The agricultural awareness of Montanas elected legislators
by Milford Louis Wearley

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Education
Montana State University

Abstract:
The purpose of this study was to assess the level of agricultural knowledge and perceptions of those elected officials who served in Montana's 54th legislative session in 1995. Members of the House of Representatives and members of the Senate serving in Montana's 54th legislative session were the population for this study.

Data for this study were gathered through a survey mailed to all members of the House of Representatives and the Senate who served in 1995. Of the 150 survey instrument mailed out, 90 usable surveys were sent back for a 60% return rate. Data were collected in three sections: (1) agricultural knowledge true/false statements, (2) agriculture perception statements, and (3) demographic information of legislators. An analysis of variance (ANOVA) and t-tests were used in statistical analysis of the data.

Conclusions drawn from the data were (1) 44% of Montana's elected officials scored higher than 90% on the seven knowledge concept areas of agriculture, 42% scored between 80% and 89%, and 14% scored between 66% and 79%; (2) Montana's elected officials who served in the legislature, on the average, have positive perceptions of the agriculture industry, with scores varying widely; (3) legislative leaders in Montana have strong positive perceptions about economic situations in production agriculture, animal agriculture, and natural resources/environment issues; (4) based on biotechnology questions and perception statements in the study, about one-fifth of Montana's legislators did not have a full understanding about biotechnology and its contributions to the future of the agriculture industry; (5) legislators rely upon the newspaper media for a majority of their information about agriculture, which may not fully inform them; (6) legislators perceive education about agriculture in the future as more important than it is today.

The data as analyzed indicated a need for better education for the general public about agriculture and agricultural issues. Support and encouragement must be provided to agencies of agricultural education in the future as they strive to maintain or increase public agricultural literacy.

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A thesis submitted in partial fulfillment
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in

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APPROVAL

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Milford Louis Wearley

This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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Signature Milford L. Wearley

Date December 1, 1996

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ABSTRACT

The purpose of this study was to assess the level of agricultural knowledge and perceptions of those elected officials who served in Montana's 54th legislative session in 1995. Members of the House of Representatives and members of the Senate serving in Montana's 54th legislative session were the population for this study.

Data for this study were gathered through a survey mailed to all members of the House of Representatives and the Senate who served in 1995. Of the 150 survey instrument mailed out, 90 usable surveys were sent back for a 60% return rate. Data were collected in three sections: (1) agricultural knowledge true/false statements, (2) agriculture perception statements, and (3) demographic information of legislators. An analysis of variance (ANOVA) and t-tests were used in statistical analysis of the data.

Conclusions drawn from the data were (1) 44% of Montana's elected officials scored higher than 90% on the seven knowledge concept areas of agriculture, 42% scored between 80% and 89%, and 14% scored between 66% and 79%; (2) Montana's elected officials who served in the legislature, on the average, have positive perceptions of the agriculture industry, with scores varying widely; (3) legislative leaders in Montana have strong positive perceptions about economic situations in production agriculture, animal agriculture, and natural resources/environment issues; (4) based on biotechnology questions and perception statements in the study, about one-fifth of Montana's legislators did not have a full understanding about biotechnology and its contributions to the future of the agriculture industry; (5) legislators rely upon the newspaper media for a majority of their information about agriculture, which may not fully inform them; (6) legislators perceive education about agriculture in the future as more important than it is today.

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CHAPTER 1

THE PROBLEM AND ITS SETTING

Introduction

"Agriculture is basic to human welfare. It, more than other activities, has shaped our (America's) history and our culture" (Douglass, 1985, p. 17). When most of American society had a tie to the land, this concept was understood and appreciated by a majority of the U.S. population. Even the people who did not have a direct tie to the land had a close origin somewhere in their immediate past. There was no concern about people having little or no knowledge about agriculture. Almost every American had lived the story of agriculture directly, either in part or in whole.

Today a third direct generation has not been raised on the land, and the general public appreciation for the agriculture industry is dropping. The warning signs of a deteriorating knowledge about agriculture by the general public are all around us. In 1950, some 15% of American's population lived on the land (Little, 1987). Production agriculturists comprise less than 2% of the total population today. Mawby (as cited by Douglass, 1985) reports of the 13 million college students in the United States, only 152,500 were majoring in an agricultural discipline. Mawby goes on to state that "few non-agricultural students

elect to take any agricultural courses, though they may eventually hold leadership positions which require them to make decisions on matters affecting agriculture and human nutrition" (Douglass, 1985, p. 7).

Lobbying our elected officials has never been more important. At the same time, having elected officials who are knowledgeable about the agricultural industry has never been more important.

Purpose of the Study

The purpose of the study was to assess the level of agricultural knowledge and perceptions of those elected officials who served in Montana's 54th legislative session in 1995.

Need for the Study

The success story of American agriculture is the envy of the world. Douglass (1985) asks the question, "Do you realize that little more than 100 years ago only one country in the world had succeeded in reducing the number of its citizens engaged in the production and distribution of food to less than half of the total population?" (p. 14). No other nation has been able to feed and clothe its people in such an efficient manner and continue to do so year after year. American agriculture has allowed Americans to spend less than 15% of their income for food, ranking them the lowest in the world (Tisdale, 1991).

