

A NEEDS ASSESSMENT OF
INTEGRATED RESOURCE MANAGEMENT EDUCATIONAL ACTIVITIES
AS PERCEIVED BY CATTLE PRODUCERS IN MONTANA

by
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APPROVAL

of a professional paper submitted by

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This professional paper 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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ABSTRACT

The purpose of this study was to assess the educational need for a statewide IRM program, and to identify those competencies that are necessary to improve management of physical, biological and social resources on Montana ranches.

Data for this study were gathered through questionnaires mailed to ten percent of the members of the Montana StockGrowers Association who were actively involved in ranching. Of the 400 surveys sent, 152 useable surveys were returned, completed by 136 males and 16 females. Majority (64.9%) of the respondents were 31-59 years old and 43% had a Bachelors degree. Herds with 101-500 head accounted for 57% of the population.

Twenty-nine competencies were identified by a delphi panel and then set up as a needs assessment model (Borich, 1980). A pilot study was used to validate and test the instrument.

The analyses of the data were used to determine any differences among selected demographic features and to rank order the competencies based upon the respondents' perceived level of use and educational need. Results were used to determine areas of priority training related to integrated resource management.

Based on weighted discrepancy scores, members of the Montana StockGrowers Association consistently perceived three competencies to be a priority for educational need: retained ownership; range monitoring systems; and market calves by video sales.

Management decisions were influenced by the level of interaction with agricultural professionals, annual production goals, and long term ranch production goals. Wildlife populations and public access slightly influenced management decisions.

Competencies with a positive weighted discrepancy score need to be taught. However, training sessions need to be targeted to a specific audience because of the reported differences in the ranked competencies.

CHAPTER 1

THE PROBLEM

Introduction

Why are some ranchers surviving while others are at the end of their rope?

Wilcox stated crises such as drought, poor markets, high interest rates, etc., are often offered as reasons for poor ranch performance. However, "the successful rancher is one who can, firstly, identify the different factors which will affect the operation of the ranch, and secondly, can anticipate the changes in them that will influence his success" (as cited in White, Troxel, Pena & Gynn, 1988, p. 3).

It is now common to hear about scientists and experts working together as much as possible with the new trend of "interdisciplinary team," "holistic approach," and "integrated approach" (Bentley, 1994; Donart, 1994). Integrated resource management is intended to bring change to current practices through a teamwork approach.

Integrated resource management (IRM) involves evaluating the entire farm and ranch operation, setting goals and identifying problems for either the entire business or a segment, and then arriving at strategies or plans for meeting

goals and solving the problems identified. The difficult area of understanding IRM for many people has been the fact that it is a concept not a program. Dr. Larry Corah described IRM as people helping people (IRM News, 1990, p.3). Washington, Idaho, North Dakota, South Dakota, and Colorado have implemented IRM programs that have resulted in cooperator ranches being established and an increased awareness of the workability of integrated management.

At the present time, Montana does not have a state coordinated IRM program in place. This study will attempt to answer the question: "Do Montana cattle producers perceive IRM competencies as having a high priority?"

Statement of Purpose

The purpose of this study was to assess the educational need for integrated resource management competencies, and to identify those competencies that are necessary to improve management of physical, biological and social resources on Montana ranches.

Need for Study

According to the 1996 Montana Agricultural Statistics, Montana is the fourth largest state in the nation with 93 million acres. Montana's 59.7 million acres of land in farms and ranches ranks second in the nation behind Texas. Rangeland and pasture account for 65.9% of the land in farms and ranches.

There are 22,500 farms and ranches occupying those 59.7 million acres. The state's cattle inventory on January 1 was 2.75 million head.

"The need for a coordinated approach to the management of renewable resources has been recognized for many years" (McLean 1984, p. 16). There are several integrated or coordinated approaches to resource management (i.e. coordinated resource management, integrated resource management, integrated crop and pest management). Integrated resource management is the coordinated development and use of natural resource areas for the sustained benefit of society. IRM has the potential to improve current management practices and outline a plan for future management that looks at the total ranching operation and not just a small section of it.

Dr. Larry Corah, Kansas State University, said IRM has two purposes, "To enhance profitability and to solve problems." (IRM News, 1990, p.3)

In 1991, there were three county IRM programs within the state of Montana. In a 1991 interview, Steve Williams, Blaine County Extension Agent said, "IRM utilizes the problem-solving approach and ranchers feel comfortable with this as they are still the final decision-maker in the whole process. IRM and ranching are a perfect match."

According to Jim Peterson, (1991), Executive Vice-President of the Montana StockGrowers Association, "IRM is struggling in Montana. No one has taken the initiative to forego a state-sponsored program. The Montana StockGrowers Association is committed to battling the political issues currently

facing Montana stockgrowers; thus they have not invested any time into promoting IRM."

How can the Montana Extension Service help landowners with integrated resource management? The Extension Service is the contact point between the land grant university and the people in the field. There is a growing need for ecological awareness of environmental problems on private land. Concerns such as water quality will have a powerful effect on private land uses, and the way that an Extension agent chooses to help private land owners respond to those concerns is going to be critical (Johnson, 1992). Extension must be more proactive in helping private landowners meet their socio-environmental challenges. However, more information is needed to determine whether ranchers are willing to utilize the integrated resource management (IRM) concept.

Objectives

To fulfill the purpose of this study, the following objectives were identified:

1. Develop a definition of integrated resource management with a panel of experts who specialize in natural resources, beef production, financial analysis, animal nutrition, and veterinary medicine.
2. Develop a list IRM educational competencies that are perceived to be important.
3. Determine the level of use of IRM competencies by cattle ranchers.

4. Determine priorities for training of IRM competencies based on weighted discrepancy scores.
5. Examine the importance of competencies based on selected demographics.

Definition of Terms

The following terms are defined in order to minimize misunderstandings:

- (1) Cattle -- refers to bovine breeds which are used strictly for meat purposes.
- (2) NCBA -- National Cattlemens Beef Association, an organization whose membership is committed to promoting the beef industry and related issues that affect cattle producers.
- (3) Educational competencies -- knowledge, skills, or attitudes required to perform a specific task.
- (4) Discrepancy score -- the difference between the level of use (importance) and the level of educational need (knowledge) given to a competency (Borich, 1980).

Assumptions

This study was based on the following assumptions:

- (1) Montana cattle operations can benefit from improved integrated resource management.

- (2) Resource management occurs in numerous ways.
- (3) Montana cattle producers have an understanding of IRM and as such can identify their own educational needs.

Limitations

The population for the study is limited to:

- (1) Montana beef cattle operations with a minimum herd size of 25 cows and sufficient resources and land to support the herd.
- (2) Ranchers who were members of Montana StockGrowers Association and in operation between November 1994 and May 1995.

CHAPTER 2

REVIEW OF LITERATURE

Studies on integrated resource management are not readily available. There are articles in which authors (MacInnes, 1984; McLean, 1984; Brown, 1984; Manning & Lavigne, 1984; Walther, 1987) have brought together a number of case studies from the timber industry versus the public. Research in the area of integrated resource management in the past has focused on "profitability and problem-solving" particularly in livestock operations. Other literature includes reports from states on the design and scope of their IRM programs.

Integrated Resource Management provides a means to evaluate and manage the broad and complex issues that are part of the business of beef production (Barao, 1991). According to an NCBA-IRM factsheet (Kniffen, 1996):

Integrated resource management will develop and facilitate programs that enhance production efficiency and provide the technology and information for producers to become better managers. This effort will promote the optimal use of natural resources, reduce unit cost-of-production and help build stronger alliances among the various segments of the beef industry. The ultimate goal is to provide an affordable product that will meet consumer demands. (p.1)

Walther (1987) stated, "integration is a process of increasing organization and order in a system" (p. 439). He also suggested that most IRM projects approach integration by improving communication and applying the concept of

cooperative decision making among "experts of sectorial interest groups" (p. 440). In general, implementation of an IRM project requires, first, the design of a framework for communication and decision making, and second, the adoption of strategies and techniques by which group decisions can be enforced.

Integrated resource management is described as people helping people. According to MacInnes (1984), "a major tragedy for integrated resource management is that too many interest groups fight most vigorously those they perceive as their most immediate competitors" (p. 14). The key to a successful multiple-use program that integrates public and private lands, lies in coordination and cooperation. McLean (1984) reported a program of integrated resource management is needed if rangelands are to be developed wisely. "For a coordinated management program to be successful, land management agencies must work with the people on the ground." (McLean, p.16).

History of Integrated Resource Management

The concept of IRM, supported by the National Cattlemen's Association and USDA, was born in a meeting of the National Extension-Industry Beef Resource Committee in 1977. The 1977 Farm Bill instructed the USDA to take the initiative in establishing coordination of State-Federal Cooperative agricultural research, extension and teaching programs, and to establish cooperative multidisciplinary research teams on major agricultural research problems (Absher, 1987). The Idaho Extension program was the first to use

IRM. In 1970, Ed Duren, one of the fathers of IRM, working with Cy Card of University of Idaho, addressed the extremely high mortality rate among newborn calves on three ranches in the proximity of Pegram, Idaho. This project known as the Pegram Project was probably the original IRM project. Corah (Integrated Resource Management, 1990) implied that this was the first structured effort involving the university, the veterinary profession and private industry as well as producers and agricultural lender groups.

