productivity through inventory control, as a substitute for travel, and by coordinating transportation to reduce spoilage of perishable products. Using telecommunications to order supplies and parts may reduce down time of equipment. Also, the administrative and coordinating role of government services may be more readily available for supporting rural projects.

The role of telecommunications is to convey information that benefits not only the users, but also society in general, and improve cost-benefits of rural social service delivery. Health care (remote EKG), distance education, and agricultural extension are examples of cost-effective alternative methods of providing services. Savings in training, labour and transportation costs may justify significant allocations for telecommunications services. Similarly, timely access to relevant information such as weather reports, prices and availability of necessary inputs can make agricultural enterprises more efficient and productive. Rural telephone or telex services may improve efficiency in both locating and ordering supplies, and marketing of products. Rural telecommunications permit more equitable distribution of economic benefits in that linking rural to urban areas makes it easier for rural people to make their needs known, and to be more effective in accessing government programs (Hudson, 1985).

Federal (United States) discussions held to look at the delivery of service in rural settings found that the appropriate level of sophistication of technology is the minimum necessary to achieve an objective. However, technology usually is not the problem. The real problems are determining needs and dealing successfully with institutional barriers. Needs, not the testing of highly sophisticated technology, should govern technology (Magnuson, 1978).

A series of recommendations evolved from Federal discussions on telecommunications. First, when used in a one-way mode, satellites, microwave and conventional broadcast television equipment are reliable. Cable television in a two-way mode poses more technical problems, but should become reliable in the future. Second, telephone networks should be used more than now. The system is in place, provides nearly universal coverage and is low in cost. The telephone system can do more than simply carry telephone messages. The key to more versatile use is a wider range of terminal equipment. For example, print material (fax), still images (slowscan video) and many forms of remote instrument readings (remote EKG) already can be transmitted by telephone networks (Magnuson, 1978).

Third, local involvement is necessary when considering telecommunication. People should be asked whether they want the technology, what they want and need, and should be included in an operating plan. Assurance should be given that they will be able to operate the system when outside help is withdrawn. It is particularly important to restore or maintain a sense of community in local rural groups who feel that large scale government and private organizations make local participation more difficult.

Fourth, telecommunication networks should provide a mix of services, and should involve up-front decisions concerning who will assemble and support the services. One of the greatest challenges will be achieving a viable mixture of useful services and functions. Many communities have not benefited from past experiments. In fact, some have probably suffered from creation of new activities on which people come to depend, but which collapse when money is withdrawn. This occurs because of difficulty in coordinating and

directing the efforts of the many autonomous government agencies necessary for demonstrations (Magnuson, 1978).

The Saskatchewan Telecommunication Strategy

In 1985, the Government of Saskatchewan formed a task force to put together a strategy for developing rural Saskatchewan. They looked at both current technology and new telecommunication projects in various stages of development.

Saskatchewan covers more than 650,000 km² of land and contains one million people who reside on more than 67,000 farms and in 1,200 communities. Thirty-three percent of the population resides in Regina and Saskatoon, with the remaining 67 percent living in small communities or on farms. There are 342 telephone exchange areas, the third highest number in Canada (exceeded only by Ontario and Alberta). Saskatchewan Telephone (Sask Tel) ranks fifth in Canada in the number of subscribers served, with farm residences representing 23 percent of the total subscriber base in 1985. Saskatchewan has the lowest population density among provinces in Canada, and the vast area covered has made basic exchange services costly (Govt. of Saskatchewan, 1985).

Telephone is the most important communication instrument to rural Saskatchewan residents and business people. They frequently make calls outside their own exchange for a variety of business, legal or social services. Long distance charges place an additional burden on rural residents and business people (Govt. of Saskatchewan, 1985).

In an effort to reduce the difference between urban and rural subscribers Sask Tel installed Extended Area Service (EAS). For a monthly rate that is added to the normal monthly rental, subscribers in one exchange can call or be called by all subscribers in an adjacent exchange without long distance charges. When two exchanges are linked, the service becomes permanent and mandatory for all subscribers. Sask Tel wants to replace EAS with Dialpac, a similar but enhanced version of EAS. Subscription would be by individual choice, and subscribers may stop service monthly. Unfortunately, only residential subscribers would be eligible, and rural businesses that already face the disadvantage of small, sparsely populated markets, will be further handicapped because many of their suppliers are outside their telephone exchanges. The Dialpac ceiling is too low for business and it would provide only minimal economic advantage (Govt. of Saskatchewan, 1985).

People living in remote areas of Saskatchewan do not have access to the same television services as those living in cities and more densely populated rural areas. The majority receive CBC English, CBC French, and CTV. Those closer to the United States border receive some American networks. Rural and remote areas of Saskatchewan want equity in television, prompting the business community to develop cable television services.

The Saskatchewan Communication Advanced Network (SCAN) was proposed in 1985 to carry a variety of new communication services to the public, including community television, cultural information, educational services, access to computer data bases, and other services that may evolve over time. SCAN was designed to complement traditional methods, not replace them. Information can be distributed by broadcasting either taped or locally-produced programs. Communities may select one-way delivery of programs or encourage audience interaction by organizing telephone conferences. It is estimated that 60 percent of some trades courses can be taught outside the traditional school system by using television, videotext and telephone conferences or some combination of the technologies. Producing or adapting information for distribution through SCAN is expensive, but once produced, materials can be used repeatedly.

The agricultural industry contains some of the highest risk businesses in the world, with farming and farm management dealing with many factors that contribute to risk. Two additional factors in Saskatchewan are remoteness and distance, which relate to markets, suppliers and sources of information required to make management decisions. Conversely, urban businesses have greater access to markets, suppliers, financial institutions and related electronic information and data bases. Advances in electronic information systems can provide farmers with extensive, accurate, relevant and affordable information enabling them to deal with business problems, make better farm management decisions and increase productivity (Govt. of Saskatchewan, 1985).