Why then has America become agriculture illiterate? The industry might have to look to itself for an answer. By freeing the large number of people from the production cycle of agriculture, America has become very diverse in its culture. By allowing this specialization to happen we have allowed the general public the opportunity of not having to learn about agriculture for their basic survival.

The other problem is the isolation of the interests of the agriculture industry as perceived within the industry. As stated by Johnson (1991), "Agriculture works to put itself separate, we are special!" (p. 1). Richardson (1990) reports that "agriculture has been living in its own sturdy, but isolated, special interest 'production only' farmhouse." The point of American agriculture isolation cannot be made more bluntly than the statement by Mayer and Mayer (1974): "The present isolation of agriculture in American academic life is a tragedy" (p. 83).

To say that production agriculture is taken for granted may be an understatement. However, most people do not realize the importance agriculture plays in American history or in the present society as we live today. As we see the baby boomer generation of Americans coming of age, perceptions about agriculture have changed dramatically in a very short time. Now, with the children of generation X hot on their heels, changes may be more dramatic and far reaching than ever before. To what extent can we contribute what some consider extreme and controversial views, as wildlife preservation and

reintroduction advocates have done, of production agriculture as a movement to get back in touch with the land? In the 1960s we saw actions taken up against the establishment. Now we see group and personal agendas taking action from within or through the government process.

Americans are worried more about the safety of the food they eat than about how much there is or where it might come from (Moore, 1987). During the time of the Alar scare and spraying for the Mediterranean fruit fly, agriculture took a backward step in the general public's eye. In recent years we have seen food poisoning scares that have dealt with cantaloupe, grapes, and hamburger. With all of these situations the basic problem was the handling and distribution of the food, not with the food itself. With an overzealous press leading the way, stories can be overblown and facts under or misreported. In the case of the Alar scare with apples, apple farmers in Washington were hit hard financially. The same happened with cantaloupe farmers in California. A misinformed public has the dramatic facts, not all the facts to make good decisions.

The American people are becoming more health conscious and more aware of the food they consume. A recent news report on CNN (November 8, 1996) reported the fastest growing segment of grocery store retail outlets is the natural food outlets selling natural grown and pesticide free foods. They now make up 10% of the market. The boom is attributed to the people who grew up in the 1960s coming of age 30 years later. A woman was quoted in the report as saying "people are waking up and growing food without chemicals."

Tisdale (1991) made an observation in this manner:

> Fear of the unknown often leads to needless public alarm. Agriculturally literate people can make personal informed decisions about agriculture related topics such as food safety, genetic engineering and pesticide versus non-pesticide issues. The often highly sensational media coverage of alar-type scares is seen in context by people with a basic knowledge of agriculture. Those without this basic understanding react without reason, frightened for themselves and their families. The resulting damage to the industry is not easily repaired. (p. 11)

If the industry of agriculture is important to the American way of life and to how our country operates, then surely making decisions about the agriculture industry must be equally important. No one may have a more direct and far reaching impact upon the future of the industry of agriculture than the people who serve as our elected officials. It is then important to assess the agriculture knowledge and perception level of our elected officials if their decisions have a significant impact. Frick and Elliot (1995) point out, "It is important to understand the public's knowledge and opinions toward agriculture. However, it is of utmost importance to understand the way that a given population assimilates information on which it bases its decisions and/or choices" (p. 1). To date no one has assessed the agricultural literacy and perceptions of an elected body.

Legislators are recognized leaders and draw heavily on their backgrounds as a source for decision making. Evidence that supports this notion was found by Humphrey, Stewart, and Linhardt (1994). They concluded that the experience of educators directly influences the information that is taught and how it is presented to students. McBlair (1995) reported that there is a positive

relationship between school administrator agriculture literacy score and the attitudes they hold towards agricultural education. Hence, the question which arises is how knowledgeable are Montana's legislators about agriculture? What agriculture issues do they perceive to be critical in the future?

Objectives

In order to accomplish the purpose of this study, specific objectives were developed. These objectives were:

1. To assess the agriculture knowledge of people elected to serve in the Montana 1995 legislative session.
2. To assess the level of agricultural perceptions of people elected to serve in the Montana 1995 legislative session.

Assumptions

The following assumptions were made concerning this study:

1. People who serve in the Montana legislation have some knowledge and perceptions about agriculture.
2. People who serve in the Montana legislature make decisions about agriculture and the agricultural industry.

Limitations

This study was limited to the state of Montana and the elected officials who served in the 1995 Montana legislature. There were 100 members elected to serve in the House of Representatives and 50 members elected to serve in the Senate.

Definitions

1. Agriculture - The science and technology of utilizing natural resources in a sound financial and environmental method to provide food, fiber, shelter and energy for the benefit of mankind. Agriculture encompasses the study of economics, technology, politics, sociology, international relations and trade, and environmental problems, in addition to biology (Shelhamer, 1991, p. 4).
2. Agricultural literacy - understanding and possessing knowledge of our food and fiber system (Frick, 1990, p. 41).
3. Agricultural knowledge - basic agricultural knowledge includes production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing and processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. An individual

possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture (Frick, 1990, p. 41).