Through IRM, we can coordinate the expertise needed to help producers develop a management plan that will make their beef operations more competitive in domestic and foreign markets (Wilson in IRM News, 1990).

Scope of IRM Programs in Other States

Since the Idaho program began, about a dozen states have active IRM programs. IRM is a concept, not a rigid program. Things that work in Colorado might not work in Kentucky and vice versa. As long as the program is producer driven and addresses producers' needs, it can work. (Integrated Resource Management, 1990)

Colorado began its program in 1983 and focused primarily on eight cooperator herds throughout the state. An interdisciplinary team used the herds to demonstrate ways to improve profitability for cow-calf operators.

Kentucky's IRM program is county driven. Extension personnel put together local teams, and if they are successful, then neighboring counties will put together their own teams. Kentucky first concentrated on reproduction.

Later they looked at the integrated pest management concept being used by their plant sciences colleagues at the university, and thought that concept might be useful for beef producers. Today, local teams made up of cattlemen, county agents, veterinarians, agribusiness reps and lenders work with Kentucky cattlemen on grazing, calving season and breeding projects.

Texas has several IRM approaches. One is Total Ranch Management, based on a series of three to eight day workshops that train producers in everything from goal setting to record analysis. Producers pay \$300 to \$400 for the workshops.

Another program emphasizes herd health and total management. This is a joint venture of the Texas Veterinary Medicine Association and Extension Service.

A third program is the Comprehensive Ranch Management Program, designed for South Texas. Experts from outside Extension, like pharmaceutical representatives and bankers, assist with it. Because many ranchers in south Texas receive income from fee hunting, wildlife experts are also part of the team.

Ten cooperator herds are the focus of the Kansas IRM program. A Kansas State University team studies the herds to see how management changes affect herd health and profitability.

Many states have now proven that the IRM program works and it is an opportunity for the beef cattle industry to take a gigantic step forward in being a more economically efficient industry (Corah, 1991).

Related Resource Management

Meyer (1993) remarked that agriculture is seen as a "competitor to natural resources" but not a part of it or a life supporting element (p.881). Rangeland managers need to "recognize and integrate ecological relationships in order to achieve short and long term goals" and do so without affecting "the ability of the rangelands to produce the goods and services necessary to basic needs" (Rowan & White, 1994, p. 338). The concern for rangeland, related to livestock production for human food, is well depicted by Schuster (1993):

The contribution of rangelands to the earth life support system and economic welfare of its people is tremendous. As the demand on rangeland resources escalates with increasing population pressure, the need for sustainable, multiple use management will become stronger. Socio-economic and political pressure will continue to bring about changes in range resource uses. (p. 63)

Needs Assessments and Their Value

Hudson (1988) defines a community needs assessment as a process that is used to gather information about a community's wants, desires, and resources.

According to Stufflebeam et. al (1985):

Needs assessment is a process that helps one to identify and examine both values and information. It provides direction for making decisions about programs and resources. . .Needs assessment can be a part of community relations, facilities planning and consolidation, program development and evaluation, and resource allocation. (p. xiii)

Needs assessment can be useful when educators are attempting to be responsive to changing needs.

Specifically, needs assessment is the process of defining the learner's current behavior, a desired behavior, and any factors influencing the learner's motivation and ability to traverse the gap between these two levels or types of behavior. Tyler (1971) defined needs specifically as the gap between the desired and actual behavior. Needs can be categorized and addressed as either a concept, skill or value. Concepts relate directly to the learners' thinking and understanding of the behavior and impact whether learners can move beyond the level of skill they receive in an educational setting.

Skills, the second type of needs defined by Tyler (1971), can be classified as either general or specific skills. Thus, when performing a needs assessment, one should examine specific skills and general skills.

A point made by Mims, Novak, Simpson, and Davis (1992) was that "easing the pain of adopting new technology is not easy, but careful attention to the user's needs will prevent adoption failure or sluggish adoption" (p.672).

The needs assessment model developed by Borich (1980) for training programs obtains a self evaluation of the trainee (cattle producers). The needs assessment determines "the congruence between what should be and what is ... The evaluation is complete when the training program has objectively determined the discrepancy between these two poles" (p.42). Montana StockGrowers Association members evaluate their own educational need and use of IRM, which is the "what is." The training/program goals are the "what should be."

One method of obtaining group input is the Delphi technique, which was

developed at the Rand Corporation in the 1950's. It is used to elicit and refine the opinions of a group of people. It does not require face-to-face participation, instead it introduces a panel of experts to a series of questionnaires interspersed with information summaries and feedback from preceding responses. A group decision is produced by allowing each individual the same opportunity for input.

The Delphi technique has been used to solicit expert opinions when a knowledge void exists for making decisions. Educators have applied the Delphi technique in a variety of problem-solving situations. Delphi has been suggested by Butler and Howell (1980) as a means of finding priorities within a community needs assessment project.

A major strength of the technique is the flexible time parameter that individuals have in which to respond at their convenience. This flexibility often allows person to participate who are not willing to share their time under other conditions. On the other hand, a time commitment from experts is necessary to complete the Delphi process. Delphi eliminates extreme positions and forces a middle-of-the-road consensus. Costs associated with conducting a Delphi are minimal, with mailing being the primary expense.

CHAPTER 3

METHODOLOGY

This study, classified as descriptive or survey research, was done by using a mailed questionnaire. The researcher felt this would be the most accurate and effective instrument for data collection given time and resources available for the project.

Population Description

The population for this study consisted of members of the Montana Stock Growers Association. The researcher requested and received verbal permission from Jim Peterson, Executive Vice President of the Montana Stock Growers Association to obtain a randomly sampled list of members. Names and addresses were obtained from the 1995 membership directory, which is a comprehensive list of all members.

Sample Size and Selection

Cattle producers who were active members of the Montana Stock Growers Association (MSGA) were selected for the survey. The size of the sample was determined by sampling ten (10) percent of the total MSGA membership. In a 1993 interview, Susan Wallwork, Director of Survey Research for Bureau of

Business and Economic Research, advised that 10% would provide an adequate sampling. In 1995, the total membership was 3800. Thus, the sample population was 400. The 20 extra names accounted for sampling error. Producers were separated by age, herd size, gender, and private/public land holdings.

The sample was randomly drawn at the MSGA headquarters. Sample may be biased because not all cattle producers in Montana are members of the Montana Stock Growers Association. Once the population selection procedure was secured, questionnaires were sent to the selected producers. Names remained confidential by using only numbers to identify questionnaires and were only used for follow up purposes. The survey instrument was pre-addressed and stamped so each questionnaire was returned directly to the Montana State University Agriculture and Technology Education Department.

The Instrument and Data Collection

The survey instrument was printed as a seven-page booklet (Appendix C). The back of the front cover explained (1) the purpose of the study, (2) provided directions for completing the instrument, and (3) defined terminology. The instrument had four main sections: IRM competencies (level of use and educational need), interaction with agricultural professionals, goal setting, and demographics. These areas were chosen by information gained from a panel of thirteen experts using a modified Delphi technique. A list of experts was generated and potential panelists were contacted by telephone. The list was reviewed, refined and approved by the researcher's graduate committee. A

postcard was mailed to selected panelists to ensure their participation. The panel was asked to define Integrated Resource Management in their own terminology.

After collecting the experts' responses for a definition, the researcher composed a single definition (Appendix A). This definition was then sent out to the panel for their review. At this same time, the group was asked to list ten competencies that producers should be concerned with regarding IRM.

In the first section of the questionnaire, respondents were asked to use a Likert-type scale to indicate the level of use (none to high) for 29 competencies related to integrated resource management. Responses ranged from zero (0) to seven (7). Zero (0) indicated that the producer did not use the competency and seven (7) indicated a high level of use. Participants were then asked to indicate their need for education on the 29 competencies using the same Likert-type scale. Zero (0) indicated no education needed and seven (7) indicated a high need for education. This structure was based on Borich's (1980) needs assessment model. Use ratings minus need ratings yields a discrepancy score for each competency from each respondent. The discrepancy scores are then weighted by multiplying the average level of need by the discrepancy score of each competency. Any weighted discrepancy score (WD) above zero could mean that more training on the competency would be appropriate. As reported in Kawasaki's (1994) study, the higher the positive WD of a competency, the higher the priority of training should be given that competency. The weighted discrepancy score can be used in planning future training of competencies.

The second section of the instrument dealt with level of interaction with various agriculture-related professionals. Respondents were asked to rate their level of interaction with various agriculture-related professionals. Zero (0) indicated the producer did not interact with that professional and seven (7) indicated a high level of interaction.

