

1-1-1990

A needs assessment of Extension horticulture clients related to educational delivery methods and based on ornamental grass experimental studies

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A needs assessment of Extension horticulture clients
related to educational delivery methods and
based on ornamental grass experimental studies

by

Roger Graham Roe

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

Department: Agricultural Education and Studies
Major: Agricultural Education
(Agricultural Extension Education)

Signatures have been redacted for privacy

Iowa State University
Ames, Iowa

1990

TABLE OF CONTENTS

	<u>Page</u>
CHAPTER I. INTRODUCTION	1
Statement of the Purpose of the Study	5
Objectives of the Study	5
Statement of Assumptions and Limitations	6
Research Questions	7
Definition of Terms	7
CHAPTER II. REVIEW OF LITERATURE	9
Ornamental Grasses	9
Extension Education Delivery Methods	14
Recommended Procedures for Conducting a Needs Assessment	21
Summary	33
CHAPTER III. METHODS AND PROCEDURES	35
Population and Sample	35
Development of Instrument	37
Data Collection	38
Coding of Data	39
Analysis of Data	39
Ornamental Grass Studies	40
Ornamental grass study	40
Ornamental grass field trial	42
Ornamental grass container overwintering trial	43
Summary	44

	<u>Page</u>
CHAPTER IV. FINDINGS AND DISCUSSION	46
Reliability and Limitations of the Survey	46
Audience Characteristics	47
Needs Assessment	51
Analysis of Relationships	57
Survivability of Ornamental Grasses	61
Ornamental grass study	61
Ornamental grass field trial	63
Ornamental grass container overwintering trial	64
Major Findings	66
CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	68
Summary	68
Conclusions	70
Demographic data	70
Needs assessment	70
Ornamental grasses	72
Recommendations	72
Bulletin format	73
Future research questions	75
BIBLIOGRAPHY	77
ACKNOWLEDGMENTS	80
APPENDIX	81
Additional Tables	82
Citation of Scientific Names	84
Cover Letter	86
Questionnaire	87
Human Subjects Research Approval Form	91

LIST OF TABLES

	<u>Page</u>
Table 1. Population of respondents' place of residence	48
Table 2. Years of schooling in horticulture	48
Table 3. Age of respondents	49
Table 4. Respondents who grow or sell ornamental grasses	50
Table 5. Rating of topics in order of importance	53
Table 6. Rating of bulletin characteristics by importance	54
Table 7. Rating of sources of information by importance	56
Table 8. Oneway anova, sources of information with population	59
Table 9. Oneway anova, sources of information with age	60
Table 10. Survival rate of ornamental grass study	61
Table 11. Survival rate of ornamental grass field trial	64
Table 12. Ornamental grass container overwintering trial	65
Table 13. T-test of bulletin topics	82

CHAPTER I. INTRODUCTION

Certain questions should be of importance to the extension education program planner. Do users of extension educational programs have differing information needs? Are there formats or length requirements of the information presented? These and similar questions are of concern to the educational program planner. It is necessary to assess questions and concerns of clientele before making decisions on delivery, content and form of educational programs. There should be a balance of research results and the needs of people.

From its beginning with the Smith-Lever Act of 1914 the Cooperative Extension Service has taken university research to the people. No other country has focused such attention on the practical (applied) dimension of education by extending and applying the knowledge base of the land grant universities to real life where people live and work (Rasmussen, 1989).

In taking this research to the people several things must be of concern to the extension professional. The clientele served and its unique characteristics must be kept in mind. The delivery methods used must coincide with the maturity, education level, background, and objective of the audience being served. All of these items were addressed in a study of beef farmers in Virginia (Obahayujie and Hillison, 1988). Full-time farmers ranked bulletins sixth in importance as a source of information. Newsletters and publications were the most popular source of information out of twenty-four sources. Part-time farmers ranked this source second to leaflets and pamphlets. It can be seen from these rankings that the written word is an important delivery method (Obahayujie and Hillison, 1988).

History shows that in the United States bulletins for farmers were first issued as Farmers Bulletins in 1889 by the United States Department of Agriculture.

"When people needed definite and detailed information, they wanted written or printed material. In 1927 the agricultural colleges published 1,600 bulletins and circulars and distributed 17 million copies of them. The Department of Agriculture distributed another 22 million publications, most of which were extension in nature. A 1927 study of farms in Minnesota, Wisconsin and Ohio showed that 62 percent of the farmers had received bulletins; 82 percent receiving them reported reading them and 48 percent had put the information to some practical use. While bulletins were not among the most important methods of influencing farmers, they did reach and help a large number" (Rasmussen, 1989 p. 93).

According to the Iowa Extension Publications office there are 3500 extension publications in stock (personal communication, 1990). These publications have been written by personnel of the Iowa Cooperative Extension Service. From these numbers it is apparent that much time, effort and expense has been devoted to extension publications.