4. Elected officials - those people who were elected by their constituents in their House and Senate districts to serve in Montana's 54th legislative session of 1995.

5. Farm - land used in production agriculture which can be used to raise livestock or grow crops to sell as agricultural commodities.

6. Farmer - person who operates a farm or ranch for producing agricultural commodities.

CHAPTER 2

REVIEW OF LITERATURE

Definition of Agricultural Literacy

Literacy in mankind's recent history has served as a measurement of progress. Bailyn (1960) suggests that literacy is a basic index of cultural attainment and illiteracy is then a measure of the regression of society. If this is true then American agriculture is in trouble. A study of 2,000 students in Kansas, America's agricultural heartland, showed that school children do not understand much about agriculture (Vining-Koch, 1986). Parallel studies were conducted by Williams (1991) in Oklahoma and by Perey (1990) in Arizona with findings which were similar to the Kansas results.

One definition of agriculture literacy came from Douglass (1985) in an early attempt to define the broad concepts of agricultural literacy.

> There are certain pieces of information which are so basic to agricultural literacy that serious consideration should be given to their integration into any curriculum. The list is still tentative, but it includes a description of the place of agriculture in human history; a philosophical investigation of the purposes of agriculture, with some attention to ethical considerations; and an examination of the links between nutrition and human development from the perspective of social science. It also includes a basic introduction to the biochemistry of agroecosystems; a comparative analysis of agricultural technologies, including an assessment of their impacts on ecological and social communities; a description of the

> institutions of political and economic power that shape agricultural decision in different societies; and a basic treatment of the demographic transition from higher to lower rates of population growth and the roles that the consumption and production of food play in that transition. (p. 18)

A shorter version was presented by Law and Pepple (1990) in The Agricultural Education Magazine:

> Agricultural literacy may be defined as the development of the individual in the principles and concepts underlying modern agricultural technology. As defined here, it applies to producing, processing, distributing, marketing, and consuming the products of the food and fiber system. It also includes an awareness of the impact agriculture has on the environment, on society, and on everyday living of the individual. (p. 10)

Frick came up with a longer more precise definition of agricultural literacy in his dissertation in 1990.

> Agricultural literacy is understanding and possessing a knowledge of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic agricultural knowledge includes: the production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing and processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. (p. 41)

Promoting Agricultural Literacy

Education about agriculture cannot be limited to just a few. Bailyn (1960) points out that "although every avenue of activity, every trade and profession, every material effort and cultural discipline has its own 'history,' written or unwritten, it cannot become meaningful in isolation" (p. vii). The National

Academy of Sciences (1988) in its report of the state of agricultural education stated that "agriculture is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies" (p. 1).

Does the U.S. population know that it is lacking in knowledge about agriculture? Little (1987) states, "The reason the agriculture industry has no interpretive information to speak of is that the public does not know how to ask for it. We do not know the terms of agriculture, the language, or the basic concepts" (p. 146).

Little (1987) further states about agriculture:

> Farming is the foundation of the largest segment of our economy, but all the same, our most diffuse industry. To where is the average citizen to go for information about agriculture. Most agricultural organizations have to do with providing help to production agriculturists, very little is available to educate the average citizen about the industry of agriculture. (p. 145)

Education in agriculture, what agriculture education is all about, has been fairly well defined since the Smith-Hughes Act of 1917. However, education about agriculture does not fit into the definition, and this is the concern of agricultural educators in educating the public about agriculture. The one statement about agricultural literacy which shook the walls of the agricultural education community came from the National Academy of Sciences (NAS) report entitled Understanding Agriculture--New Directions for Education (1988) which was put together by the Committee on Agricultural Education in Secondary Schools. The NAS report emphasized the point of traditional vocational

agriculture education programs embracing education about agriculture as a key to the agriculture education future. The report stated:

> The committee envisions that an agriculturally literate person's understanding of the food and fiber system would include its history and its current economic, social and environmental significance to all Americans. This definition is purposely broad, and encompasses some knowledge of food and fiber production, processing, and domestic and international marketing. As a complement to instruction in other academic subjects, it also includes enough knowledge of nutrition to make informed personal choices about diet and health. Agriculturally literate people would have the practical knowledge needed to care for their outdoor environments, which include lawns, gardens, recreational areas, and parks. (p. 8)

Birkenholz (1992) headed an AAAE (American Association of Agricultural Education) Ad Hoc agricultural literacy work group which formulated the following guiding principles for the development and implementation of agricultural literacy programs:

1. Every citizen of the United State should possess a basic understanding of agriculture.

2. Schools and other agencies of government have a responsibility to educate the citizenry concerning agriculture and its role in American society.

3. Students should be able to apply scientific principles to agricultural applications.

4. By definition, agricultural literacy programs are too broad and pervasive in concept to be implemented through traditional structures of vocational agriculture and state divisions of vocational education.