The third section included questions on goal setting. Two questions covered factors that influence management decisions. Three questions covered time frame for accomplishing goals, i.e., annually, five years, and long term (over five years).

Demographic questions comprised the last section. These related to education level, age, herd size, total acres, ownership status (deeded, private or public lease), and gender. Data on respondents herd size and ownership status were gathered to determine if these two factors influenced the producer's management style.

The last question allowed producers to voice their comments and/or concerns regarding integrated resource management. These responses are reported in Appendix D.

The instrument was pilot tested on 10 participants randomly selected from the Broadwater County Extension agriculture mailing list. They were not duplicated in the main population study. On January 20, 1995, a cover letter and the questionnaire were sent to the 10 selected participants. Pilot respondents were asked to return the completed survey with any comments by February 10, 1995. A follow-up was sent on February 20. Two weeks were given for the

survey to be returned.

Of the 10 pilot surveys sent, nine were returned. Reviewers were asked to evaluate the instrument for editorial or appearance changes, and to review the directions and questions for ease of response, clarity, or ambiguity. No major changes were suggested. Respondents felt the time of 30-35 minutes was sufficient or adequate for completing the survey instrument.

On March 15, 1995, the cover letter of introduction (Appendix B) and the questionnaire were sent on Agriculture and Technology Education Department letterhead bearing the signature of Van Shelhamer, Graduate Committee Chairperson and the researcher.

Due to time constraints, a postcard follow-up to non-respondents was not sent. This may have affected the overall return rate.

With spring being a busy time for cattle producers, the researcher allowed six weeks before sending a second follow-up letter and second survey instrument to those who had not yet responded. The second cover letter reminded the respondents of the questionnaire and urged them to respond through a more personal approach. All respondents were asked to return the questionnaire by the week of May 14, 1995. Response rates are shown in Table 1. Of the 400 originally mailed, 111 were returned. The second mailing was sent to 250 people and 65 returned the second survey. This resulted in a 44.0 percent return rate.

Table 1. Return Rate by date of return. (N=400)

Date Returned	Number	Number	Percent
	Sent	Returned	Returned
First Mailing	400	111	27.8
Second Mailing	250	65	26.0
Total		176	44.0

Table 2 shows that non-useable surveys constituted 13.6% of the returned surveys. Due to sampling error, a certain proportion of the sample would not meet the population criteria.

Table 2. Frequency distributions and reasons for non-useable surveys. (N=176)

Reasons	n	%*
Returned without any further information	6	24.0
Retired or sold cattle operation	15	62.5
Completed the survey but non-useable	3	12.5
Total	24	13.6**

*Percentage relative to the non-useable surveys.

**Proportion of non-useable relative to all surveys returned.

CHAPTER 4

RESULTS OF THE STUDY

The study was designed to determine the competencies and training needed by Montana cattle producers to enhance their profitability through integrated resource management. Some respondents' surveys were improperly completed, so the total number of responses for each question was not always equal to 152.

Definition of Integrated Resource Management

A group definition of integrated resource management was developed by the modified Delphi panel of thirteen experts. A list of descriptors (Appendix A) was used to form the consensus definition of integrated resource management. The consensus definition was returned to panelists for their comments. Only two suggested revisions (Appendix A) came back from the group. In reviewing the suggestions, the researcher felt these views were not shared by the whole group. The definition remained intact for the duration of the study.

The panelists' definition of integrated resource management follows:

Integrated resource management is a multidisciplinary approach to problem-solving in a livestock production system that utilizes available resources and their interactions to achieve improved economic performance while maintaining the sustainability of natural resources.

The panelists' consensus definition of integrated resource management led to the second round of the Delphi, which asked the panelists to list ten

competencies that cattle producers should be concerned with regarding IRM. A total of 67 competencies were returned by the panelists (Appendix G). The competencies were refined by the researcher. This was accomplished by identifying duplicate competencies and related competencies that could be combined. A third mailing to the panelists requested them to rank the refined competencies based on importance. Evaluations of the returns led to the final list of competencies used in section A of the questionnaire.

Demographic Data

Data arranged in Table 3 show the distribution of respondents by age. Of the 152 returned, 2 (1.3%) fall into the less than 30 years of age grouping. The highest return rate was in the 31-59 age category, 98 (64.9%) respondents. Fifty-one (33.8%) respondents were 60 years old or older.

Table 3. Distribution of age of the respondents. (N=152)

Age	n	%
under 30	2	1.3
30-39	98	64.9
Over 60	51	33.8
Missing responses	1	.01

The data represented in Table 4 are the return rates by type of education received. The bachelors degree group had the most respondents, 65 (43%). The respondents with some college education was the second highest group, 36 (23.8%). Twenty-six (17.2%) respondents hold only a high school degree.

Table 4. Distribution of degree held by the respondents. (N=152)

Degree held	n	%
Elementary	3	2.0
Some high school	2	1.3
High School	26	17.2
Some college	36	23.8
Associate	4	2.6
Bachelors	65	43.0
Masters or Doctorate	15	9.9
Missing	1	.01

The data in Table 5 indicate respondents' returns by herd size. Fifty-seven percent (n=86) of the respondents had a cattle herd ranging from 101-500 head. Of the 152 producers surveyed, 24 (15.9%) had 501-1000 cattle. There were only seven (4.6%) respondents with less than 50 head, while 23 (15.2%) had herds of 51-100.

Table 5. Distribution by herd size. (N=152)

Herd Size	n	%
less than 50	7	4.6
50-100	23	15.2
101-500	86	57.0
501-1000	24	15.9
1000+	11	7.3
Missing response	1	.01

Frequency distribution for gender shows that 136 males and 16 females completed the survey. Seventeen respondents (11%) did not own private land. Of those 17, three leased public land only. Six leased private ground and four lease both private and public land. In contrast, 133 respondents own private land. Fifty-three respondents (35%) own private land and lease both public and private land. Furthermore, 40 respondents own private land and lease public land.

Perceived Level of Educational Need

Table 6 represents data generated from ratings of educational need. The data were calculated from responses to each competency. Ratings of 0 through 7 were the choices, where 0 was "no need" and 7 was "high need." Higher mean values indicate greater need for that competency. The data were summarized for mean and standard deviation (SD). All means and SDs were truncated at two decimal places. The competencies are listed in rank order based on the mean

level of educational need.

The data in Table 6 indicate that mean of the educational need ratings by producers range from 3.54 to 1.11. The highest competency was *analyze break-even costs*, whereas the lowest need mean was for the competency *sell calves at auction yards*. The competencies with the highest need are: (1) analyze break-even costs, (2) utilize range monitoring system, (3) computerize financial and production records, (4) Match cow size to environment, (5) harvest hay at optimum production, (6) gather carcass data, and (7) vaccinate breeding cattle. These are the areas that should be given first consideration when planning educational programs. It should be recognized that these means do not indicate a high need. On the other hand, those competencies below 2.5 probably should be taught on an individual basis because, on the average, there is minimal need. These competencies include: sell calves by private treaty; keep production records on each cow; pregnancy test cows; keep health records on individual animals; weigh calves at birth and weaning; market calves via video sales; graze pastures season-long; fertilize irrigated pastures annually; and sell calves at auction yards.

Table 6. Rank order of competencies by mean level of educational need.
(N=152)

Competencies	Mean*	SD
Analyze break-even costs	3.54	2.57
Utilize range monitoring system	3.39	2.46
Computerize financial & production records	3.39	2.80
Match cow size to environment	3.02	2.57
Harvest hay at optimum production	3.02	2.29
Gather carcass data	3.02	2.56
Vaccinate breeding cattle	3.00	2.62
Use EPD's to select herd sires	2.95	2.60
Intensively graze pastures	2.87	2.41
Vaccinate calves	2.81	2.66
Pre-condition calves prior to weaning	2.80	2.59
Use forward contracts to market calves	2.79	2.61
Use Deferred grazing system	2.75	2.30
Use retained ownership	2.74	2.65
Utilize alfalfa hay as protein source	2.70	2.40
Use genetic selection to gain optimum calf weaning weights	2.70	2.50
Map out crop rotation plan	2.57	2.33
Deworm cattle annually	2.55	2.50
Regulate breeding season for uniform calf crop	2.52	2.52
Fertilize hayfields	2.51	2.43
Sell calves by private treaty	2.27	2.47
Keep production records on each cow	2.25	2.36
Pregnancy test cows	2.16	2.46
Keep health records on individual animals	2.04	2.26
Weigh calves at birth and weaning	2.02	2.19
Market calves via video sales	2.01	2.24
Graze pastures season long	1.98	2.28
Fertilize irrigated pastures annually	1.87	2.44
Sell calves at auction yards	1.11	1.72

*Based on a scale of 0 to 7.