Computer Technology

AGRITEX is a new agricultural information delivery service that provides access to data bases. The most relevant data base to Saskatchewan residents is called "Grassroots." It puts users in touch with a large computer file of farm information through private telephone lines. Examples of information in the data base include weather reports at the local, national and international levels, futures markets from the Chicago Board of Trade, the Winnipeg Commodities Exchange, and the North America Commodity Exchange, and an educational program that explains futures markets. Also available are data on cash market prices for major grains and oilseeds in-store at Thunder Bay and Vancouver (including street prices, and special crops), market commentary (from the Farm Market Network, Canadian Cattlemen's Association, Broadwater Farm Services, Can Am Commodities, the Canola Council of Canada, Statistics Canada and the International Wheat Council), regulatory and reporting information, farm management programs, miscellaneous agricultural information, and non-agricultural information regarding vacations, education, recreation, news, sports, finance, investments and banking (Govt. of Saskatchewan, 1985).

A similar data base is provided on AGNET, an interactive network designed to deliver management tools to individuals and groups concerned with agriculture. It provides services in the five major areas of problem solving, simulation, information, communications and computer associated instruction. Information packages provide access to market data, economic analysis, news items, supplier sales, historical data and major events that may effect farm operations. In 1981, AGNET served 2400 users in 36 states and several foreign countries. User patterns show that management decisions, information analysis of markets, news items that effect operations, and the ability to communicate with other users are equal in importance to problem solving (Alberta Agriculture, 1983)

Both public and private computer based information services are serving the information needs of agriculture, and the potential is tremendous. Innovations are being developed with new applications being devised, tested, and implemented constantly (Alberta Agriculture, 1983).

Future Technology in Rural Communication

Active users of the North Carolina Agricultural Extension Service (NCAES) were surveyed in 1987 to identify perceptions of the current and future capacity of the NCAES to deliver state-of-the-art technological information. Findings show that 81 percent of producers perceive future needs for more complex technological information to be "somewhat more" or "much more" than current needs. About 90 percent of respondents had positive perceptions of the ability of NCAES to deliver needed technological information. As the educational level of the producers increases, their level of positive perception of NCAES' capacity to provide technological information also increases. The results imply that information delivery strategies must be varied if NCAES is to continue to maintain a positive image as a responsive, needs-oriented agency that effectively delivers usable technological information to all farmers, whether they are marginal part-time or highly advanced full-time producers (Richardson and Mustian, 1988b).

Farmers can subscribe to computerized market and news reports transmitted by telephone, with up-to-the-minute price quotes via satellite, and a host of other services that were not available a few years ago. An Ohio State University survey, however, found that the average producer is keeping the information explosion at arms length. Those who farm large land bases (600 plus acres), however, are more receptive to new information sources because they have more to gain from the information. Information tools can help a farmer increase per bushel prices, so the greater the volume produced the more incentive there is to look at newer and faster sources of information (Jacobitz, 1989).

Farmers with smaller operations commonly have off-farm jobs, and their outside income helps offset the impact of poor pricing decisions. Some researchers are surprised at the low ratings farmers may give to the most timely sources of marketing. For example only 2 percent listed computerized sources as one of the most useful sources of market information. Brokerage firms (3 percent), marketing consultant services (4 percent), television (6 percent) and commercial newsletters and other farmers (7 percent) also are near the bottom of the list of sources. Marketing aids that rate highest include local market reports (18 percent), radio (13 percent), and farm magazines (12 percent).

Farmers often give high ratings to less timely and less complete information. Local market reports on radio and available from local elevators and farm magazines are considered useful, but they do not allow two-way communication. Conversely, farmers can ask specific questions of a marketing consultant or broker and computerized sources have a wealth of current information available for almost any marketing need. These sources, however, are expensive.

The more farmers spend on information, the happier they are with the results. Users of futures and options and farmers with more than 600 acres are most satisfied with the information they receive. Benefits are derived either or both because they spend more time and money seeking information than do other farmers, or because they are better managers (Jacobitz, 1989).

INFORMATION ACQUISITION IN RURAL CANADA

Manitoba Studies

A "Quantitative Study of Manitoba Producers' Attitudes and Opinions" was conducted in 1990 (Manitoba Agriculture, 1990). The survey was based on 400 telephone interviews with Manitoba farmers in five regions. The sample consists of individuals with farming as the main occupation (81 percent) or one of the main occupations (19 percent) of the respondent's household. Persons contacted are those primarily responsible for the management of the farming operation.

The audience responding to the survey is comprised primarily of operators of mixed farms (56 percent). About three-fourths of the respondents farm two sections or less, but one in five farm 3 sections or more. Most have farmed for more than 10 years. Sales from farming fall into three categories, with \$25,000 to \$100,000 being most common. Nearly half of those interviewed worked off-farm. The respondent gender ratio of 79 percent male to 21 percent female does not align with the ration of 97:3 reported from farm operators in the Census of Agriculture (Canada, 1986:41).

Manitobans were asked a series of questions concerning their sources for various types of information (Figure 4). Manitoba Agriculture is the major source for technical information on both grain and livestock production. Neighbours and seed dealers serve as secondary sources of information on grain, while veterinarians and neighbours are important to livestock producers. Banks and credit unions provide most farmers with financial counselling, but Manitoba Agriculture also plays a role. A poorly worded question concerning market information received 69 percent "other" or "don't know" responses. Agricultural representatives and professional services accommodate one in five farmers (sources such as farm magazines and radio likely comprise most of the "other" responses.)

Farmers were asked to indicate the likelihood of contacting Manitoba Agriculture for various information needs. Responses listed are a total percentage of those listing "very likely" or "somewhat likely" (Figure 4). Most farmers would be contacting Manitoba Agriculture for technical information on grain and livestock, and the values are not divergent from those indicated earlier. The number of farmers listing the accessing of information on financial and market questions from Manitoba Agriculture, however, is more than double the number who currently suggest that the government is a leading source of such information (Friesen, 1991).