Most extension bulletins are written by specialists or experts in that subject. Often the end result is a publication which the author feels is a scholarly, all encompassing bulletin. In practice that same bulletin may not cover items of interest and importance to the client, or a particular group of clients. Of even greater importance is the level of writing used in the publication; it should be written at a level of technical understanding commensurate with the anticipated readers (Obahayujie and Hillison, 1988). In practice many extension bulletins may not be read, or at least not as widely read as they could be. A client or potential reader of the bulletin may pick it up, only to return it to the

shelf after a quick glance shows it to be not useful.

Caffarella (1982) stresses the necessity for client needs assessment during the extension program planning process. This identification of the clients' educational needs is an important step in designing educational programs. Of the many steps in the needs assessment process the most important one is the decision to complete a needs assessment.

This research will include both a needs assessment and a report on the ornamental grass studies currently being conducted by the Iowa State University Horticulture Department. The results of the ornamental grass hardiness trials will not only enable Iowa State University to provide a list of plants adapted to Iowa; but also this study might help increase the interest in ornamental grasses.

According to Grounds (1981) grasses are possibly the most unappreciated and underrated of all ornamental plants. The economic importance of grasses is well understood, for they provide the major food crops of the world.

"'All flesh is as grass'-and indeed it is, although when King James had the Bible translated into the common tongue, the word 'grass' carried a wider connotation than it does today, meaning herbage in general. The quotation (which comes from the First Epistle of Peter) goes on 'and all the glory of man as the flower of grass. The grass withereth, and the flower thereof fadeth away' and can be taken at the most literal possible level". (Grounds, 1981 p. 15).

However, the decorative qualities of grass are not as appreciated, although grasses as decorative plants have a grace and beauty that no other group of plants can match. The term "ornamental grass" uses the word "grass" in a loose sense. Here grass includes the grasses Gramineae,

sedges Cyperaceae and rushes Juncaceae. These plants can range in size from the smallest of plants to towering, treelike bamboos (Gould and Shaw, 1983).

The use of ornamental grasses is becoming ever more popular. To this point most work has been done on the east and west coast; consequently, the available publications are more applicable to those climates. This study will focus on those grasses which are adaptable to the upper Midwest, and are included in current experimental studies of the researcher.

There is a future for ornamental grasses in the midwestern landscape. Current work on grass being done within the Department of Horticulture, Iowa State University, may lead to a new area of interest for the garden and horticulture industry in Iowa. In order for this facet of gardening to develop well, it is important that information on the use of ornamental grasses be available to clients of the Extension Service. The needs of clients should be addressed in any extension publication on ornamental grasses that is produced.

This study looked at three groups who were considered to be representative of the state: The Iowa Nurserymans' Association, responsible for the interests of plant producers in Iowa; the garden center retailers who provide the link between the plant producer and the ultimate user; and the Iowa Master Gardeners, volunteers for the Extension Service. Master Gardeners are members of the local community who take an active interest in their lawns, trees, shrubs, flowers and gardens. Master Gardeners receive special training in horticulture, in classes taught by Iowa State University extension staff.

The results of this study will enable extension specialists to address the concerns and problems of various users of information on ornamental grasses. As the field of interest in ornamental grasses is somewhat limited although growing, this specific information would be providing assistance to only a small number of future authors. However the methodology used to determine the needs of a group with differing interests could easily be utilized elsewhere. It would provide the basis for similar research in other closely related subject areas.

This study would help educators to produce programs which more precisely meet the needs of the audience for whom they are intended.

The Iowa State University Horticulture Department is in the process of developing information for a bulletin on ornamental grasses in the Midwest. It is the researcher's desire to write a bulletin which does, in fact, cover the areas of interest for the anticipated clients at a useful technical level.

Statement of the Purpose of the Study

The purpose of this study was to conduct a needs assessment related to ornamental grasses. Based on experimental grass studies, it assessed the current knowledge and interest in ornamental grasses and the possible content and format of future delivery of extension programs.

Objectives of the Study

To accomplish the stated purpose of determining the needs of horticulture information users, the following objectives were established.

- 1) To determine the suitability of fifty species and cultivars of

ornamental grasses to the Iowa climate and the growth habits of those grasses in Iowa.

2) To determine the knowledge level and interest in ornamental grasses by the two audiences: a. producers, that is, the growers and sellers; b. users, that is, the landscapers and gardeners.

3) To determine what information from current research on ornamental grasses is needed by the two audiences.

4) To determine if differences in characteristics, knowledge level, interest and information needs exist between the audiences.

Statement of Assumptions and Limitations

The following assumptions were made about Extension bulletins.

1) People use the Cooperative Extension Service and bulletins as a source of information (Rasmussen, 1989).