Perceived Level of Use

Cattle producers were asked to rate their level of use on the 29 competencies on a scale from zero to seven. The competencies are in rank order based on the mean level of use. The data presented in Table 7 show that producers are managing their herds by vaccinating calves ($\bar{x}=6.62$) and breeding animals ($\bar{x}=6.18$), regulating breeding season ($\bar{x}=5.8$), and using EPD's to select herd sires ($\bar{x}=5.46$). The lowest mean was for the competency *market calves via video sales* ($\bar{x}=1.04$).

Fourteen competencies (48%) had a mean less than three(3). These results signify a low level of use by the respondents. Therefore, this information raises a question of why the competencies are not being used. In the researcher's opinion, these competencies require a higher degree of knowledge and management, except the competencies *sell calves at local auction yards* and *graze pastures season long*, which require a low level of input by the respondent. The data allow the researcher to generalize that members of the Montana StockGrower Association need to increase their knowledge base before they are willing to increase the level of use for these competencies.

Table 7. Rank order of competencies by mean level of use. (N=152)

Competencies	Mean*	SD
Vaccinate calves	6.62	1.33
Vaccinate breeding cattle	6.18	1.81
Regulate breeding season for uniform calf crop	5.8	1.71
Use EPD's to select herd sires	5.46	2.10
Use genetic selection to gain optimum calf weaning weights	5.29	2.09
Harvest hay for optimum production	5.22	1.81
Pregnancy test bred cows	5.15	2.63
Utilize alfalfa hay as protein source	4.96	2.20
Match cow size to the environment	4.77	2.16
Sell calves by private treaty	4.25	2.71
Deworm cattle annually	4.21	2.94
Use deferred grazing system	4.05	2.33
Analyze break-even costs	3.86	2.45
Fertilize hayfields	3.49	2.90
Map out crop rotation plan	3.12	2.54
Keep production records on each cow	2.83	2.94
Use forward contracts to market calves	2.8	2.91
Intensively graze pastures	2.7	2.30
Pre-condition calves prior to weaning	2.54	2.79
Graze pastures season long	2.53	2.53
Computerize financial & production records	2.48	2.89
Utilize range monitoring system	2.46	2.42
Weigh calves at birth and weaning	2.41	2.78
Fertilize irrigated pastures annually	2.2	2.89
Keep health records on individual animals	2.02	2.46
Gather carcass data	1.93	2.51
Sell calves at auction yards	1.82	2.38
Use retained ownership	1.59	2.39
Market calves via video sales	1.04	1.93

*Based on a scale of 0 to 7.

Perceived Educational Needs as Assessed by Borich's Method

Data presented in this section show the educational needs assessment results using Borich's method. For each item, weighted discrepancy scores (WD) were calculated by subtracting the educational need mean from the level of use mean, multiplying this value by the mean educational need. A positive WD score for a competency indicates the need for additional training.

Tables 8, 9, 10, and 11 show the weighted discrepancy (WD) scores for all competencies based on five major areas: Pasture and rangeland; tame forage production; livestock production and management; and financial and marketing strategy. Each table depicts the rank order of competencies for the WD score. Only eight competencies had a positive WD value.

Data in Table 8 show that *utilize range monitoring system* and *intensively graze pastures* had positive WD scores at 3.15 and 0.49, respectively. Both competencies relate to managing a natural resource. Clearly, the positive WD score indicates a priority area for training programs sponsored by the Extension Service.

Table 8. Pasture and Rangeland (N=152)

	USE	NEED	WD*
COMPETENCY	Mean	Mean	Score
Utilize range monitoring system	2.46	3.39	3.15
Intensively graze pastures	2.70	2.87	0.49
Graze pastures season-long	2.53	1.98	-1.09
Use deferred grazing rotation	4.05	2.75	-3.57

*WD = (Use - Need) x Need. WD > 0 means educational need; < 0 indicates minimal or no educational need.

Data displayed in Table 9 show that none of the tame forage production competencies have a high training priority based on the negative WD scores. One explanation for this is not all ranching operations have access to irrigated pastures or hay fields based on the land ownership data. Normally, leased public land is native rangeland.

Table 9. Tame forage production. (N=152)

Competency	USE Mean	NEED Mean	WD* Score
Fertilize irrigated pastures annually	2.2	1.87	-0.62
Map out crop rotation plan	3.12	2.57	-1.41
Fertilize hayfields annually	3.49	2.51	-2.46
Utilize alfalfa hay as protein source	4.96	2.70	-6.10
Harvest hay for optimum production	5.22	3.02	-6.64

*WD=(Use - Need) x Need. WD > 0 means educational need; < 0 indicates minimal or no educational need.

Data recorded in Table 10 show a high WD score for *computerize financial and production records* (WD=3.08), but respondents perceived the competency *analyze break-even costs on calves and cull cows* (WD=-1.13) to have a low priority. Analysis of the marketing strategy competencies in Table 10 exhibit that respondents demand more training in *market calves via video sales* (WD=1.95). One respondent commented there is a lack of market reporting on video sales. The other three competencies had a score below zero: *use forward contracts to market calves* (-0.03); *sell calves at local auction yards* (-0.79); and *sell calves by private treaty* (-4.49).

Table 10. Financial and Marketing Strategy. (N=152)

Competency	USE Mean	NEED Mean	WD* Score
Computerize financial & production records	2.48	3.39	3.08
Market calves via video sales	1.04	2.01	1.95
Use forward contracts to market calves	2.80	2.79	-0.03
Sell calves at local auction barn	1.82	1.11	-0.79
Analyze break-even costs on calves and cull cows	3.86	3.54	-1.13
Sell calves by private treaty	4.25	2.27	-4.49

*WD=(Use - Need) x Need. WD > 0 means educational need; < 0 indicates minimal or no educational need.

Table 11 data show that producers perceive a relatively low educational need for livestock production and management competencies. Only two competencies received a WD score greater than 3. They are: gather carcass data (WD=3.29) and use retained ownership (WD=3.15). On an individual basis, there may be producers who would utilize information on pre-conditioning calves and maintaining health records on individual animals.

Upon examination of data in Tables 8-11, four competencies have a WD score greater than 3.0. They are (1) utilize range monitoring system, (2) gather carcass data, (3) use retained ownership, and (4) computerize financial and production records. These competencies should receive priority when designing educational programs for cattle producers.

Table 11. Livestock production and management. (N=152)

Competency	USE Mean	NEED Mean	WD* Score
Gather carcass data on calves	1.93	3.02	3.29
Use retained ownership	1.59	2.74	3.15
Pre-condition calves	2.54	2.80	0.73
Keep health records on individual animals	2.02	2.04	0.04
Weigh calves at birth and weaning	2.41	2.02	-0.79
Keep historical production records on each cow	2.83	2.25	-1.31
Deworm cattle annually	4.21	2.55	-4.23
Match cow size to environment	4.77	3.02	-5.28
Pregnancy test cows	5.15	2.16	-6.46
Use genetic selection to gain optimum calf weaning weights	5.29	2.70	-6.99
Use EPD's in selecting herd sires	5.46	2.95	-7.40
Regulate breeding season for uniform calf crop	5.80	2.52	-8.27
Vaccinate breeding cattle annually	6.18	3.00	-9.54
Vaccinate calves seasonally	6.62	2.81	-10.71

*WD=(Use - Need) x Need. WD > 0 means educational need; < 0 indicates minimal or no educational need.

The data in Table 12 list the rank order of competencies based up on the weighted discrepancy score (WD) calculated according to herd size. The mean WD varied from 10.74 to -11.61. The higher WD scores represent priority for educational needs. In comparison of the data in Table 12, *utilize range monitoring system* competency had the only positive WD across all herd sizes. Respondents with 51-100, 501-1000, and greater than 1000 head showed the

highest need (7.07, 4.43, and 5.76, respectively) while respondents with less than 50 and 101-500 head displayed a lower educational need, 1.28 and 1.77 respectively. *Market calves via video sales* competency had one low WD score (-0.03) from respondents with 501-1000 head. The competency given the lowest rank order was *vaccinate calves seasonally*. One explanation for this is the high level of interaction with veterinarians as shown in Table 18. *Use retained ownership* had a high priority among all of the herd sizes except herds larger than 1000 head. Retained ownership can serve as a marketing strategy and also allows producers the opportunity to gather data on carcass quality.

The most important priority for producers whose herds varied from 51-100 head was *computerize financial and production records* (WD=10.74). This was closely followed by *utilize range monitoring system* (WD=7.07) and *used retained ownership* (WD=5.55). Based on a 1992 national Standardized Performance Analysis (SPA), small herds (less than 200 head of breeding cows) were the most costly. The larger herds (greater than 500 head) had the lowest cost of production. In this researcher's opinion, computerization of records will help producers measure production and financial performance and identify areas that need to be changed.