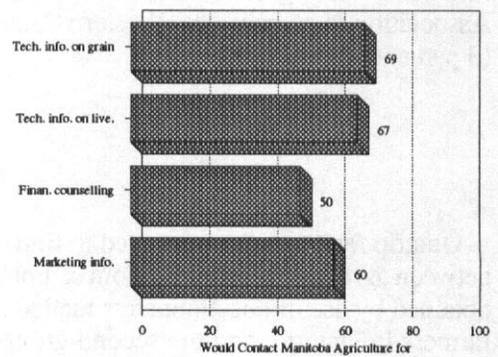
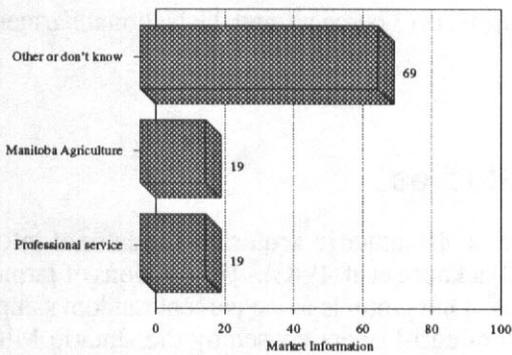
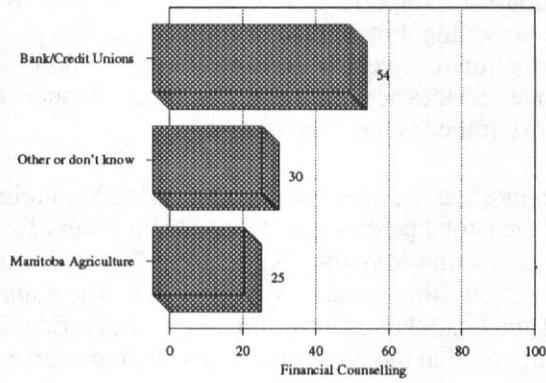
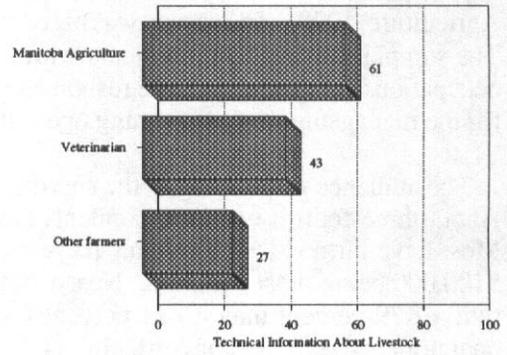
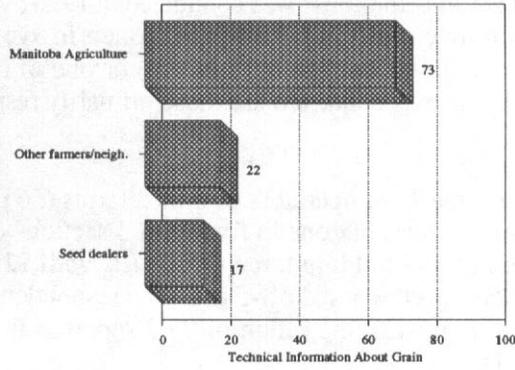
Eleven percent of farmers list Manitoba Agriculture as their source of information concerning stress management. Similarly, only 12 percent said that they use the services of a Home Economist. A great majority of farmers (65 percent) indicate that the Keystone Agricultural Producers (KAP) best represents their interests. Other groups selected are Manitoba Pool Elevators (6 percent), the Manitoba Cattle Producers Association (4 percent), the Western Canadian Wheat Growers (3 percent), and the National Farmers Union (3 percent) (Friesen, 1991).

Ontario Studies

Ontario farmers were surveyed to find out if there was a difference in acquisition and use of information between agri-leaders and a random sample of farmers (Blackburn et al, 1983). The opinions of farmers were obtained by use of questionnaires mailed to two samples. One group is a one percent random sample of all farmers in Ontario, and the second group is comprised of agri-leaders chosen by the Ontario Ministry of Agriculture and Food (OMAF) agricultural representative in each county. Agri-leaders are defined as farmers whose views on agricultural matters are well-respected in the farming community.

Figure 4

Major Sources of Information Used By Manitoba Farmers, 1990



The number of responses was 358 for the random sample and 452 for the agri-leaders. The two samples are significantly different in many ways. Agri-leaders are on average younger, better educated, have farmed fewer years, and tend not to be employed off farm. The majority belong to farm organizations, farm larger acreages, have higher gross farm sales and operate more labour intensive enterprises.

There is a difference between the groups in use of OMAF staff and publications. OMAF maintains an office in each county or district in the province. In addition to an agricultural representative, who may carry out a number of extension activities, the staff may consist of a home economist, crop specialist, livestock specialists or others. The random farm group lists county offices as moderately to very important 73 percent of the time, while 90 percent of the agri-leaders lists the same two responses, with 61 percent suggesting very important.

There also are some minor difference between the groups in the use of farm magazines and newspapers. OMAF provides several free publications, factsheets, and bulletins on agriculture and related matters. Respondents report them as moderately or very important sources of information (79 percent among random farmers and 92 percent among agri-leaders). Of the agri-leaders, 60 percent say that publications are very important.

Most farm homes receive at least one farm paper or magazine. The majority of both samples find these to be moderate or very important sources of information. Farmers in general rate them at 81 percent, and agri-leaders at 88 percent in the two categories.

Agricultural information is presented in a number of different formats on radio and television. Although the majority of both survey groups indicate that radio and television are moderately or very important sources of information, many from both samples also consider them only slightly or not important. Responses are significantly more favourable from the random sample (63 percent) than from agri-leaders (54 percent). In both groups the number of "very important" responses are fewer than the number of "moderately important" responses (random sample 28 percent and agri-leaders 16 percent).

Respondents were asked to assess the degree of importance of various sources of farm information. The percentages of "moderately important" and "very important" ratings for the advice of neighbours are 76 percent for farmers in general, and 64 percent for agri-leaders. Forty-nine percent of the random sample cite friends as "very important" and 27 percent as "moderately important," while only 29 percent of the agri-leaders cite friends as "very important." The two groups rate their personal experience equally, and at a very high 98 percent. More than 80 percent of both groups cite own experience as "very important."

Newsletters are rated as "very important" by 24 percent of both groups. Overall, however, agri-leaders rate the importance of newsletters higher (78 percent) than do general farmers (68 percent).

The importance of bankers and farm credit officers is greater among randomly chosen respondents (60 percent) than among agri-leaders (49 percent). To a lesser extent the same is true for the importance of agri-business representatives or salespersons (random sample 57 percent, agri-leaders 51 percent). A variety of "other sources," however, is deemed "very important" by 79 percent of the general farm respondents and 67 percent of the agri-leaders.