5. Agricultural literacy programs should be incorporated, insofar as possible, into existing efforts of USDA such as Ag in the Classroom and Cooperative Extension Service programs for youth and adults, state departments of education (in

departments other than vocational and technical education), and universities. (p. 7)

Testing for Agricultural Literacy

With Frick's definition of agricultural literacy in hand, one of the first tests for agricultural literacy came in 1993. Birkenholz (1993) conducted a study testing Indiana High School students, Michigan high school students, rural Missouri adults, and urban Missouri adults. Findings from that study were that adults had a higher level of knowledge and more positive perceptions about agriculture than high school students although each respondent group had relatively positive perceptions of agriculture.

A study conducted in Missouri by Harris and Birkenholz (1996) which tested secondary educators' knowledge of and attitude toward agriculture concluded that educator groups in the study were knowledgeable of agriculture and had a positive attitude toward the agriculture industry. However, the groups did have statistically significant differences between disciple areas. Language arts and mathematics teachers were less knowledgeable and had less positive perceptions about agriculture, whereas agriculture education instructors were more knowledgeable and more positive.

Testing students about their knowledge and attitudes was the focus of one study of enrollment in secondary agriculture education programs compared to not being enrolled. Wright, Stewart, and Birkenholz (1994) did the study to compare

the knowledge and perceptions about agriculture of 11th grade students in small Missouri schools. The following conclusions were drawn from this study:

> Students studying agriculture in schools with an agricultural education program have greater knowledge about agriculture.
>
> Students enrolled in a secondary agricultural education program have a more positive perception towards agriculture.
>
> The agricultural awareness survey instrument is able to detect differences in student knowledge and perception of agriculture.
>
> A weak positive relationship exists between knowledge and perception scores. (p. 58)

A study was conducted by Humphrey, Stewart, and Linhardt (1994) on elementary education majors' knowledge of and perceptions toward agriculture. When asked about their confidence to teach agriculture concepts, only 20% of elementary education majors were confident to teach agricultural concepts. However, those student teachers with agricultural experience were more confident about teaching science topics which were related to agriculture.

A study by Frick, Birkenholz, and Machtmes (1995a) assessed the knowledge and perceptions of 4-H members in a midwestern state. With the information collected at an annual state 4-H conference, it was found that knowledge and perceptions about agriculture were high but varied widely. Members were most knowledgeable about natural resources and marketing of agricultural products and least knowledgeable about the plants in the agriculture concepts area. In the same light, 4-H members were most positive about natural

resources and animal agriculture areas and least positive about the agricultural policy concepts.

Another study by Frick, Birkenholz, and Machtmes (1995b) surveyed rural and urban adults about their knowledge and perceptions of agriculture. The general conclusion was that both of these groups were somewhat knowledgeable about agriculture and had a relatively positive perception of agriculture. Adults in the study were most positive about the natural resource concepts and least positive about the agricultural policy concepts. Rural adults were found to be very positive about the conception statements in the animal agriculture section. Knowledge scores turned out to be highest in the animal agriculture concept area and lowest in the plants in agriculture concept area.

McBlair (1995) concluded that there is a relationship between administrators' agricultural literacy test scores and enrollment in secondary agriculture education programs. Administrators in the study had a mean agriculture literacy score of 69.4%, which was considered minimal agricultural literacy.

CHAPTER 3

METHODOLOGY

Population

The population of the study was all of the members of the 54th legislative session which was held in Helena, Montana in 1995. Names and addresses were secured from the Montana 1995 Directory Fifty-Fourth Session (U.S. West Communications, 1995) and Lawmakers of Montana (Langley & Langley, 1995) put out to the general public. There were 150 total legislators with 100 serving in the House of Representatives and 50 serving in the Senate. Of the 50 senators, there were 41 males and 9 females. In the House of Representatives, 73 were males and 27 were female.

Forty-eight members of the House of Representatives came from a city which had at least one Class AA school. Twenty-one members of the Senate came from a city which had at least one Class AA school.

Instrument Design

The data collection instrument (Appendix C) was divided into three sections. The three sections included a knowledge section, perceptions section, and demographics section. The instrument was originally developed by a research

team that ran a pilot study in December, 1993 (Birkenholz). With Frick's (1990) Delphi study as a guide, seven concept areas were used with each concept area having five knowledge questions and five perception statements. The knowledge and perception portions used these seven concept areas:

1. Significance of Agriculture
2. Policy in Agriculture
3. Agriculture's Relationship with Natural Resources
4. Plant Science
5. Animal Science
6. Processing of Agricultural Products
7. Marketing of Agricultural Products

The first portion of the collection instrument, the knowledge section, contained 35 true/false statements. The respondents were instructed to either answer "True," "False," or "Don't Know" to each statement. As the surveys were collected, the responses were coded into numbers for scoring purposes. A correct response was scored 1 and an incorrect or "Don't Know" response was scored 0. Scores were then computed for each concept area and for the overall knowledge section. The possible scores could range from 0 to 35 with 35 being the highest possible score.