2) Extension is expected to be a useful source of information for individuals starting a new enterprise or garden project. Bulletins are expected to provide the readers with knowledge of the subject and also provide them with a list of references for additional information.

3) The data reflects the true opinions of the respondents.

4) The instrument is effective in determining levels of interests in ornamental grasses and the information that the respondents feel they need.

5) Results will be limited to the population being studied.

Research Questions

Based on the objectives, the following research question was formulated: Do growers and sellers of ornamental grasses need a different level and type of information than do landscapers and gardeners?

1) The two independent variables were the commercial producers, the growers and sellers of ornamental grasses and the users, the landscapers and gardeners who use ornamental grasses.

2) The dependant variables were the level and type of information needed.

3) The hypothesis was that commercial growers and sellers of ornamental grasses need different information from the bulletin on ornamental grasses than that which landscapers and gardeners require.

4) The rationale for the hypothesis was that producers of ornamental grasses are concerned with the commercial production of grasses, including the protection of container plants during winter. Producer needs may differ from those of the ultimate users of those plants.

5) The goal was to investigate the relationship of informational needs of two different groups of users of extension programs, namely growers and sellers and the landscapers and gardeners.

Definition of Terms

Ornamental Grasses: Grasses grown for ornamental purposes other than as a turfgrass. Grasses grown for their decorative qualities (Grounds, 1981).

Growers: People who grow plants for sale to either retailers or consumers.

Sellers: People who sell plants to the consumer.

Landscapers: People who either construct landscapes or who plant and care for garden landscapes.

Gardeners: People who work with or care for a garden, whether as a professional or an amateur.

Extension bulletin: A publication of the Cooperative Extension Service. A bulletin could range in size from one page to a dozen or more pages (Rasmussen, 1989).

Cooperative Extension Service: An institution at the federal, state, and local level whose philosophy is to help people identify their own problems and opportunities, and then to provide practical research-oriented information that will help them solve the problems and take advantage of opportunities (Rasmussen, 1989).

Extension agent: Employee of the Cooperative Extension Service working in a county agency with the purpose of diffusing among the people useful and practical information in agriculture, home economics, youth and related subjects through demonstration, publications and other means (Rasmussen, 1989).

Area Horticulturist: An employee of the Cooperative Extension Service who is a specialist in horticulture. The area specialist normally covers a region within the state (Rasmussen, 1989).

Client: Those whom extension serves through education--adult learners, 4-H youth, adult volunteer leaders--and all those who plan and participate in extension educational programs (Rasmussen, 1989).

CHAPTER II. REVIEW OF LITERATURE

The purpose of this study was to conduct a needs assessment related to ornamental grasses. Based on experimental grass studies, it assessed the current knowledge and interest in ornamental grasses and the possible content and format of future delivery of extension programs.

The first section of this chapter will start with information on ornamental grasses. It will be followed by the importance of effective extension education delivery methods to the mission of the extension service. The final section will look at recommended procedures for conducting needs assessments.

Ornamental Grasses

Grass has been present on the planet since before recorded time. Heath and Kaiser (1985) used the following quotes from the Bible to illustrate the importance of grass.

"Early recognition of the high value of grass is noted in the Book of Psalms thousands of years ago: 'He causes the grass to grow for the cattle...' (Ps. 104:14). The want of grass was recognized as the symbol of desolation: 'The grass is withered, the tender grass died out, there is no green thing...' (Isa. 15:6). The theme of grass runs all through the Bible" (Heath and Kaiser, 1985 p. 3).

Examination of the blanket peat which covers the moors of Dartmoor, England, shows pollen from grass dating to 3,000 B.C. Present day ornamental grass species include purple moorgrass Molinia caerulea; heath rush Juncus squarrosus; fine bent Agrostis setacea; the sedge Carex panicea; sheeps fescue Festuca ovina; field woodrush Luzula campestris; and red fescue Festuca rubra [full citation of scientific names presented

in Appendix] (Harvey and St. Leger-Gordon, 1974).

This researcher spent some time in the early 60s working as an archeologist at an Iron Age hillfort site. This fort was located on the English-Welsh border near the town of Clun, in the county of Shropshire. During excavation of food storage pits cut into the bed rock grains of wheat, Triticum vulgare were found. Current research suggests that this was possibly the wild type Triticum dicoccoides (Martin, Leonard and Stamp, 1976). These grains, showing evidence of winnowing by exposure to hot charcoal, were still viable when tested by the University of Manchester. This is further evidence of the tremendous vitality of members of the grass family. The Iron Age occurred during the first millennium, 1,000 B.C. and was well known for the many hillforts through the west of England. The spaces within the defenses was packed with houses and storage structures, laid out along well-maintained metalled roads (Cunliffe, 1983).