Examination of the data for herds with less than 50 head show the respondents perceived a greater educational need for the following competencies: *Pre-condition calves*(WD=5.65), *use deferred grazing rotation*

Table 12. Competencies in rank order by the mean WD for herd size. (N=152)

Competencies	WD by Herd Size				
	<50 n=8	51-100 n=23	101-500 n=86	501-1000 n=23	>1000 n=10
Pre-condition calves	5.65	3.16	-0.58	3.46	-1.08
Use deferred grazing rotation	4.48	-3.63	-3.63	-4.81	-2.98
Use forward contracts to market calves	2.24	2.50	0.18	-2.82	-0.91
Use retained ownership	2.18	5.55	2.95	2.93	-2.11
Utilize range monitoring system	1.28	7.07	1.77	4.43	5.76
Market calves via video sales	1.08	2.54	2.67	-0.03	1.57
Computerize financial & production records	0.37	10.74	4.79	-2.54	-4.95
Graze pastures season long	0.11	-1.22	-0.74	-1.41	-1.74
Map out crop rotation plan	-0.38	0.39	-2.02	-0.60	-2.88
Intensively graze pastures	-0.48	0.15	0.80	-1.07	1.81
Fertilize hay fields	-0.57	-2.39	-2.43	-2.33	-5.35
Gather carcass data	-0.85	4.41	4.03	2.93	-1.73
Fertilize irrigated pastures	-1.01	-0.63	-0.22	-1.18	-1.89
Keep health records on individual animals	-1.54	-1.48	-1.08	-0.97	0.18
Utilize alfalfa as protein source	-1.57	-7.86	-6.23	-6.66	-2.89
Sell Calves at auction yards	-1.80	-1.79	-0.75	-0.71	0.16
Harvest hay for optimum production	-2.25	-8.02	-6.23	-8.08	-8.17
Pregnancy test cows	-2.56	-3.48	-7.43	-5.63	-9.82
Analyze break-even costs	-2.66	0.73	-0.49	-1.79	-8.36
Weigh calves at birth & weaning	-3.06	-0.02	-0.48	-1.02	-2.10
Sell calves by private treaty	-3.50	-3.57	-4.26	-4.98	-6.36
Keep production records on each cow	-4.57	-1.94	-1.08	-0.97	-0.20
Match cow size to the environment	-4.73	-5.15	-5.14	-5.12	-8.13
Deworm cattle annually	-4.89	-2.69	-4.42	-3.36	-6.03
Use EPD's to select herd sires	-5.43	-8.02	-7.50	-7.53	-5.73
Use genetic selection to gain optimum calf weaning weight	-5.87	-7.82	-7.15	-6.55	-4.64
Vaccinate cattle annually	-7.00	-7.39	-10.22	-8.49	-11.53
Regulate breeding season for uniform calf crop	-7.22	-8.35	-8.92	-5.66	-9.54
Vaccinate calves seasonally	-8.45	-9.74	-10.97	-10.32	-11.61

*WD > 0 means educational need; < 0 indicates minimal to no educational need.

(WD=4.48), *use forward contracts to market calves* (WD=2.24), *use retained ownership* (WD=2.18), *utilize range monitoring system* (WD=1.28), and *market calves via video sales* (WD=1.08). The lowest ranked competencies for educational need among this group was *regulate breeding season for uniform calf crop* and *vaccinate calves seasonally*.

Data represented in Tables 13 - 16 list the top seven competencies according to degree of education. The interpretation of the data focuses on the top seven because these competencies consistently had a positive WD score.

Results in Tables 13 and 14 show that five competencies were ranked by all producers to be in the top seven educational priorities. Data revealed that producers with a Masters or Doctorate degree perceived noticeably greater educational needs than producers with a Bachelors degree, even though both groups ranked the same competencies as their top three: (1) *gather carcass data*, (2) *utilize range monitoring system*, and (3) *use retained ownership*. One example is *gather carcass data* had a WD score of 11.73 for respondents with Masters and Doctorate degrees, and only 2.23 for respondents with Bachelors degree. Members of Montana StockGrowers Association who have a Bachelors degree perceive their educational need to be low.

Comparison of the data in Tables 15 and 16 show the same four competencies receiving priority status. Respondents from these categories (high school degree and some college) perceived an educational need for *computerize financial and production records*, *use retained ownership*, *gather carcass data*,

and *market calves via video sales*.

In summary, three competencies are perceived to be priority educational needs by all education categories: *gather carcass data*, *used retained ownership* and *market calves via video sales*.

Table 13. Competencies in rank order for respondents with Masters and Doctorate degrees. (N=15)

Competency	WD
Gather carcass data	11.73
Utilize range monitoring system	8.68
Use retained ownership	8.52
Computerize financial & production records	5.45
Use forward contracts to market calves	4.72
Market calves via video sales	3.99
Keep production records on each cow	2.40

*WD > 0 means educational need; < 0 indicates minimal to no educational need.

Table 14. Competencies in rank order for respondents with Bachelors degree. (N=65)

Competency	WD
Utilize range monitoring system	5.30
Gather carcass data	2.23
Use retained ownership	1.86
Market calves via video sales	1.52
Intensively graze pastures	0.95
Keep health records on individual animals	0.63
Use forward contracts to market calves	0.19

*WD > 0 means educational need; < 0 indicates minimal to no educational need.

Table 15. Competencies in rank order for respondents with some college education. (N=36)

Competency	WD
Computerize financial & production records	6.05
Use retained ownership	4.21
Gather carcass data	2.50
Market calves via video sales	1.80
Analyze break-even costs	1.61
Pre-condition calves	1.42
Use forward contracts to market calves	0.74

*WD > 0 means educational need; < 0 indicates minimal to no educational need.

Table 16. Competencies in rank order for respondents with high school degree. (N=26)

Competency	WD
Computerize financial & production records	6.48
Gather carcass data	2.26
Use retained ownership	1.88
Market calves via video sales	1.52
Utilize range monitoring system	1.17
Intensively graze pastures	-0.03
Sell calves at auction yards	-0.43

*WD > 0 means educational need; < 0 indicates minimal to no educational need.

Interaction with Professionals

This section is representative of the respondents' interaction with various experts as revealed by the data in Table 17. The respondents rated their level of interaction with each agriculture-related expert based on a scale from 0 to 7.

Zero depicted no interaction and seven related a high level of interaction. A high value designated a willingness to receive outside advice.

As shown in Table 17, respondents from all herd sizes have a high level of interaction with veterinarians ($\bar{x}=5.57$), but revealed a low level of interaction with private consultants ($\bar{x}=0.98$), university agronomists ($\bar{x}=0.97$), and agricultural education teachers ($\bar{x}=0.87$). When asked to rate their level of interaction with county extension agents, some respondents commented that they did not have a county extension agent. The researcher assumes this is the reason extension agents did not rank higher. Professionals with an interaction mean less than 2 included university-based specialists, as well as agricultural education teachers. Based on the low interaction mean, the researcher feels that university-based specialists are perceived to be either inaccessible or not valuable by the respondents. Example is the private industry nutritionist (mean of 2.52) ranked higher than the university nutritionist (mean of 1.42).

Examination of Table 17 reveals the top six agricultural professionals are associated with either giving or taking money from cattle producers. This explains their high interaction means ($\bar{x}=5.57$ to 3.31). The next group of six professionals with interaction means from 2.86 to 2.09 were people who may provide service to those seeking information. The last grouping of seven professionals, with the exception of the A.I. technician, are educators with limited opportunities for respondent interaction.

The Soil Conservation Service (NRCS), who ranked fifth among the agricultural professionals, serves as the technical advice agency for USDA farm

payment programs. Thus, if a rancher accepted a loan for range improvements, he or she must work with one of the NRCS subject-matter specialists.

In comparing herd sizes, the data in Table 18 indicate a higher level of interaction with professionals by respondents with larger cattle herds.

Veterinarians ranked high among all herd sizes. In contrast, the agricultural education teachers were not seen as experts in the agriculture field. One explanation for this is agricultural education teachers work primarily with youth.