The perception section was the second section of the data collection instrument. This section was also based on the seven concept groups with five statements for each concept area being given for a total of 35 statements. Each

respondent was directed to choose from a Likert-type scale ranging from strongly agree (SA), agree (A), neutral (N), disagree (D) and strongly disagree (SD). As data were collected, the responses were coded to a number: strongly agree--1, agree--2, neutral--3, disagree--4, and strongly disagree--5. Several statements in the perception section of the survey were negatively worded. The response scale from these negatively worded statements was reversed prior to the data analysis so all answers could be considered within the same scale. The total possible range of perception scores was 35 to 175. A lower score indicated a more positive perception of agriculture and a higher score indicated a less positive or negative perception of agriculture.

The third section of the instrument requested respondents to provide personal and demographic information. Respondents were asked to provide information for the following:

1. Gender
2. Home location
3. Legislative experience
4. Population of nearest town
5. Size of farm/ranch (if any)
6. Relatives who lived or worked on a farm
7. Relatives who worked in an agricultural business
8. Enrollment in high school agriculture courses
9. Membership in FFA

10. Membership in 4-H
11. Constituents involved in agriculture
12. Rate the current ability of state groups to educate Montanans about agriculture
    a. Extension Service
    b. College of Agriculture at MSU
    c. Montana Department of Agriculture
    d. Agriculture in Montana Schools
    e. Public Education Agricultural Education Programs
    f. Farm/Ranch Interest Groups (i.e., Farm Bureau)
    g. University/USDA Research Stations
    h. Other (Please list)
13. Rate the future ability of state groups to educate Montanans about agriculture
    a. Extension Service
    b. College of Agriculture at MSU
    c. Montana Department of Agriculture
    d. Agriculture in Montana Schools
    e. Public Education Agricultural Education Programs
    f. Farm/Ranch Interest Groups (i.e., Farm Bureau)
    g. University/USDA Research Stations
    h. Other (Please list)

14. Regular use of following media to receive agriculture information:
    a. news magazines
    b. newspapers
    c. radio
    d. television
15. Rank the following issues you think most critical to address:
    a. Food safety
    b. Animal welfare
    c. Agriculture practices that effect the environment
    d. Viability of our rural economic base
    e. Conservation of natural resource base
    f. Biotechnology
    g. Other (Please list)

This same instrument had been used in at least five prior studies and no significant changes were made to the knowledge and perception statements. The only change or addition was made to the demographic portion to gather specific information pertaining to the population. Therefore, the survey instrument was not pilot tested before being sent out.

With the same survey instrument being used in at least five other studies, the reliability had been checked before. The reliability of the knowledge section of the instrument was assessed by calculating a Kuder-Richardson 20 (KR-20) coefficient over all of the knowledge questions. The KR-20 figure for the

knowledge section of the instrument was .85. The perception portion of the instrument has been assessed by using the Cronbach's alpha coefficient for instrument reliability. The Cronbach's alpha coefficient computed for all statements in the perception section was .90. A national panel of agricultural literacy experts had reviewed the instrument for content validity. In the opinion of the expert panel, the data collection instrument was considered a valid tool to use for assessing agricultural literacy.

Making the survey instrument as non-political as possible was a high priority of the researcher. The cover letter (Appendix A) was put on personal stationery rather than using stationery from Montana State University in order to not bias answers or create concern about how the information might be used. The survey instrument (Appendix C) was printed on both sides of legal size paper and folded into a booklet. Legal size paper allowed for a larger font to be used for reading ease. For efficiency and ease, respondents could circle the answers to the right of the question and send the whole questionnaire back in a self-addressed, stamped envelope. To avoid using address labels, all envelopes were addressed using the database software in Microsoft Works software program and each envelope hand-fed into a laser printer.

Collection of Data

A cover letter (Appendix A) and the survey instrument were mailed out on July 16, 1996. Fifty-seven surveys (38%) were returned within the first week, with

one being returned not filled out. One survey was returned with the identification number ripped away. Within the second week 24 (16%) additional completed surveys were returned.

A follow-up postcard (Appendix B) was sent out on August 8, 1996. The postcard was printed on a high quality paper and hand-fed through a laser printer to avoid address labels. The front of the card had the same mountain scene as the cover of the survey instrument to create an association between the follow-up postcard and the survey instrument. Ten completed surveys (6%) were returned after the postcard was sent making a total of 90 useable surveys sent back for a 60% return. Due to time constraints on the researcher as a full-time teacher and as an acceptable return was received, no additional follow-up was conducted.

Early and late completed survey returns were identified and analyzed separately. Surveys returned from the first mailing were considered as early returns. Completed surveys returned after the follow-up postcard was sent were considered as late returns. No difference was found between early and late respondents' answers.

Statistical Treatment

The data was put into the Excel spreadsheet software program as the returns were mailed back. Using the statistical functions in Excel, means were determined for the knowledge and perception portions of the study. Within the Excel program, the t test and analysis of variance (ANOVA) were also used to

determine if statistical difference existed between knowledge and perception scores within certain stratums of related demographic factors.