Several domesticated grasses which are considered primarily ornamental in the United States have been and still are of major importance to seed gathering peoples the world over. The Panicum family on a world basis is a major producer of wild seed for seed gathering peoples. In Africa P laetum or P turgidum have been seen to yield 10 kg in a morning with no difficulty. Similarly the Bushmen of Australia have harvested the seeds of Panicum grass for a millennia. In North America P capillare, P obtusum and P urvilleanum have been listed as harvested in the wild. Seven species are listed for Africa, four for Australia and two in Eurasia and India, respectively. At least five species of Sporobolus are harvested in North America, three in Africa and three in Australia.

Species of Eragrostis are gathered in North America, Africa and Australia. From a list of fourteen hundred wild food plants found in Africa at least sixty are grasses. Grass plants that to the developed countries have great ornamental value also have a tremendous value as a source of food (Harlan, 1975).

From primitive times to the present, man's history has been largely influenced by grasslands. Civilization began on the grasslands; civilizations have vanished with their destruction. In the United States about forty percent of our nineteen hundred million acres were grasslands prior to the influx of settlers. At that time there were hundreds of indigenous species of grass, thriving under a variety of soil and climatic conditions (Heath and Kaiser, 1985)

Grasses are found in nearly all plant communities. Plant communities dominated by grasses are subject to wide variations in season to season and year to year temperature and precipitation. Because grasses can tolerate these fluctuations better than trees, there is a broad grass dominated region from southern Saskatchewan and Alberta in Canada, to eastern Texas and from Indiana westward to the woodland zone in the Rockies. Grasses are a codominant type of vegetation east of the tallgrass prairie; they occur as an understory of savanna ecosystems. Tallgrass prairies once dominated a landscape of over forty million acres along the eastern edge of this area. These deep rooted, tall growing grasses included big bluestem Andropogon gerardii, indiagrass Sorghastrum nutans, and switchgrass Panicum virgatum. Today these grasses are used as both forages as well as ornamental grasses. The short grass prairies encompass some two hundred and eighty million acres on the western part of

this area. Dominant vegetation of this grassland consists of buffalograss Buchloe dactyloides, western wheatgrass Agropyron repens, and blue grama Bouteloua gracilis. These grasses are also beginning to receive interest in the landscape and turf area as alternative grasses due to their drought resistance. West of the great plains, grasses are often codominant with drought resistant shrubs. The big sagebrush ecosystems of the Great Basin, Columbia and Colorado Plateaus, and the Wyoming Basin are examples. Several grasses, such as the western wheatgrass Agropyron repens, bluegrass Poa, fescue Festuca, and brome Bromus are codominant herbs. These grasses are considered to be useful as forages, as well as turf and ornamental grasses (Safley and Pendleton, 1983).

Grasslands provide food and habitat for much of the world's wildlife population. Grasslands in state and national parks and open private lands provide strikingly beautiful scenery and form the basis for the growing business of recreation. Increasing population, changing attitudes of people, and increased levels of affluence are influencing the development and use of the earth's grassland resources.

It is, however, with the decorative qualities of grass that the researcher is currently concerned. As stated by Grounds (1981) grasses are greatly unappreciated and perhaps the most underrated of all ornamental plants. In looking around at the wild countryside a person cannot fail to be impressed by the fact that grass plants greatly outnumber all other plants in the landscape. By contrast the modern garden is found to have a singular lack of grasses in proportion to other plants. Since nature uses grasses so lavishly in the landscape, it is worth looking at the diversity of ways that grasses can be used in the

garden. Grasses as decorative plants have a grace and beauty that no other group of plants can match. It is largely through their utilization in floral arrangements on both sides of the Atlantic that the gardening public has become aware of the garden uses of the ornamental grasses (Grounds, 1981).

Grasses are being used in traditional landscaping features for their ornamental value. Other uses are also being found for ornamental grasses. Gardens being maintained as wild life sanctuaries, particularly for birds, find ornamental grass species valuable. Using grasses can not only add beauty to the garden but can also attract birds to the garden. Birds find food in both the seeds produced by the grass and the insects living in the grass. Gardens designed for the bird enthusiast contain ponds which provide an appropriate back drop to water loving grasses, sedges and rushes (Proctor, 1989).

A new enthusiasm for wild gardens and gardening for wildlife has arisen this century. Many gardens now feature a special wilderness area, in which plants are encouraged to mix freely and attract all kinds of different insects and mammals. As wild flowers are increasingly threatened with extinction in their native habitats, more people are introducing them into their gardens. One attractive way of conserving endangered species of wild plants is to create a wild lawn, where traditional hedgerow flowers mingle with ornamental grasses. By careful planting, color and interest can be maintained throughout the year (Feltwell, 1987).