No one factor is consistently related to the importance ratings received, but the following relationships are noted:

- 1) The importance of OMAF publications and bulletins is related to major enterprises of agri-leaders (swine/lower ratings).
- 2) The importance of the county OMAF office is related to the age (older/higher ratings) and formal education (higher/higher ratings) of the random sample of farmers and to the major enterprise

(swine/lower ratings) and regional location (central region/higher ratings) of the sample of agri-leaders.

- 3) Both samples rate their own experience as extremely important.
- 4) The ratings for farm papers and magazines are related to alternative employment (part-time farming/lower ratings) among the random sample, and type of major enterprise (cash crops/slightly lower ratings) and regional location (north/higher ratings) among agri-leaders.
- 5) Television and radio ratings are related to age of agri-leaders (older/higher ratings), formal education of both samples (higher education/lower ratings), and alternative employment among the random sample (part-time farming/lower ratings).

Both groups of farmers use a number of sources for farm information and regard them favourably. Agri-leaders use more print and technical information (agricultural representatives and other OMAF staff), while the general farming population uses interpersonal sources (friends and neighbours) and mass media more frequently. Although farm papers and magazines and OMAF office programs are the most highly rated sources of information, all of the public and private agency programs investigated are considered important by more than half the farmers (Blackburn, et al., 1983).

Alberta Studies

In 1983 the Alberta Provincial Government surveyed farmers and farm families to determine their information needs and sources. A producing farm is defined as having annual sales from agricultural products of \$2500 or more. A questionnaire was administered through a 25 minute telephone interview, and the sample was designed to be representative of both the provincial and regional farm populations of Alberta. The sample contained 2312 farmers (Alberta Agriculture, 1983).

Farmers aged 15-34 years generally have farmed for less than 10 years, have high school or post-secondary education, are more likely to work off-farm, have gross farm sales of \$25,000 or more and are most likely to have a family partnership/corporation business arrangement. Farmers aged 55 years or more generally have farmed for more than 30 years, have less than high school education, are least likely to work off-farm, are least likely to have gross farm sales of \$100,000 or more, and have predominantly a single ownership business arrangement. Respondents in the 35 to 54 year age category represent a transitional group with some characteristics of both younger and older respondents.

Education is inversely related to age. The older the respondents, the less likely they are to have post secondary education. For example, only 17 percent of those less than 35 years of age, but 66 percent of those 55 years of age or more had less than high school education. Conversely, 38 percent of young, but only 14 percent of older farmers have post-secondary education (Alberta Agriculture, 1983).

A similar relationship exists between age and farm sales of \$100,000, which declined with increasing age. Gross farm sales of \$100,000 or more also are associated with respondents who have a post secondary education, and there is a direct relationship between gross farm sales and acres of cultivated land owned. This suggests that as farmers become better educated they also are more successful in terms of farm productivity. As younger farmers, and those with large farming operations turn to other types of business arrangements (e.g., use of computers is least likely with single ownership arrangements), they become more sophisticated in use of information (Alberta Agriculture, 1983).

The information sources rated as most useful by respondents are 1) neighbours and friends, 2) radio, 3) Alberta Department of Agriculture, 4) farm magazines and newspapers, and 5) the district agriculturist (Table 12). Universities and colleges, county field personnel, Agriculture Canada, and television receive the lowest ratings. Respondents who have been farming for less than 30 years rate television as a more useful information source than do respondents who have been farming more than 30 years. Farmers who have been

farming for 30 years or more rate elevator agents and county field personnel higher than do younger farmers (Alberta Agriculture, 1983).

Table 12. Important sources on information listed by Alberta farmers, 1983

Source	Important(%)	Very important (%)	Total
Neighbours and friends	35	40	75
Farm magazines and newspapers	43	30	73
Agriculture (Provincial)	41	31	72
Radio	38	32	70
District Agriculturist	36	33	69
Suppliers	36	26	62
Elevator agents	33	29	62
Veterinarians	25	36	61
Bankers/credit agencies	25	28	53
Television	24	13	37
County field personnel	23	10	33
Agriculture Canada (Federal)	21	9	30
Universities	20	9	29

Radio is identified as the best source of daily market information and market forecasts (Table 13). Respondents rely on farm magazines and newspapers for information on livestock production technology. Farm magazines, newspapers and district agriculturists are the best sources for information on crop production technology. For information on the selection and use of agricultural chemicals, respondents rely on elevator agents, suppliers/dealers and district agriculturalists. Personal experience and bankers are considered the best sources of business management information. Newspapers and radio are the best sources of information on government policies, while respondents rely primarily on personal experience for information on home management and family relationships (Alberta Agriculture, 1983).

Table 13. Best sources of information for various aspects of farming listed by Alberta farmers, 1983

Information category	Best source (Percent respondents)	Information category	Best source (Percent respondents)
Daily markets		Chemical selection and use	
Radio	75	Elevator agents	19
Don't know/no response	5	Suppliers/dealers	18
Newspapers	4	District agriculturalists	15
Market forecasts		Business management	
Radio	45	Bankers/credit agencies	17
Newspapers	15	Personal experience	16
Farm Magazines	11	Don't know/no response	16
Livestock production technology		Government policy	
Don't know/no response	26	Newspapers	22
Farm magazines	23	Don't know/no response	17
Newspapers	14	Radio	15
Crop production technology		Home management and family relationships	
Farm magazines	22	Don't know/no response	25
District agriculturalist	17	Personal experience	21
Newspapers	17	Farm magazines	10

Farmers were asked to rate the importance of eight categories of information (Table 14). The selection and use of agricultural chemicals is deemed as very important by 42 percent of the respondents and important by 29 percent. Business management is very important in 38 percent and important in 29 percent of the responses. Of the 61 percent of respondents who said home management and family relationships are important, 38 percent cite very important while 25 percent list them as important. When asked what other information not on the list is important to day-to-day decisions, 33 percent list weather forecasts and 54 percent list none (Alberta Agriculture, 1983).