Table 17. Interaction with agricultural professionals. (N=152)

Professionals	Mean by Herd Size
	Mean
Veterinarian	5.57
Accountant	4.65
Brand Inspector	4.61
Fertilizer representative	3.73
Soil Conservation Service	3.42
Bank Loan Officer	3.31
County Extension Agent	2.86
Nutritionist (private industry)	2.52
Chemical representative	2.39
Pharmaceutical representative	2.22
Breed representative	2.12
Financial planner	2.09
State Extension Beef Specialist	1.44
Nutritionist (university)	1.42
A.I. technician	1.41
State Extension ag economist	1.39
Private consultant	0.98
University agronomist	0.97
Agricultural education teacher	0.87

Table 18. Rank order of professionals by interaction mean for herd size comparison. (N=152)

Professionals	Mean* by Herd Size				
	<50 n=8	51-100 n=23	101-500 n=86	501-1000 n=23	>1000 n=10
Veterinarian	4.88	5.91	5.57	5.38	5.8
Accountant	3.38	4.04	4.88	4.63	5.1
Brand Inspector	3.63	5.00	4.44	4.71	5.7
Fertilizer Representative	2.75	3.52	3.78	3.50	5.1
Bank Loan Officer	1.00	2.83	3.75	2.25	5.1
Soil Conservation Service (NRCS)	2.63	3.39	3.49	3.13	4.3
County Extension Agent	3.00	2.91	2.98	2.08	3.5
Chemical Representative	1.00	2.04	2.68	1.83	3.2
Nutritionist (private industry)	2.00	2.43	2.39	2.79	3.6
Financial Planner	1.75	1.30	2.39	1.46	3.2
Pharmaceutical Representative	2.00	1.52	2.26	1.96	4.3
Breed Representative	1.13	2.56	2.22	1.79	1.8
University nutritionist	0.38	0.74	1.61	1.75	1.5
State Extension Beef Specialist	1.63	0.91	1.53	1.29	2.1
State Extension Ag Economist	0.38	1.48	1.51	1.17	1.5
A.I. Technician	2.75	0.96	1.41	1.13	2.1
University Agronomist	0.13	0.91	1.00	0.88	1.8
Private Consultant	0.13	0.61	0.98	0.96	2.6
Agricultural Education Teacher	0.25	1.00	0.78	0.92	1.8

*Based on scale from 0 (no interaction) to 7 (high interaction).

Perceptions towards Goal Setting

Data in Table 19 show that annual (76.5%) and long-term goals (75.8%) are important to ranchers; however, five-year goals (46%) tend to be less

significant to the respondents for total ranch management. Seventy-seven respondents (52%) said public access did influence their management decisions. In contrast, 83 (56%) respondents said wildlife populations influenced their management decisions.

Table 19. Respondents' perceived attitudes on goal setting for ranch management. (N=152)

Management factors	n*	Frequency Distribution			
		Yes	%	No	%
Set production goals annually	149	114	76.5	35	23.5
Set productions goals for a 5-year period	147	68	46.0	79	54.0
Set long term goals for ranch production	149	113	75.8	36	24.2
Wildlife populations influence management decisions	149	83	56.0	66	44.0
Public access influences management decisions	149	77	52.0	72	48.0

*N does not equal 152 due to missing responses.

Upon concluding the questionnaire, respondents were given the opportunity to make comments. Responses are listed in Appendix D. One respondent wrote "I'm very interested and have contacted NCA for the workbooks. They sent them but no one is really qualified that I know to help me fill them out."

CHAPTER 5

CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to assess the educational need for a statewide IRM program, and to identify those competencies that are necessary to improve management of physical, biological and social resources on Montana ranches.

To fulfill the objectives of the study, a panel of experts defined integrated resource management and listed competencies relevant to IRM. Ranchers who were members of the Montana Stock Growers Association were then surveyed to determine the:

- (1) Perceived level of use of selected competencies needed for integrated resource management;
- (2) Perceived level of educational need of selected competencies for integrated resource management;
- (3) Priority for training of competencies based on the weighted discrepancy score;
- (4) Differences within selected demographic factors influenced the mean weighted discrepancy score.

Conclusions

The results of this study should not be generalized beyond the members of the Montana Stock Growers Association. The following conclusions have been drawn based on the objectives and data analysis:

- (1) Based on the results of the modified Delphi technique, integrated resource management was defined as a multidisciplinary approach to problem-solving in a livestock production system that utilizes available resources and their interactions to achieve improved economic performance while maintaining the sustainability of natural resources.
- (2) Montana stock growers perceived that there were educational needs for the competencies: *gathering carcass data*, *market calves via video sales*, *utilize range monitoring system*, and *use retained ownership*. This is based on the weighted discrepancy scores for degree of education and herd size.
- (3) There is a need to target educational sessions to a specific audience. Educational needs are dependent upon the producer's degree of education and herd size. Training sessions need to be developed for each level because of the reported difference in the ranked competencies.
- (4) Management decisions are influenced by annual production goals and long-term production goals, and not as much by 5-year goals. Furthermore, wildlife populations and public access slightly influence the overall management decisions.

- (5) Based on information in Tables 17 and 18, producers are willing to accept advice from agriculture-related professionals to assist them in their management decisions.

Implications

Data collected during this study permitted the researcher to extract the following implications:

- (1) It appears that younger people, under the age of 30 years, are a minority in the ranching population.
- (2) Based on comments made by some respondents, Montana Extension Service is not accessible to all cattle producers. To fill that information gap, they turn to other professionals for advice.
- (3) It appears that agricultural education teachers need to get more involved with producers. They are not perceived as an expert in this area.

Recommendations

As a result of this study, the following recommendations are offered:

- (1) Based on the data in Chapter 4, state extension specialists and county extension agents should help coordinate experts in the field to apply IRM competencies in the effort to strengthen the sustainability of Montana ranchers.

- (2) Under the IRM concept, Montana Extension Service (MES) should provide education to cattle producers on carcass data in relation to herd management and marketing.
- (3) Based on the IRM concept, MES should provide more educational opportunities that address the needs identified within a specific demographic category.

Recommendations for Further Study

- (1) Research should be conducted on a larger group of producers, not just members of MSGA, to better understand their perceptions of IRM and educational need.

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APPENDICES

APPENDIX A
DEFINITION OF INTEGRATED RESOURCE MANAGEMENT

COMPILED DEFINITION:

Integrated Resource Management is a multidisciplinary approach to problem-solving [in a livestock production system] that utilizes available resources and their interactions to achieve improved economic performance while maintaining the sustainability of natural resources.

LIST OF DESCRIPTORS:

Management paradigm	maximization of marginal returns
physical, biological and social resources	physical, biological and economic interactions
available resources	optimize productivity
desired goal	maximize profitability
interaction	optimizing net returns
selected management options	technological, financial, legal, and managerial expertise
unlimited resources	obtain some goal or objective
balanced management strategies	improve and maintain production and profitability
network	improve production efficiency
diverse resource management team	multi-subject matter effort
comprehensive agricultural plan	increase economic return
utilize available inputs	enhance production
multidisciplinary	all inclusive management methodology that integrates all of the ranch's resources
problem-solving	
maximize production/profit	
maintaining the sustainability of natural resources	
enhance the competitiveness, efficiency and profitability of the enterprise	

SUGGESTED REVISIONS TO IRM DEFINITIONS:

1. Strike improved. We are currently in upswing of cattle cycle and prices are expected to decline \$0.10 to \$0.20 in the next few years. Will " improved" economic performance result from IRM concept. Should say something like "maximize potential economic returns."
2. Delete "in a livestock production system".

APPENDIX B
COVER LETTERS


Department of Education

Agricultural and Technology Education
 Cheever Hall
 MSU • Bozeman
 Bozeman, MT 59717-0374
 Telephone (406) 994-3201
 Fax (406) 994-6696

March 15, 1995

Dear Agricultural Producer:

As a graduate student in Agriculture Education at Montana State University, I am conducting a study to determine the agricultural producer's attitudes and perceptions towards Integrated Resource Management (IRM). Realizing that the busy season is already upon us, I hope you will be able to take 10-15 minutes to complete and return the enclosed questionnaire.

It is my intent in determining what livestock producers want for educational programs in Integrated Resource Management. By knowing your educational needs the MSU Extension Service can better meet your needs.

Your response to this questionnaire will be recorded by number only, with individual responses kept in strict confidence. The code number on the top of the survey is used for follow-up purposes and encoding information only. Please feel free to add any additional comments that you feel may be important.

I want to thank you in advance for your prompt, honest responses. Please return the completed questionnaire by taping it shut so the return address, and stamp are visible and mail by April 7.

Thank you again for your valuable time and assistance.

Sincerely,

Virginia Knerr
 Graduate Student

A handwritten signature in cursive script, appearing to read "Dr. Van Shelhamer".

Dr. Van Shelhamer
 Committee Chairman

Encls.


Department of Education

Agricultural and Technology Education
 Cheever Hall
 MSU • Bozeman
 Bozeman, MT 59717-0374
 Telephone (406) 994-3201
 Fax (406) 994-6696

April 10, 1995

Dear Agricultural Producer,

About four weeks ago you should have received, I hope, a questionnaire from me to be completed by yourself responding to your perceptions towards Integrated Resource Management activities. Perhaps you have completed it or it may have gotten buried on your desk; any number of things could have happened. Just in case it was misplaced, I have enclosed another questionnaire.

I am writing to you again because your response is necessary for me to complete my professional paper which is a major part of my graduate program. Also, you are part of a small sample of producers chosen to represent the cattle industry in Montana and that makes your participation in this study even more important.

If you have not already done so, please take 10 minutes to fill out the enclosed questionnaire and return it. All questionnaires must be returned by May 8, 1995 to be included in the study.

Your cooperation is greatly appreciated.