Ornamental grasses have been used extensively in many of Britains stately homes. The country home of Sir Winston Churchill contained a wild

life garden, with ornamental grasses interplanted with flowers and ornamental shrubs. Sir Winston had a brick summerhouse converted into a butterfly house, from which he used to release over a thousand butterflies into the garden every year (Feltwell, 1987).

The home of Christopher Lloyd, Great Dixter in Kent, an impressive fifteenth-century manor house, was extensively restored by Sir Edward Lutyens in 1910. Part of this restoration included a sunken garden which forms a picture of color from the many flowers and at least fifteen species of ornamental grass. Christopher Lloyd is a well known connoisseur of gardening matters. While he did not invent wild flower gardening, he was one of the few to foster it for public display. He is widely known for his wild lawn or meadow gardening (Feltwell, 1987).

Extension Education Delivery Methods

The Extension Service is a source of accurate, reliable information on horticultural topics. Users of Extension want to obtain current, unbiased, knowledgeable information in a timely manner (Rasmussen, 1989).

Methods used to deliver information to Extension Service clientele include: print media, electronic media, direct (face to face) contact, experiential learning, and observation (Baker, 1984).

Available literature indicates there is very little published on writing extension bulletins. The literature seems to be dominated by sales and promotional bulletins rather than extension bulletins. Much of it is based on the physical aspects of production: photographs, layout, print style and size. The available work is broad in scope, serving multiple audiences who often have conflicting information needs. It would

seem that there are no publications which cover the production of an extension bulletin based on needs satisfaction for the ultimate user. Extension bulletins play a very important part within the Cooperative Extension Service, and its mission of information dissemination to the people.

Rasmussen (1989) reports that experiment stations began issuing research bulletins as their programs got under way, but many issued popular bulletins and leaflets as well. The Connecticut station at New Haven issued ninety-three bulletins in the first ten years of its existence. They were a mix of scholarly reports and farm-oriented papers.

Bulletins are one method of dissemination of this information used by the Extension Service. When starting a new enterprise or garden project the individual expects the extension bulletin to be useful. It is expected to provide the reader with knowledge of the subject and also provide them with a list of references for additional information.

Extension has completed seventy-five years of service to the American people. During this time it has carried the results of research from the land-grant universities directly to broad segments of the population. It has taught these people how to use this knowledge to improve their lives. Because of its accomplishments this public service institution has the support of a majority of citizens, both rural and urban (Rasmussen, 1989).

Today Extension is serving many suburban and urban residents with programs which include horticulture, and urban gardening. Many of the noncommercial horticultural programs are financed with county funds; they often are carried out by volunteers. Some of the urban programs, including part of the urban gardening program, are carried out at the

direction of Congress and are financed by appropriations earmarked for those programs. Many farm organizations oppose the urban programs, but since the work is funded by all of the public, it will not be workable in the future to treat rural and urban populations unequally (Rasmussen, 1989).

Pounds (1985) stated that research indicates people use different sources for information, depending on the kind of information they're seeking. In a 1965 Extension-sponsored survey in Michigan (Pounds, 1985), people identified bankers, brokers and finance companies as their most important sources of financial information; books and pamphlets as their most important sources of occupational or professional information; and the mass media as their most important sources of consumer information. According to Pounds (1985), knowing where people look for information is only half the battle for Extension communicators. It is just as important to know where people find information.

Pounds (1985) went on to further illustrate the importance of information sources to both the public and the Extension Service program planners. In a survey sponsored by Iowa State University Extension in 1984, Iowans were asked where they would go if they needed certain kinds of information. The survey focused on five kinds of information: family nutrition, personal and family relationships, home energy conservation, managing family and personal finances, and child raising. Results showed that professionals and businesses were the most popular source for all five types of information. The county Extension office was the second most popular source for information about nutrition or energy conservation. The most popular source for the other three kinds of

information was friends. They were also asked where they had found information on those same topics. Newspapers were ranked the highest in all categories, followed by magazines, television, radio and leaflets (Pounds, 1985).

Grieshop, Bone and Frankie (1990) found that important differences often occur between what people want to know and what they need. There are also differences between what people think they need and what Extension educators feel the people need to know. The study by Grieshop, Bone and Frankie (1990) was primarily concerned with pesticides but they also asked the clients to evaluate two Extension publications. A free sixteen page University of California publication, "Using Pesticides Safely in the Home and Yard", was used for the evaluation. One version, published in 1979, presented illustrations of insects, discussed insect control, and used a text book format. The revised 1987 version illustrated the safe use of pesticides, discussed safe means of home application, and used blocks of text. Changes for the revised edition were obtained through focus group interviews with Master Gardener volunteers.