Table 14. Importance of various types of information to Alberta farmers, 1983

Type of information	Very important(%)	Important(%)	Total(%)
Chemicals selection and use	42	29	71
Crop production technology	33	35	68
Business management	38	29	67
Home management and family relations	38	25	61
Market forecasts	24	31	54
Daily market information	29	24	53
Livestock production technology	21	25	46
Government policies	20	23	43

In a more recent Alberta study, pork producers were asked to indicate their sources of market information (Knox et al., 1990). Radio is indicated most often, followed by Codephone, newspapers and magazines, and the Alberta Pork Producers Development Corporation (APPDC). Market information sources are evaluated according to years of experience the producer has in the industry (Figure 5). Radio sources account for 38.9 percent of the aggregate total, and APPDC sources account for an additional 29.4 percent. These two primary sources, therefore, account for almost 70 percent of the aggregate responses (Knox et al., 1990).

The top ten information sources used by Alberta Pork Producers for all types of information rank high on satisfaction in consumer evaluations (Table 15). The first four services enjoy more than 90 percent satisfaction from users. More than three out of four users are satisfied with even the lowest ranked source, the agribusiness suppliers. Information services directly from universities and colleges are among the least used (not in top ten) (Knox et al., 1990).

Alberta Agriculture is responsible for the development and effective management of programs and resources to improve the incomes and well-being of primary producers and those engaged in the processing and marketing of agricultural products and services. The services offered by Alberta Agriculture include 1) education, 2) resource assistance, 3) research, and 4) regulation. Almost all respondents (99 percent) are aware of the Alberta Department of Agriculture. Three-quarters of the respondents have contacted someone from their district office during the past year. Ninety-two percent contacted the district agriculturalist, 19 percent contacted someone at the regional office, and 8 percent contacted Provincial Headquarters. Of the 20 percent who have not contacted anyone at Alberta Agriculture, the majority feel there is no need to contact them, suggesting that they perceive Alberta Agriculture as problem solvers (Alberta Agriculture, 1983).

Figure 5

Use of Sources of Information By Alberta Hog Producers, 1990

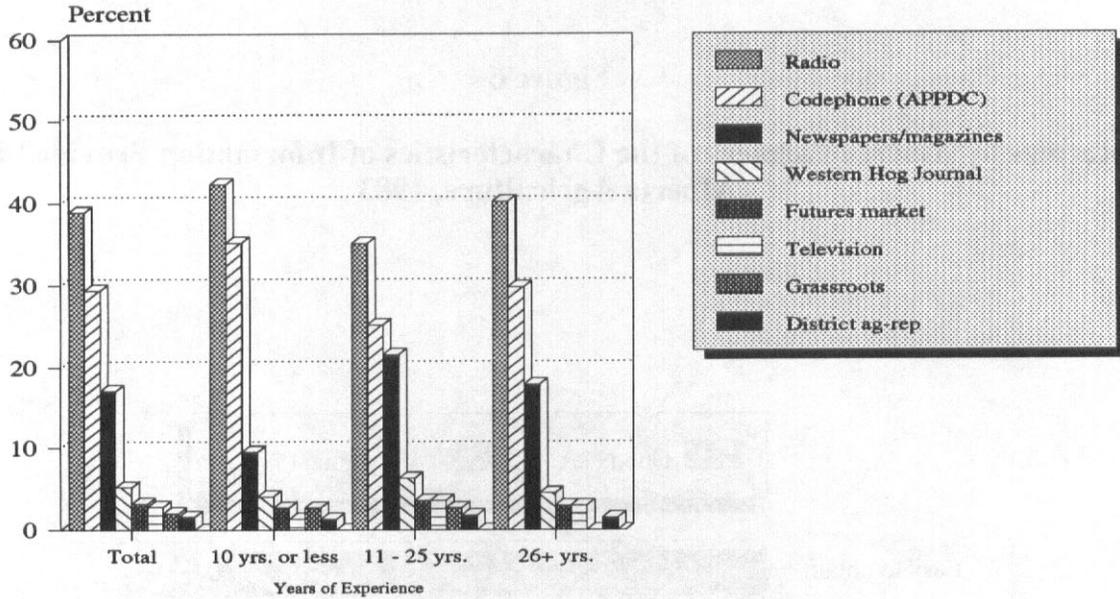


Table 15. Satisfaction levels of Alberta pork producers with overall sources of information, 1990

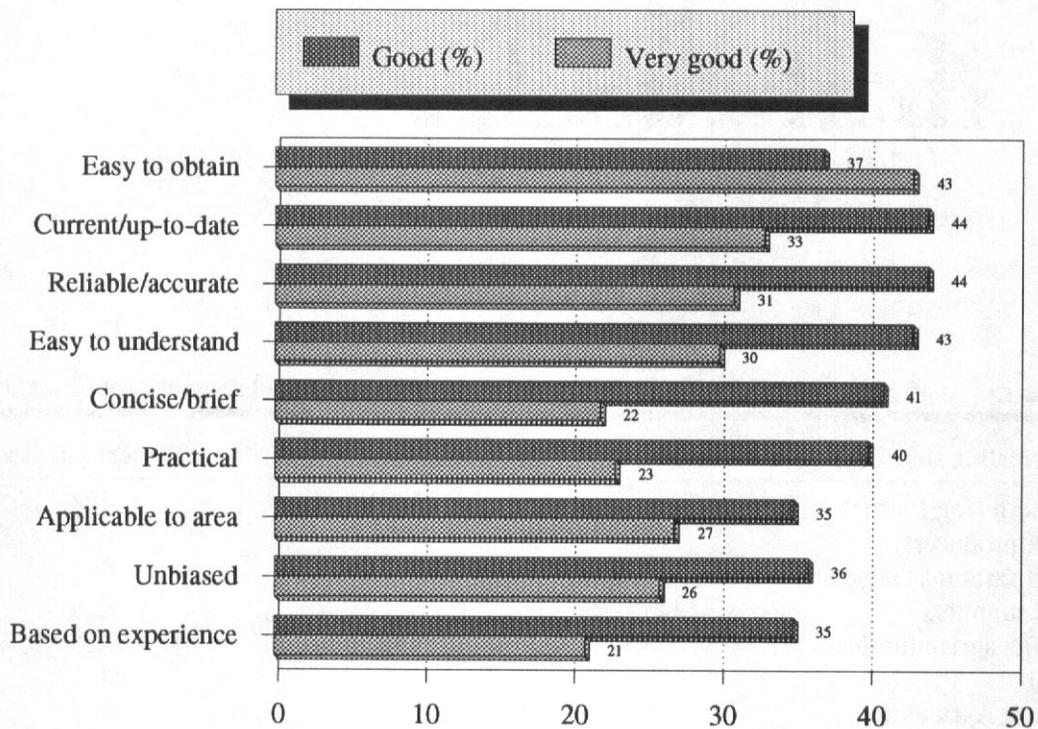
Information sources	Percent satisfied
Western Hog Journal	96.8
Other producers	95.5
Other farm magazines	92.8
Feed suppliers	92.6
District agriculturalists	88.8
Radio	88.1
Alberta Agriculture	86.7
Newspapers	86.0
Veterinarians	83.7
Agribusiness suppliers	77.7