CHAPTER 4

RESULTS OF THE STUDY

Introduction

The purpose of the study was to assess the level of agricultural knowledge and perceptions of those elected officials who served in Montana's 54th legislative session in 1995. The specific objectives were:

1. To assess the agriculture knowledge of people elected to serve in the Montana 1995 legislative session.
2. To assess the level of agricultural perceptions of people elected to serve in the Montana 1995 legislative session.

The results of the survey are reported in several parts. Data are presented in the following sections: (1) demographics of the respondents, (2) knowledge of agriculture of respondents, (3) perceptions of agriculture of respondents, (4) state groups' ability to educate the public about agriculture, (5) sources of agriculture information, (6) importance of issues to respondents, and (7) influence of demographic factors data analysis.

Demographics

Of the usable surveys, 70 (78%) were from males and 20 (22%) were from females. This was close to the gender distribution of the Montana 54th legislature of 76% male and 24% female.

A majority of the respondents lived in a town or city. Nineteen (21%) of the legislators indicated their home was on a farm or ranch and 48 (54%) indicated they lived in a town or city. Twenty-two (25%) of the respondents lived in a rural area.

The data in Table 1 reveal that 41 (45.6%) of the respondents indicated that they had 0 to 5 years of experience in the legislature. The next largest group was 22 (24.4%) respondents with experience from 6 to 10 years. Twelve (13.3%) had over 21 years of experience in the legislature.

Table 1. Years of legislative experience.

Legislative Experience in Years	Number	Percent
0-5 years	41	45.6
6-10 years	22	24.4
11-15 years	11	12.2
16-20 years	4	4.4
21 plus years	12	13.3

The political break-down of both the Senate and House of Representatives can be found in Table 2. A greater percentage of members of the House of Representatives (64%) returned completed surveys than did the members of the

Senate (50%). One survey was returned with no identification number and could not be tracked to either legislative body. The data also reveal that Democrats had lower return rates (37.5% and 32%) than did the Republicans (62.5% and 68.0%).

Table 2. Legislative body, political party make-up, and return rate of the respondents.

Legislative Body	Total Number	Percent of Total	Number (n) Returned	Percent Returned
House of Representatives	100		64	64.0
Republican Party	67	67.0	40	62.5
Democratic Party	33	33.0	24	37.5
Senate	50		25	50.0
Republican Party	31	62.0	17	68.0
Democratic Party	19	38.0	8	32.0

Respondents were asked the size in population of the nearest town to their home. The data in Table 3 reveal that most respondents (41.1%) lived closest to the largest population centers in Montana. The next largest group (31.1%) were those respondents who lived in or close to towns under 2,500 people. Twenty-five (18 + 7) of the respondents lived in or close to towns with populations from 2,501 to 25,000 people.

Table 3. Population of nearest town to respondents.

Population	Number	Percent
Under 2,500	28	31.1
2,501 - 10,000	18	20.0
10,001 - 25,000	7	7.8
25,001 - 100,000	37	41.1

The data in Table 4 show the distribution of the size of farms on which the respondents lived. Most (73.0%) answered they did not live on a farm or ranch. Of those who did live on a farm only two lived on a farm with less than 1000 acres while 22 (24.8%) replied the farm they lived on was over 1000 acres.

Table 4. Size of legislators' farms.

Size of Farm	Number	Percent
Do not live on a farm/ranch	65	73.0
10 - 50 acres	1	1.1
50 - 100 acres	0	0.0
501 - 1000 acres	1	1.1
Over 1000 acres	22	24.8

When asked if they had relatives who live or work on a farm, 58 respondents (64.4%) answered yes and 32 (35.6%) answered no. In the same light, 50 legislators (55.6%) answered they had relatives in an agricultural business, and 40 (44.4%) replied that they did not have a relative involved in an agricultural business.

Fourteen percent (13) of the respondents were former members of FFA and 39% (35) of the respondents had been 4-H members. The majority did not have experience as a member of the FFA or 4-H organizations. Nineteen legislators (21.1%) responded they had taken agricultural courses in high school.

When asked if they thought a considerable portion of their constituents were involved in agriculture, about half (48.9%) replied yes while 46 (51.1%) replied no.

Knowledge of Agriculture

The results of knowledge for all respondents are displayed in Table 5. Overall mean knowledge of agriculture scores ranged from a perfect score of 35 (100%) to a low of 23 (66%) correct responses. When putting the scores into a percentage basis, 40 respondents (2 + 12 + 9 + 17) scored 90% or above, 38 respondents (11 + 12 + 9 + 6) scored between 80% and 90%, and 12 respondents (4 + 4 + 1 + 2 + 1) scored less than 80% on the knowledge portion of the survey instrument.

Table 5. Distribution of knowledge scores of respondents.