Results from this study indicated that the old (90%) and new (87%) versions provided new and useful information. A considerable portion, (45%) old and (41%) new, indicated improvements were needed, primarily with more details on pest problems and understandability. Participants also indicated a strong interest in pest specific information in a leaflet. Following the questionnaire study four focus group interviews were conducted. Results from these interviews indicated no preference for one version over the other. Group members liked the original's easier-

reading format. The newer version received more compliments on table of contents, quantity, quality and relationship of illustrations to the text, easy-to-read format, and the general design of the publication. Critical comments of the old version - illustrations not fitting the text, information was too general, elementary, or just plain omitted - were noted. The new version was faulted for its simplicity, lack of detail, elementary illustrations, small typeface, and excessive use of "do" and "don't". They also reported that the title of the publication did not fit the publication and the Master Gardeners expected coverage of topics which the publication did not discuss (Grieshop, Bone and Frankie, 1990).

The Iowa Master Gardener program began with a single class in Davenport in 1979. Additional counties showed interest and in 1982 the program was administered at the state level. Over seven hundred people from nearly half of Iowa's 100 counties have completed the Master Gardener program (Wiley-Jones and Jost, 1990).

The program offers forty hours of instruction in all aspects of gardening. Participants become Certified Master Gardeners after completion of the course work and successfully passing an exam. In exchange for the training, participants are asked to volunteer forty hours of time to their county extension program. This information is taken from a promotional brochure produced by the Iowa State University Extension Service for the Master Gardener program.

According to Simonson and Pals (1990) the Master Gardener program was formed to satisfy the need of the many citizens with gardening problems and too few professional Extension staff members to answer those questions. These volunteers are trained in basic horticultural topics by

Extension Service personnel and are then available to answer calls about gardening problems. They undertook this research to discover the motivational factors that attracted Master Gardeners to the program. In their survey of 161 Idaho Master Gardeners they found that 51 percent wanted to increase their knowledge for their own use. The remaining 49 percent were broken down as follows: 1) self-improvement, 13.9 percent, 2) knowledge for job, 11.1 percent, 3) other reasons, 9.7 percent, 4) hobby, 8.3 percent, and 5) to help others, 5.6 percent. They reported that Grieshop had received similar responses from a survey of California Master Gardeners. Master Gardeners looked mainly at the educational benefits available through the program (Simonson and Pals, 1990).

The Idaho Master Gardeners rated their trainers very highly when asked to evaluate their training. Simonson and Pals (1990) asked them to rate 14 different training topics on a 5-point Likert Scale with 1=poor to 5=excellent. Overall usefulness received a high score of 3.91. Insect problems rated the highest with a 4.31 score, followed by pesticide use with 4.24. The two lowest ratings were still good scores, with a 3.91 for greenhouse/nursery management and a 3.35 score for household plants.

In a report by Relf, O'Dell and Kushad (1990) it was reported that Master Gardeners can be an excellent source of consumer preference information. To predict the market potential of a fresh broccoli product produced by Virginia growers, a survey of 1240 Virginia Master Gardeners was conducted. This survey requested information on purchasing preferences and consumption of broccoli. This was not a random market survey, but rather a survey aimed at high users of horticultural products and crops. The response rate was greater than 40 percent and most of the

surveys were returned within 3 weeks. This indicates a survey topic with a very high level of consumer interest and a strong willingness on the part of Master Gardeners to participate in such research surveys. The report concluded that Master Gardeners are an excellent source of data on consumer preference within an existing group of high users of horticultural products. Their high return rate and prompt response made it possible to identify trends and provide guidance to Extension research projects.

One implication for Cooperative Extension is that, if marketed correctly, written information has a large, ready, and willing audience. According to Grieshop, Bone and Frankie (1990) sources of information most frequently used were listed in this order: 1) nursery (64%), 2) own books (53%), 3) magazines (35%), 4) friends/neighbors (32%), 5) Cooperative Extension (30%), and 6) newspapers (30%). Finally they suggested that to effectively respond to the demand, publications must be tested by the consuming public before finalizing them.

In a creative component study at Iowa State University in 1987 it was found that Master Gardeners were satisfied with the delivery of portions of their program by satellite telecast. Almost ninety percent indicated they would be willing to attend satellite telecasts in the future (Eckles, 1987).

Decker and Merrill (1990) reported in a study by Cornell University that dairy farmers liked the use of a videotape as part of a workshop. Furthermore, the videotape program led to improvement in knowledge and a change in attitude among farmers. This in turn led to substantial on-farm changes in milking procedures. Subsequent viewing by the farmer at home

was found to reinforce the information. Immediate response by the farmers following viewing indicated that seventy-one percent were considering changes in milking practice.

A three month follow-up of thirty-three percent of the farmers found that eighty-seven percent of them had changed one or more milking practices. The number of practices changed or adopted averaged 2.4 per farmer.