Respondents were asked about the quality of the information provided by the Alberta Department of Agriculture. Ease of access is rated as very good by 43 percent and good by 37 percent of respondents, giving the highest overall positive rating. Currently, reliability and ease of understanding also receive high evaluations. All other aspects of information provided by Alberta Agriculture receive positive ratings from between half and two-thirds of farmers (Figure 6).

When asked if there are additional information services they would like to see Alberta Agriculture providing, 85 percent of the 2295 respondents said "no." When asked if there are information services that Alberta Agriculture currently provides that are not needed 98 percent said "no." Among the services provided, 89 percent are somewhat or very satisfied with bulletins and pamphlets, 78 percent with office consultations, 77 percent with courses and workshops, and 52 percent with farm visits (Alberta Agriculture, 1983).

Figure 6

Ratings by Alberta Farmers of the Characteristics of Information Provided by Alberta Agriculture, 1983



Respondents also were asked how important it is that the Alberta Department of Agriculture provides information in the various media (Table 16). Newspaper articles and newsletters receive the highest overall importance ratings, but various ways of accessing agricultural representatives, radio, pamphlets, and demonstrations all are perceived as important by at least three-fourths of all farmers. Even the lowest rated source of information, television, is important to 60 percent of farmers. Obviously, farmers access information from a variety of sources (Alberta Agriculture, 1983).

Table 16. Ratings by Alberta farmers of the overall importance of various ways Alberta Agriculture provides information, 1983

Media outlets	Important(%)	Very important(%)	Total(%)
Newspaper articles	41	41	82
Office consultations with ag representative	37	42	79
Radio programs	36	42	78
Telephone with ag representative	35	42	77
Newsletters	40	36	76
Bulletins/pamphlets	40	36	76
Demonstrations	38	38	76
Courses	36	38	74
Telephone with ag specialists	36	37	73
Consultation with ag specialists	39	32	71
Farm visits by ag representative	33	34	67
Farm visits by ag specialists	35	30	65
Television programs	30	30	60

An Alberta-Ontario Comparison

Sandhu (1983) conducted a comparative study of uses of information sources by Alberta and Ontario farmers. A mailed questionnaire containing 10 sections was developed for Alberta, but only four essential sections were retained in the Ontario questionnaire. Discussions were held with various officers and staff of both Alberta Agriculture and the Ontario Ministry of Agriculture and Food, and visits were made to selected farmers.

Although most farmers are between 35 and 55 years of age in both provinces, there are twice as many young farmers in the Alberta sample (19 percent) than in the Ontario sample (8 percent). In Ontario, the number of older farmers (44 percent) is nearly identical to the number of middle-aged farmers (47 percent). The age structures of the two samples, therefore, differs considerably. The age difference is reflected in education levels, as 23 percent of Alberta respondents, but only 9 percent of the older Ontario farmers had schooling beyond high school. A major difference between the two provincial samples is the size of farms operated by respondents. Nearly 80 percent of Ontario farms have less than 500 acres, while about one-third of the Alberta farms are in this category. This is expected because of differences in types of farming between the regions.

In Alberta respondents were asked to include the media and methods being used by extension agencies in their county to communicate information to farmers. In Ontario, farmers were asked to indicate the media and method they had personally used during the past year (Sandhu, 1983). Data, therefore, are not directly comparable between the two provinces.

Alberta farmers indicate knowledge of a variety of print and electronic media that are being used by Alberta Agriculture (Table 17). District newsletters, farm magazines and other newsletters all are identified by 70 percent or more of the respondents. Press releases, posters and personal letters are mentioned by less than one-third of respondents. Similar services accessed by Ontario farmers rank in similar order. Farm magazines, newspapers, and publications from the University of Guelph rank highest, while press releases, personal letters and posters are used less frequently. Radio and television are ranked one and two, with virtually identical percentage use in the electronic media in the two provinces. Telephone use, however, differs considerably. Films and cassettes were not important media in 1983.

Many farmers prefer to work with advisors on a personal basis (Figure 7). Alberta producers most often identify personal visits to extension offices as an option provided to access information. Local elevator operators, farm supply dealers, informational meetings and personal phone calls also are mentioned by most farmers as avenues available to gather information. Similarly, Ontario farmers often use inter-personal channels of communication. Visits to extension offices, attending meetings, making personal telephone calls and making on-farm visits all have been used by approximately two-thirds of Ontario respondents. On-site visits by private suppliers are used less frequently.