Range of Knowledge Scores	35	34	33	32	31	30	29	28	27	26	25	24	23
Percentage Score	100	97	94	91	89	86	83	80	77	74	71	69	66
Number Scoring in Range	2	12	9	17	11	12	9	6	4	4	1	2	1

The data in Tables 6-11 disclose that the overall mean knowledge scores for the seven concept areas ranged from a high of 96.4% in the marketing and distribution concept area to a low of 78.4% in the plants in agriculture concept area. Other concept areas scores were 94.9% in natural resources, 90.2% in animal agriculture, 87.7% in significance of agriculture, 84.4% in agricultural processing, and 82.1% in agricultural policy.

The data in Table 6 look at overall mean knowledge score for the significance of agriculture concept area. Just less than half (49.4%) of the respondents knew that the average U.S. farm is not larger than 500 acres. The concept knowledge score was 87.7%. Scores on other significance of agriculture concept statements ranged from 95.6% to 98.9%.

Table 6. Significance of agriculture knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Significance of agriculture:			
There are more farmers in the U.S. than there were 10 years ago.	96.7	2.2	1.1
U.S. research has improved farming methods in other countries.	98.9	1.1	0.0
Thousands of people in the world die of starvation each year.	95.6	1.1	13.3
The average U.S. farm is larger than 500 acres.	49.4	28.1	22.5
Several countries depend on U.S. agricultural exports for food and fiber.	97.8	0.0	2.2
Concept Average	87.7	6.5	7.8

The data in Table 7 reveal two concept statements that over 25% (7.8 + 27.8, 20.2 + 6.7) of the respondents either missed or did not know. The statement government subsidy payments to farmers are used to stabilize food prices was missed by 26.9% (20.2 + 6.7) of the respondents. Over 35% (7.8 + 27.8) of the respondents did not know that one of every five jobs in the U.S. is related to agriculture. A few (13.8% + 2.2%) did not know about agriculture's contribution to the Gross National Product. On the average, 82.1% of the respondent knew the correct answers to the agricultural policy concepts statements.

Table 7. Agricultural policy knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Agricultural policy:			
Less than 3 percent of the U.S. gross national product is from agriculture.	84.4	2.2	13.3
One of every five jobs in the U.S. is related to agriculture.	64.4	7.8	27.8
Local laws and regulations have little effect on farmers.	97.8	2.2	0.0
U.S. agricultural policies influence food prices in other countries.	91.1	4.4	4.4
Government subsidy payments to farmers are used to stabilize food prices.	73.0	20.2	6.7
Concept Average	82.1	7.4	10.4

As data in Table 8 show, in the natural resources and environment concept area, all respondents correctly answered the questions of farming and wildlife being able to survive in the same geographic area and water, soil and minerals are important in agriculture. Over 13% (10.0 + 3.3) of the respondents answered incorrectly or did not know that soil erosion does not pollute U.S. lakes and rivers. Respondents correctly answered the statements in the natural resources and environment concept area 94.9% of the time.

Table 8. Natural resources/environment knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Natural resources/environment:			
Soil erosion does not pollute U.S. lakes and rivers.	86.7	10.0	3.3
Many farmers use tillage practices that conserve the soil.	95.6	0.0	4.4
Farming and wildlife cannot survive in the same geographic area.	100.0	0.0	0.0
Animal wastes are used to increase soil fertility.	92.2	3.3	4.4
Water, soil, and minerals are important in agriculture.	100.0	0.0	0.0
Concept Average	94.9	2.7	2.4

Table 9 data show the lowest concept area mean score (78.4%) for the population was in the plants in agriculture area. A significant number (53.3% + 14.4%) of respondents missed or did not know the answer to the statement of

profits increase as farmers strive for the maximum crop yields. Nearly 18% (8.9 + 8.9) of respondents missed or did not know that biotechnology has increased the pest resistance of plants. The term biotechnology may not be a familiar term to the respondents and could have led to an incorrect response. The respondents recognized that pesticides increase yields (90%) and that plant products are the main source of human food (93.2%).

Table 9. Plants in agriculture knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Plants in agriculture:			
The use of pesticides has increased the yield of crops.	90.0	4.4	5.6
Plant products are the main source of human foods.	93.2	1.1	5.7
Biotechnology has increased the pest resistance of plants.	82.2	8.9	8.9
Profits increase as farmers strive for the maximum crop yields.	32.2	53.3	14.4
Very little of the grain produced in the U.S. is exported.	94.4	2.2	3.3
Concept Average	78.4	14.0	7.6

In the area of animal agriculture, nearly 20% (5.6 + 13.5) of the respondents missed or did not know that biotechnology has increased animal production in the U.S. One might question again if the respondents understand biotechnology. Animals eat foodstuffs that cannot be digested by humans was a

statement which 16.7% (8.9 + 7.8) of the respondents either missed or did not know. The concept average for animal agriculture was 90.2% as indicated by data in Table 10.