Recommended Procedures for Conducting a Needs Assessment

Caffarella (1982) pointed out the necessity of identifying client needs during the extension program planning process. Identifying educational needs of potential participants is an important component in designing educational programs. A needs assessment is a systematic way of determining these educational needs. There are two basic types of educational needs: prescriptive and motivational. A prescriptive need is usually organizational in origin. A motivational need is a deficiency in a specific individually defined goal. The process for identifying educational needs is called a needs assessment, a systematic way to identify educational deficiencies or problems. In designing a needs assessment, it is important to ensure that both types of educational needs, those of the individual (motivational) and the organization (prescriptive), are addressed. Considering both needs will provide for a more effective and balanced educational program.

Caffarella (1982) further identified the following ten steps in the needs assessment process. In the planning stage step one is the decision to complete a needs assessment. Step two is the identification of

individuals who will complete the needs assessment. The next stage is doing the needs assessment; step three is the development of the focus and specific objectives for the needs assessment. Step four covers the determination of budget and time frame. Steps five, six and seven cover the selection of design and data collection techniques; collection of data; and the analysis of data to determine needs. The final stage is priority setting and action planning. Step eight is rank ordering the needs; step nine covers selection of those needs for attention; and finally step ten is the development of specific objectives and a plan of action.

A variety of techniques can be used to determine needs and interests. They range from highly structured techniques such as mail surveys to informal discussions. Surveys can be conducted by mail, telephone or interviews. The survey is the best approach in determining the needs of a broad range of individuals. If the questionnaire is properly constructed and tested, the data obtained is usually reliable and valid. Drawbacks to using this approach are: cost in both time and money, the skill needed to design a valid and reliable instrument, and the hesitation of individuals to answer surveys (Caffarella, 1982).

McKillip (1987) identified five steps of need analysis. These are that users and uses should be identified, and that there should be a description of the target population. Also need identification, needs assessment and finally communication of those identified needs must all take place. Another aspect of needs assessment is that "where we are now" should first be determined (Baker, 1984). Following this, where we want to go is identified with the gap being a need or a want. Baker further

states that deciding on how to go about delivering the program, by selection of methods, techniques and aids, is the important next step. This includes the use of print or electronic media, direct contact, experimental learning and observation.

McKillip (1987) states that surveys are a popular method of gathering information on needs. There are three survey methods considered for need analysis: face-to-face interviews, telephone interviews, and mailed surveys. Question format is very important. Ranking versus ratings formats can be used. Ratings are simpler for the respondents and allow application of advanced statistical techniques to develop an order of needs. Ranking, however, requires that some option be number one according to (McKillip, 1987). If questions which require ranking are used, they should be placed at the beginning of the survey. This should be done to prevent structured questions affecting responses (Johnson and Meiller, 1987). Surveys can yield useful data for need identification.

Johnson and Meiller (1987) pointed out that a community score card, a precursor of the modern survey, was used as early as 1917. Modern survey methodologies which stressed proper sampling, improvements in response rates, refinements in questionnaire and interview schedules began to be developed in the 1930s. Those who conduct surveys must communicate effectively if they expect a high rate of cooperation.

The following are several types of information which should be communicated to the respondent to answer the question, "why respond?" Information regarding the value of the survey and the purposes for which the data will be utilized should be stated. How the community and individual respondent may benefit should also be explained. Other areas

to be addressed in the communication with the respondent should cover the requirements of scientific sampling and particularly how essential a high response rate is. Finally a time schedule and a guarantee of anonymity should be stressed.

Maclean and Genn (1979) reported a traditional reluctance in Britain to the use of postal surveys, due mainly to a perceived low response rate. They stated that a review of available literature reporting methodological studies provided little clear guidance on this. A number of studies on response rate were clearly contradictory. In their reviews of the literature it was demonstrated that the advantages of postal surveys as apposed to personal interview surveys tended to be subject-specific. In a study conducted in Bristol, England, Maclean and Genn (1979) found that the use of a postal survey obtained the following results. This survey was prepared following the guidelines for a quality mailing, namely: Printed on good-quality white stationary; stamped rather than franked; addressed personally; cover letter signed by the researcher. The survey was mailed to twelve hundred and thirty-four people. During the first twelve days following mailing a response rate of fifty-six percent was obtained, which is considered good for a general mailing (Dillman, 1978). Postal surveys are generally used if cost is of concern, or when it is felt that the respondents have an interest in the subject.

Alreck and Settle (1985) looked at the total process from survey planning and design through report generation. From the standpoint of needs assessment, desires and preferences are often measured by identifying and listing the possible categories that might be desired. Horizontal, numeric scales can be used to rate them. Demographic data are

often valuable because demographic groups often differ significantly on the issues of importance. Demographics can be used to identify segments, groups, audiences, or constituencies of people who are both identifiable and behave in similar ways. Project planning involves the following phases; information needs, sampling design, instrumentation, data collection, data processing, and report generation.