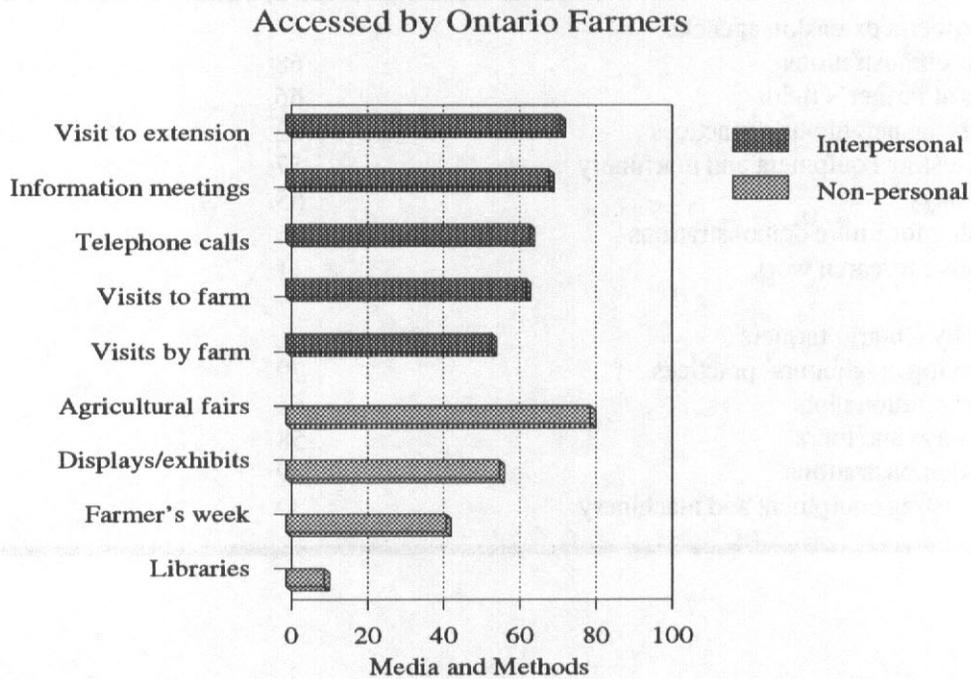
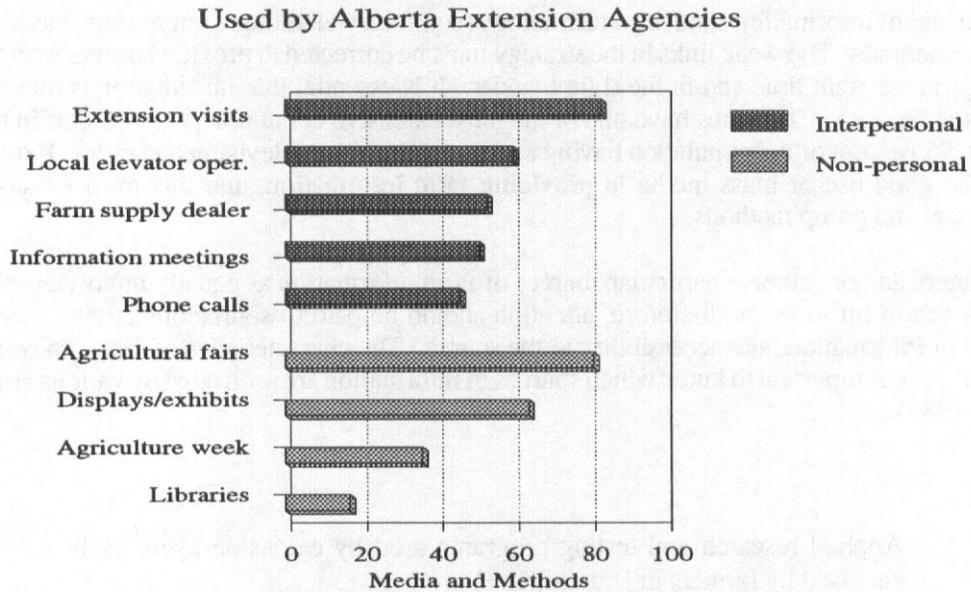
Alberta farmers identify agricultural fairs as the most obvious non-personal method of distributing farm information. Displays and exhibits also are commonly listed, but "agriculture week" and use of libraries are not mentioned frequently (Table 18). Among non-personal methods of accessing information, Ontario farmers use fairs most often (79 percent), while displays and exhibits and "farmers' week" are attended by half the respondents. Libraries seldom are used.

Table 17. Print and electronic media and methods used by extension agencies in Alberta, and those accessed by farmers in Ontario, 1983

Category	Percent response	Category	Percent response
Print media and methods			
Used by Alberta extension agencies		Accessed by Ontario farmers	
District Newsletter	80	Farm magazines	97
Farm magazines	72	Newspapers	85
Newsletters	70	Notes on Ag (U of Guelph)	82
Newspapers	64	Newsletters	71
Booklets/Brochures	53	Fact sheets	69
Agrinews articles	49	Bulletins	63
Press releases	30	Press releases	46
Posters	25	Personal letters	15
Personal letters	13	Posters	4
Electronic media and methods			
Used by Alberta extension agencies		Accessed by Ontario farmers	
Radio	92	Radio	92
Television	72	Television	74
Telephone	26	Telephone	50
Films	11	Agri-phone	18
Cassettes	6	Films	13
		Cassettes	7

Figure 7

Interpersonal and non-personal media and methods used by extension agencies in Alberta, and those accessed by farmers in Ontario



Agriculture departments use applied research and testing programs to distribute information to farmers. Alberta farmers identify seven types of delivery for such programs, with field demonstrations, on-site farm trials, and observing neighbours most frequently mentioned (Table 18). Field testing of equipment and field days also are widely recognized, but "farming for future" programs and adaptive research are less commonly known. Ontario farmers most often access information by observing neighbours, but visiting demonstration plots and attending field trials also are common practises. Field demonstrations and equipment testing are less popular means of gaining new knowledge.

The transfer of information about new technology requires a well thought out strategy based on appropriate media and methods. The weak links in the strategy must be corrected to provide farmers with the appropriate knowledge at the right time and in the right manner. It is essential that information is related to the actual needs of the farmers. Canadians have one of the most extensive communication systems in the world, with more than 95 percent of the population having access to telephone, television and radio. Extension agencies must make good use of mass media in providing farm information, and this must be supplemented by interpersonal and group methods.

All farmers do not perceive particular sources of farm information as equally important. When selecting a source of farm information, therefore, attention should be paid to source objectivity, source credibility, relevancy of information, and accessibility to the source. The characteristics of farm innovations influence behaviour, so it is important to know which sources of information are used most by various groups of farmers (Sandhu, 1983).

Table 18. Applied research and testing programs used by extension agencies in Alberta, and those accessed by farmers in Ontario, 1983

Applied research and testing programs	Percent response
Used by Alberta extension agencies	
Field demonstrations	68
Trials at farmer's fields	66
Observing neighbour's practices	62
Field testing equipment and machinery	57
Field days	55
Farming for future demonstrations	26
Adaptive research work	11
Accessed by Ontario farmers	
Observing neighbours' practices	79
Demonstration plots	64
Field days and tours	58
Field demonstrations	39
Field testing equipment and machinery	30

When asked to indicate the importance of various sources of information, Alberta farmers rate Alberta Agriculture and farm magazines as not only the best sources, but also as equals (Table 19). Major secondary sources include radio and agricultural field representatives, while television and neighbours are somewhat less important. Although not directly comparable, Ontario farmers rank sources similarly using a scaled response format. The Ontario Ministry of Agriculture and Food, farm magazines and agricultural representatives are nearly identical in importance. The University of Guelph, however, receives higher scores than farm newspapers, radio, neighbours and television.