Sincerely,

Virginia Knerr
 Graduate Student

Dr. Van Shelhamer
 Committee Chairman

APPENDIX C
SURVEY INSTRUMENT

**A NEEDS ASSESSMENT OF INTEGRATED
RESOURCE MANAGEMENT ACTIVITIES AS
PERCEIVED BY MONTANA CATTLE
PRODUCERS**



AGRICULTURAL EDUCATION PROGRAM

MONTANA STATE UNIVERSITY

BOZEMAN, MONTANA

The purpose of this research project is to determine how Integrated Resource Management (IRM) activities are perceived by cattle producers in Montana.

As a research participant, you will be asked to do four things. First, you will be asked to rate your usage of an agricultural practice using a scale of 0 to 7 (with 7 being intensive use). Second, you will be asked to indicate your need for further or additional education before you would use the practice listed. And third, you will be asked to rate your interaction with various agriculture professionals. Lastly, you will be asked to describe yourself through the use of demographic information.

In completing this survey, you may wish to refer to the definitions and examples below.

IRM - a multi-disciplinary approach to problem-solving in a livestock production system that utilizes available resources and their interactions to achieve economic performance while maintaining sustainability of the natural resources.

No Use - less than 5% usage in a year.

Intensive Use - 90 to 100% usage in a year.

No Educational Need - do not need or want additional education on a particular practice.

High Educational Need - this rating means that you definitely would like to receive additional education related to more efficient use of the practice mentioned.

Part A: Listed below are practices involved with ranching. Please use the two scales to best describe how you utilize each one and then if you need additional training or education to help you better understand/utilize the practice. Please circle the appropriate rating.

	SCALE #1	SCALE #2
	Level of Use	Educational Need
	None Int	None High
1. Intensively graze pastures/rangeland.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
2. Use deferred grazing rotation.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
3. Graze pasture/rangeland season-long.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
4. Utilize range monitoring system.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
5. Harvest hay for optimum production.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
6. Utilize alfalfa hay as a protein source.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
7. Map out crop rotation plan for hayfields or pastures.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
8. Irrigated pastures are fertilized annually.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
9. Hayfields are fertilized annually.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
10. Breeding cattle are vaccinated yearly.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
11. Vaccinate calves at branding.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
12. Cattle are dewormed annually.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
13. Calf weights taken at birth and weaning.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
14. Historical production records kept on each cow.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
15. Breeding season regulated for uniform calf crop	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
16. EPD's used in selecting herd sires/bulls.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
17. Match cow size to the type of environment. . .	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
18. Pre-condition calves 21 days prior to weaning .	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
19. Keep health records on individual animals . . .	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
20. Pregnancy test cows.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
21. Use genetic selection to gain optimum calf weights.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
22. Gather carcass data on calves occasionally . .	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
23. Analyze break-even costs on calves and cull cows.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
24. Use forward contracts to market calves.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
25. Calves are sold at local auction barn.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
26. Market calves through video sales.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
27. Calves are sold privately.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
28. Use retained ownership.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
29. Financial & production records are computerized.	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7

Part B: In this section, please describe your level of interaction with various professionals related to the agriculture industry based on a scale from 0 (no interaction) to 7 (high interaction). Please circle the appropriate number.

30. Veterinarian.	0	1	2	3	4	5	6	7
31. A.I. Technician.	0	1	2	3	4	5	6	7
32. Nutritionist (private industry)	0	1	2	3	4	5	6	7
33. Nutritionist (university)	0	1	2	3	4	5	6	7
34. State Extension Beef Specialist. ...	0	1	2	3	4	5	6	7
35. Financial Planner.	0	1	2	3	4	5	6	7
36. Bank Loan Officer.	0	1	2	3	4	5	6	7
37. Accountant.	0	1	2	3	4	5	6	7
38. Extension Ag Economist.	0	1	2	3	4	5	6	7
39. County Extension Agent.	0	1	2	3	4	5	6	7
40. Agricultural Educ. Teacher.	0	1	2	3	4	5	6	7
41. University agronomist.	0	1	2	3	4	5	6	7
42. Soil Conservation Service.	0	1	2	3	4	5	6	7
43. Brand Inspector.	0	1	2	3	4	5	6	7
44. Fertilizer Representative.	0	1	2	3	4	5	6	7
45. Pharmaceutical Representative. ...	0	1	2	3	4	5	6	7
46. Chemical Representative.	0	1	2	3	4	5	6	7
47. Private consultant.	0	1	2	3	4	5	6	7
48. Breed Representative.	0	1	2	3	4	5	6	7
49. Other _____	0	1	2	3	4	5	6	7

Part C: Goal setting can be an important part of overall ranch management. Please answer the following questions by placing a check on the appropriate line.

50. Do you set production goals annually for the ranch? ☐ YES ☐ NO
51. Do you set production goals for a five year period? ☐ YES ☐ NO
52. Do you set long-term goals as a focus for ranch production? ☐ YES ☐ NO
53. Do wildlife populations influence your management decisions? ☐ YES ☐ NO
54. Does public access influence your management decisions? ☐ YES ☐ NO

CONTINUE ON NEXT PAGE

DEMOGRAPHICS

Please be assured that the information you provide in this part of the survey instrument will be used only for group responses to analyze data based on similar characteristics. Your name will not be associated with this study or with any final report.

Please answer the following questions:

WHICH ONE OF THE FOLLOWING CATEGORIES BEST DESCRIBES YOUR HIGHEST LEVEL OF EDUCATION:

- | | |
|--|--|
| 1. ☐ ELEMENTARY GRADUATE | 5. ☐ ASSOCIATE DEGREE |
| 2. ☐ SOME HIGH SCHOOL | 6. ☐ BACHELOR DEGREE |
| 3. ☐ HIGH SCHOOL GRADUATE | 7. ☐ MASTERS DEGREE |
| 4. ☐ SOME COLLEGE | 8. ☐ Ph D |

WHAT IS YOUR AGE?

- | | |
|--|---|
| 9. ☐ Less than 30 years | 12. ☐ 50 to 59 years |
| 10. ☐ 30 to 39 years | 13. ☐ Over 60 years |
| 11. ☐ 40 to 49 years | |

14. What is the approximate size of your ranch? _____ ACRES

15. Do you own the land? ☐ YES ☐ NO

16. Do you lease private land? ☐ YES ☐ NO

17. Do you lease public land? ☐ YES ☐ NO

18. Do you manage the land for someone else? ☐ YES ☐ NO

19. Are you: ☐ Female ☐ Male

Additional comments:

Super Job! Thank you for your assistance with this study. When you have completed the study, please close the study, tape it shut and mail it.

APPENDIX D
RESPONDENTS' COMMENTS

The reason I marked the "Educational Need" so high consistently is because I feel we never know it all and can always stand to learn more. I'm interested in becoming more involved in IRM.

I am usually done calving in a 6 week period. We run from 98% to 100% calf crops. Most years 100%. I have worked for 30 years on the fertility of the herd.

Run cows out on shares, also pasture my own cows on 78 acres under irrigation.

I would like to see the results of your survey. I have been out of town on assignment so I apologize for being late. I hope this is still of value.

Sorry this is late. It got buried under calving records!

We are not a real ranch operation. But keep a few stock cows to utilize our grass land that is not farmable for crops. My husband says it is my hobby and pets!

Weed control is essential without it you're going broke.

It is great to see that the people of Montana are still respected and treasured for their opinions. Thank you.

450,00 acres: 50% deeded, 40% Indian & tribal leases, and 10% state & federal leases.

Might need more education on how to inform the public we are concerned about the well being of our resources. Being a high debt farmer/rancher, I am concerned some management moves are sacrificed for lack of funds. Range management is a practice of well-off managers.

I own this ranch but I have a ranch manager run the operation.

We run our cattle with family's on an open range area until calving, when they're brought to "our place" of 300 acres with 40 acres owned by us personally. We annually calve out 300+ cows, 60 which we own.

We have taken over a ranch from my father-in-law in the last 4 years and need information on every aspect of the business.

Have been ranching for over 50 years. My husband's family has been on this ranch since 1910.

We have integrated the grazing of Angora goats for noxious weed control, which works super on leafy spurge. Also, it has raised the profitability off pastures where dense weed infestation occurred. We and 2 other ranches joining, use the Savory Method, modified and monitored closely. USDA-APHIS have worked with us on this project using the *Apthona* flea beetle. Economic returns on spurge utilization is remarkable!!!

There is a need for educational programs on using futures and options for hedging.

*Item 26. There is a lack of market reporting on video sales.

This questionnaire will not accomplish what you want it to. You must explain IRM more thoroughly, especially its relationship to SPA. Every rancher could benefit from IRM. Cost analysis and enterprise accounting are difficult. Most of us haven't take the time to do a good job of critically looking at our operation and planning for the future.

We do not show a great need for education in many areas of the first section of this survey because many of our sources of information are already in place and being utilized such as veterinarian, SCS, private agronomist, banker, etc.

Live in county without extension agent.

We are in an area of high land prices and a push is in progress to develop homesites in all rural areas.