Table 10. Animal agriculture knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Animal agriculture:			
Animal health and nutrition are important to farmers.	97.8	0.0	2.2
Animals can be a valuable source of medical products.	88.9	2.2	8.9
Animals eat foodstuffs that cannot be digested by humans.	83.3	8.9	7.8
Biotechnology has increased animal production in the U.S.	80.9	5.6	13.5
Hamburger is made from the meat of pigs.	100.0	0.0	0.0
Concept Average	90.2	3.3	6.5

Examining the agricultural processing concept knowledge scores in Table 11 reveal that 25.8% of the respondents thought that homogenization uses heat to kill bacteria in milk. Another 10.1% did not know the answer to the homogenization question. The researcher noticed, when tabulating the data, 25 of the respondents changed their answers from the wrong answer to the correct answer for this true/false statement. Regarding the statement food safety is a major concern of the food processing industry, 8.9% missed the correct answer

and 3.3% did not know the answer. Twelve (12.2) percent of the respondents did not realize new products have been developed using surplus grain. The concept average score for agricultural processing was 84.4%.

Table 11. Agricultural processing knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Agricultural processing:			
Food safety is a major concern of the food processing industry.	87.8	8.9	3.3
Homogenization uses heat to kill bacteria in milk.	64.0	25.8	10.1
New products have been developed using surplus grains.	87.8	0.0	12.2
Pasteurization uses heat to kill bacteria in milk.	91.1	1.1	7.8
Using grain alcohol for fuel reduces the U.S. dependence on foreign oil.	91.1	5.6	3.3
Concept Average	84.4	24.3	7.3

The marketing and distribution concept area had fewer incorrect and don't know answers than any of the other concept areas. Table 12 data reveal that every respondent (100%) knew that an efficient food distribution system is essential to the agricultural industry. The other correct responses varied from 91.0% to 97.8%. Some respondents (2.2% + 6.7%) did not know that feed grain is sold on the world market.

Table 12. Marketing and distribution knowledge statements answered correctly and incorrectly.

Concept Area Statement	% Correct	% Incorrect	% Don't Know
Marketing and distribution:			
Processing increases the cost of food products.	95.6	3.3	1.1
The U.S. does not sell its feed grains on the world market	91.0	2.2	6.7
Grain exports are usually transported between continents by airplane.	97.8	1.1	1.1
An efficient food distribution system is essential to the agricultural industry.	100.0	0.0	0.0
Transportation and storage effects the supply of agricultural products.	97.8	1.1	1.1
Concept Average	96.4	1.5	2.0

Perceptions of Agriculture

Each respondent was directed to respond to the perception statements on the survey instrument by using a Likert-type scale ranging from strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree(SD). Responses when analyzed were coded to a number: strongly agree--1, agree--2, neutral--3, disagree--4, and strongly disagree--5. Several statements in the perception section of the survey were negatively worded. The response scale from these negatively worded statements was reversed prior to the data analysis so all answers could be considered within the same scale. The total possible range of perception scores was 35 to 175. A lower score indicated a more positive perception of agriculture and a higher score indicated a less positive or negative perception of agriculture.

Individual respondent perception scores ranged from a low of 44 (more positive) to a high of 92 (less positive).

The coding of the perception answers ranged from strongly agree 1.00-1.49, agree 1.50-2.49, neutral 2.50-3.49, disagree 3.50-4.49, to strongly disagree 4.50-5.00. The perception score as reported in the following tables is the mean of the individual scores in a specific concept area.

The overall mean concept perception scores ranged from a low of 1.8 (agree) in the agriculture policy area and the animal science concept areas to the highest concept score of 2.2 (agree) in significance of agriculture concept area. The overall mean concept area perception score was a 2.0 (agree). All concept area perception scores showed that, overall, the respondents have a positive attitude towards the agriculture perception statements.

Perception scores for significance of agriculture concepts are shown in Table 13. Respondents had the highest perception (1.8) towards the statement of U.S. citizens spend a higher percent of their income on food than in other countries. Overall the respondents were neutral (2.5) on the statement that people are moving away from rural areas due to changes in agriculture. The respondents agreed that a strong agriculture is more important than military power (2.4) and that technology has improved the world food supply (2.0). They also recognized that developing countries lack the ability to produce enough food (2.4).

Table 13. Respondents' perceptions about significance of agriculture.

Concept Area Statement	Perception Score*
Significance of agriculture:	
U.S. citizens spend a higher percent of their income on food than in other countries.	1.8**
People are moving away from rural areas due to changes in agriculture.	2.5
A strong agricultural industry is more important than military power.	2.4
The world food supply has increased as a result of improved technology	2.0
Developing countries lack the ability to produce enough food.	2.4
Concept Average	2.2

* Strongly agree 1.00-1.49, agree 1.50-2.49, neutral 2.50-3.49, disagree 3.50-4.49, strongly disagree 4.50-5.00.
** The response scale for negatively worded items was reversed to compare perception scores in a like manner.

In the agricultural policy concept area, respondents agreed with the statement that the U.S. needs a steady supply of food and fiber goods to remain strong (1.6). To a lesser degree (2.1) respondents agreed with the statement that agriculture employs a large number of people in this country. Respondents recognized that farmers do not earn too much money (1.8). They also recognized that agriculture exports help to reduce the U.S. trade deficit (1.7) and that government should not exert more control over farming (1.7). Agricultural policy perception concept scores are found in Table 14.