Table 19. Perceived importance of sources of information by farmers in Alberta and Ontario, 1983

Sources of information	Percent response
Alberta farmers	
Alberta Agriculture	81
Farm magazines	81
Radio	59
Agricultural field representatives	57
Television	45
Neighbours and friends	42
Ontario farmers	
	Mean scores (3 point scale)
Ontario Ministry of Agriculture and Food	2.32
Farm magazines	2.31
Agricultural representative	2.30
University of Guelph	2.22
Farm newspapers	2.07
Radio	2.04
Neighbours and friends	1.94
Television	1.57

PERSPECTIVES ON RURAL COMMUNICATION

One must understand the personal and social characteristics of individuals in order to communicate information about innovations to them. People develop attitudes over long periods of time and in response to many different influences, and once an attitude is formed it is difficult to change (Read, 1966). Adopters and non-adopters of innovation exhibit distinctly different characteristics, attitudes, value orientations and behavioural patterns.

Different methods of communication are required to reach these discrete audiences. To reach disadvantaged farmers, for example, several factors are important. The use of mass media is important in the awareness stage of the decision making process, but of little use in later stages. In the spread of information regarding new ideas and practices, face-to-face communication may be most important (Colette and Easley, 1978).

Differences in attitudes result in different adoption processes, and change agents must approach early and late adopters differently. The major problem with innovators is keeping them informed, while late adopters are less inclined to seek information and need more proof of applicability (NCRE, 1961). An awareness and respect for individual differences in the process of exchanging information increases the spread of knowledge for the benefit of all (Abell, 1953).

Innovators are likely to attend meetings but are unlikely to be impressed with what other local farmers have to say. Early adopters and the early majority are most likely to attend meetings and be influenced by others present (NCRE, 1961). Agricultural workers who feel that conducting informative meetings are the primary and most efficient method of reaching an audience are limited to the minority who choose to attend (Abell, 1953).

A Canadian study of the major differences between commercial and limited-resource farmers reports that commercial farmers are more highly educated, generally use more up-to-date farming technology, and make intensive use of their capital resources and credits. The commercial group generally indicates high levels of social participation and expresses preferences for indirect forms of support (i.e., advisory service, credit facilities) over the more direct forms of support (i.e., price subsidies). The commercial group expresses a desire to maximize profits and a willingness to cooperate with others. Generally, commercial farmers are more likely to respond to programs than are farmers with limited resources (Alberta Agriculture, 1983). The most apparent problem is not one of receiving too much information, but lack of a coordinated system that ensures easy access to both specific and general enquiries (Alberta Agriculture, 1983).

The following generalizations are based on review of studies concerning how rural people get information. The list is not complete, and does not cover all aspects of either sending or receiving information. Much is known, and much remains to be discovered.

Summary Statements

- 1) Operators of large farms have more contact with agricultural representatives than do operators of small farms.
- 2) Audiences value media that are immediately available and useful to them.
- 3) Provincial extension agencies and universities are the most important sources for production technology, but are of minor importance for market information. Radio and television are the two dominant sources

for weather information. Suppliers are the major source of information for purchased farm supplies, and consultants are the most important sources for farm business management.

- 4) Extension services are focused on large successful farms, to the detriment of less affluent farms. (Although this contention is supported by several studies, there are reports that indicate the benefits of information received through extension services by smaller operators may be less tangible, but useful and important.)
- 5) Farm magazines are the source most often used by farmers to obtain farm information.
- 6) There is a need to encourage young people (who are better educated and potentially more efficient) to stay on farms.
- 7) The most important objectives of a farm information communication strategy are to a) introduce proven research to the farmers, and b) evaluate information and advice from various sources to ensure its practicality and suitability for their production units.
- 8) There is a need for more information in the areas of farm supplies and inputs, farm engineering and youth education programs.
- 9) The majority of farmers rate the existing strategies and methods of farm information communication employed by extension agencies as suitable. Some strategies suggested by farmers to make communications more effective are a) more intensive contact between extension staff and farmers, b) more farm programs on radio and TV, c) better use of newspapers for farm information, d) employment of farm correspondents and editors by print and electronic mass media, and e) opening farm information centres at central points in a district.
- 10) Communication of information should be made an integral part of communications policies, not merely an incidental service of mass media.
- 11) Policy should involve primarily programs of non-formal education, of a continuing nature, which could be presented to rural people through mass media and distant education technologies.
- 12) Staff engaged in farm information distribution should receive regular training in communications with respect to collecting, processing and disseminating information in an effective manner.
- 13) Policies have to be based on the economic and social realities of various regions, which may differ from place to place.
- 14) Agencies should try to meet the needs of total farm populations and not emphasize the successful and large production units.
- 15) There is a need to develop a proper linkage between farm research and development. Agricultural scientists working on research should be much more involved in communications than at present.
- 16) A communication program should be structured so that the immediate concerns of the farmer are the focal points. Extension programs focused away from the immediate needs of people are viewed as irrelevant.

- 17) A gap exists between the advance of farm technology and its implementation. The time lag to disseminate new technology to users must be minimized.
- 18) There is a need to make present farm programs carried on radio and TV more technical, scientific and professional. Emphasis should be placed on the information rather than the means of communication.
- 19) There are few trained farm educators or agricultural specialists serving as editors or producers of farm programs. News or farm programs are sometimes irrelevant to local needs, difficult to understand, or both. Mass media is one-way communication and there is no organized arrangement to receive immediate feedback on message content and delivery.
- 20) Interviews with some farmers suggest that while they receive journals containing useful information, they either do not have or do take the time to read them. Similarly, they seldom care to listen to or view the farm programs on radio or TV. There is a need to motivate farmers to benefit from farm programs. Stimulating the audience is required to achieve reception of information by any means of transfer.

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