Own some and lease some ground.

Less bureaucrats at any level or capacity would be welcome!

Weather seems to control almost all goals. Past experience, not to make too many expensive mistakes. Marketing is a problem. The up's and down's are volatile and unpredictable week to week. What works one year doesn't the next year.

No one in the state that I know of is pushing IRM. I'm very interested and have contacted NCA for the workbooks. They sent them but no one is really qualified that I know to help me fill them out.

If it wasn't for my wife working, me driving school bus and an outfitting business, I would be out of the cow business.

A nice survey -- not too complex or cumbersome. Thanks.

Purebred operation with some sheep.

Very few college or experiment station projects are workable on a self supporting cattle ranch. They waste a lot of taxpayers money.

Write-in responses for Question 49 that asked for other professionals not listed.

Range consultant

Wife

Pharmacist at local drug store in charge of animal drugs, etc

CSU staff

Cattlefax

Printed articles

Neighbor

Forest Service & BLM

Other ranchers

Minister

State Forestry

Computer rep

Farm Credit

APPENDIX E

COVER LETTERS TO DELPHI PANEL OF EXPERTS

November 12, 1992

FIELD(First Name) FIELD(last Name)
FIELD(Address 1?)
FIELD(Address 2?)
FIELD(Address 3?)
FIELD(city), FIELD(state) FIELD(zip code)

Dear Dr. FIELD(last name):

Thank you for your willingness to participate in the integrated resource management (IRM) study to determine the definition and concepts of IRM. The portion of the study with which you will be involved concerns the generation of a definition for IRM and the determination of standards and competencies that form the framework of IRM.

Your expertise is needed for the following phases of the study:

Phase 1: Defining integrated resource management.

Phase 2: Consensus on the definition and listing competencies which you believe to be necessary components of each subject included in the definition from Phase 1.

Phase 3: Ranking of the competencies based on importance.

These phases will be carried out over the next two months. The final phase of the study will be a questionnaire mailed to beef producers in Montana for their input. This will take place after the first of January.

Enclosed is a form that you may use to provide me with your definition of integrated resource management. After defining integrated resource management, please return the completed form in the self-addressed, stamped envelope by November 24. The return of your definition will constitute the first phase of the study.

Your participation in the panel is appreciated.

Sincerely,

Virginia L. Knerr
MSU Graduate Student

October 16, 1992

First Name- Last Name-
Address 1-
Address 2-
City-, State- Zip Code-

Dear Dr. Last Name-:

I am a graduate student at Montana State University nearing completion of my master's degree. I am interested in determining the standards and concepts of integrated resource management (IRM) to develop a program unique to Montana. Because of your expertise in Area-, you have been identified by your peers to serve on a panel to define and determine the concepts of integrated resource management.

The method to be used in this study is the Delphi technique. The Delphi group process utilizes written responses of experts regarding the research question. Delphi is a tool to aid understanding or decision-making. The responses of this panel will remain anonymous.

Your expert assistance is needed in the initial phase of defining integrated resource management and identifying educational competencies which are essential to understanding and implementation of an IRM program. The next step will be consensus building, with regards to definition and educational competencies.

The tasks requested of you should not require more than two - three hours out of your busy schedule over the next couple of months.

Will you assist me in completing my advanced degree by participating in this educational study? A postage paid, self-addressed postcard is enclosed for your response. The initial questionnaire will be mailed upon receiving your acceptance.

Thank you.

Sincerely,

Virginia L. Knerr, MSU Graduate Student

September 16, 1993

First Name- Last Name-
address 1-
address 2-
city-, state- zip code-

Dear first name- last name-:

I want to thank you for helping with the first round of defining integrated resource management (IRM). I am sorry for the delay in getting back to you, but I am back in the swing of things and ready to proceed with the study.

I have analyzed the content of the returned definitions and am ready to continue with the next phase of the project. During the analysis, several key words were observed in the majority of definitions. The resulting definition is enclosed for your review along with your definition and a list of descriptors derived from all of the definitions.

In this phase of the study, I am asking you to review the definition and list ten competencies (knowledge, skills or attitudes) that you feel should be an important part of IRM. Please write your competencies on the enclosed instrument. In considering the important task in front of you, I am requesting your returned responses by October 4, 1993.

I would like to take this opportunity to express my sincere appreciation for your continuous support of this study. My next mailing, about October 15, will include a list of the competencies for your rating. Once again, thank you very much for your time and effort.

Sincerely,

Virginia Knerr
MSU Graduate Student

APPENDIX F
DELPHI PANEL INSTRUMENTS

MONTANA INTEGRATED RESOURCE MANAGEMENT PANEL

_____ YES, I accept the nomination and look forward to
serving on the panel.

_____ NO, At this time I am unable to accept the
nomination.

First Name- Last Name-
Address 1-
Address 2-
City-, State- Zip Code-

Signature

Thank you for the prompt return.

FIRST QUESTIONNAIRE

Please submit your definition of integrated resource management (IRM) in the space provided below.

DEFINITION OF INTEGRATED RESOURCE MANAGEMENT:

Dick Raths, DVM
Lewistown Veterinary Service
Route 3
Fairgrounds Road
Lewistown, MT 59457

Signature

**INTEGRATED RESOURCE MANAGEMENT
DEFINITION APPROVAL AND COMPETENCY LISTING**

Compiled Definition Okay? ____YES ____NO

If No, write in your suggested revision to the definition: _____

List ten (10) competencies (knowledge, skills, or attitudes) that producers should possess to manage an IFM program effectively. [i.e. Identify sources of water pollution and contamination and suggest methods of prevention and correction.]

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Thank You

APPENDIX G
DELPHI PANEL LIST OF COMPETENCIES

IRM Competencies Identified by Delphi Panelists

1. Multi-disciplinary
2. Maintaining the sustainability of natural resources
3. Optimize productivity
4. Human resources
5. Planning
6. Setting goals and objectives
7. Ecologically sound
8. Profitable
9. Interactions and interaction effects
10. Ecology
11. Ability to make correct economic decisions
12. Must be observant as to what is happening to the land
13. Ability and willingness to work with others on problem solving.
14. A desire to learn from reading, attending meetings, media, etc.
15. Be able to see the big picture and not be side tracked by the details.
16. Ability to set goals
17. Ability to set priorities
18. Ability to get things done once goals are set
19. Be aware of surroundings outside the ranch and public attitudes.

20. Practical "hands on" experience
21. Record keeping skills -- including financial and production records.
22. Awareness of historical data in the region and on the ranch.
23. The ability to evaluate solutions.
24. The ability to recognize slight differences and analyze why they might occur.
25. Openness to evaluation by peers.
26. Long term goals
27. Environmental sensitivity
28. The ability to verbalize or describe goals, problems or results.
29. The desire to improve
30. Commitment
31. Attitude - to recognize problems with the production system; to segmentally analyze the problems and then evaluate all the pieces to the whole system.
32. Attitude - to be concerned with public perception of agriculture (livestock rearing and land stewardship) and its end product = FOOD. (A good defense is a strong offense)
33. Skills & Knowledge - Forage and soils
34. Knowledge - water - forage and livestock requirements - legalities.
35. Skills & knowledge - animal health - prevention and proper treatment.
36. Animal nutrition
37. Knowledge - carcass and feedlot performance of your livestock.
38. Knowledge - production economics

39. Knowledge - environmental - potential pollutants to soil, water, air, & drug/pesticide residues in carcass.
40. Attitude - know when to ask for expert help ie. CPA, Co. Agent, Nutritionist, Agronomist, Veterinarian.
41. A working understanding of a financial record keeping system.
42. A working understanding of a production record keeping system.
43. A working knowledge of a performance record keeping system.
44. A method of obtaining the best information possible
45. A willingness to change (provided it can be justified economically).
46. Open-mindedness
47. Ability to inventory available resources
48. A working knowledge of team-building techniques
49. An understanding of problem-solving techniques.
50. A working knowledge of standardized performance analysis (SPA).
Side comment: Could probably just list RECORDS 10 times
51. Thorough knowledge of animal biology
52. Knowledge of interaction of grazing animal and ranch ecosystem.
53. Keen observational skills
54. Logical thought processes
55. Environmental sensitivity
56. Knowledge of information resources
57. Livestock husbandry skills
58. Accurate and complete record systems

- 59. Market sensitivity
- 60. Ability to historically analyze and "measure the progress" of the operation both physically and financially.
- 61. Ability to prepare and interpret financial statement.
- 62. Good understanding of marketing "system" and how to utilize all aspect as necessary -- futures, options, contracting, auctions, etc.
- 63. Understanding global markets
- 64. Understanding supply and demand issues.
- 65. Ability to understand and interact with agriculture policy issues: current and future.
- 66. Establish and maintain for themselves an educational program on various topics. Attend meetings, read, call Extension, etc.
- 67. Overall -- the ability to manage, not necessarily do most or all of the day-to-day physical work.