Alreck and Settle (1985) felt that the selection of the most appropriate method for collecting the data was a key decision for the researcher. Collecting data requires contact with the respondents, and that can be accomplished by speaking with them in person, by reaching them on the telephone, or by mailing them a questionnaire to be completed and returned. The fundamental difference among the three methods consists of the intensity of contact between the researcher and the respondents. Mail survey data collection differs from interviewing in many important respects. The cosmetic aspects of the mailing piece must be considered carefully because its form and appearance will affect the rate of response and the quality of the data. As each respondent is presented with an identical questionnaire and exactly the same instructions and tasks the chance of interviewer bias is eliminated. The mailing piece must be constructed very carefully, and the instructions must be clear to virtually all potential respondents. The questionnaire should be pretested to ensure its effectiveness and clarity. Data processing is best done by computer and a statistical analysis program. The nature and format of the reports should be considered in advance. The final element of the project outline is the cost schedule and timetable for the project. The important factor for the researcher to note when completing the survey

plan is the necessity for an integrated project.

In order to utilize the capability of the survey the questions must be asked correctly. Vague questions produce vague answers (Dillman, 1987). Questionnaire format is equally important, for not only does the order in which the questions are asked make a difference in how people respond but whether they respond at all. The survey needs to be constructed in a way that order bias and resistance to responding are overcome. The first questions in a survey should be ones that are interest-getting and easy to answer.

Fuller (1988) felt that the choice of self-administered, or mailed questionnaires depended to a certain extent on the reading and writing skills of the population and their motivation to cooperate. If one is collecting data from a population that is highly literate and likely to be interested in the research, mail procedures become more attractive. With self-administered questionnaires, closed questions produce the best results, because open-ended questions lead to difficulty for the respondent in answering, and thus adversely affect the response rate. More importantly, self-administered open-answers often do not produce useful data. Designing a good questionnaire involves the following; selecting the questions needed, testing them to ensure they can be asked and answered as planned, then putting them into a form that is easy for respondents to complete. Starting with relatively easy straightforward questions gets the respondent into the survey. It is also a good idea to reserve the difficult or sensitive questions for the middle or end of the questionnaire. Self-administered questionnaires should be self-explanatory. They should be restricted to closed-answer questions in

which checking a box or circling a number is the only task required. Question forms should be few in number; the more the questionnaire can be set up so that the respondent has the same kinds of tasks and questions to answer, the easier the task will be. The questionnaire should be clear and uncluttered and the respondent should be provided with adequate information and instructions. Pretesting is critical, as virtually every questionnaire could be changed in some way to make it easier for respondents to meet the researcher's objectives. The best way to pretest a self-administered questionnaire is in person with a group of potential respondents. One outcome of the pretest should be to find out how long it takes to complete a questionnaire.

According to Alreck and Settle (1985) effective survey questions have three important attributes, focus, brevity, and simplicity. Both vocabulary and grammar are important when forming survey questions. Is the question expressed as clearly and simply as it can be? If the meaning will not be clear to virtually every respondent, the item should be rewritten. The manner in which questions are expressed can all too often introduce systematic bias, random error, or both. If the criteria by which respondents must judge some issue or respond to some question are not completely obvious, the criteria must be stated in the question. Leading questions, those that create a very strong bias, often result in data that are completely invalid. In similar fashion loaded questions, those that have only one right answer, can constitute a more subtle form of influence. These biases are known as instrumentation bias; when bias is introduced because of the mentality or predispositions of respondents, it is called response bias. There are many different types of response

bias; the main types are social desirability, acquiescence, prestige, hostility or order.

Finally, the nature of the questions should be structured, whenever possible. Unstructured, or open-ended questions often do not clearly indicate the dimensions along which respondents are supposed to respond. They also make it difficult to directly compare data from one respondent to another (Alreck and Settle, 1985).

Answers to survey questions are typically a choice of position along some continuous spectrum. A response scale is merely a representation of that continuous spectrum. When creating a response scale the best guide is the philosophy of keeping it simple (Alreck and Settle, 1985). Respect the respondent and select scales that will make it as quick and easy as possible. When deciding on the range it should be borne in mind that respondents normally classify into a range from two to seven or eight. Pick the denominations and group only when absolutely necessary. In questionnaire construction emphasize the introduction, since most refusals will come immediately and once respondents begin they seldom terminate. Simple, interesting, informative items should come first and sensitive items as late as possible. Limit and control branching as much as possible; when used, it should be simple with concise instructions. Combine items that use the same scale, or treat the same topic into sections. Finally, use ample instructions that are simple enough for the least sophisticated respondents (Alreck and Settle, 1985).

Fuller (1988) stressed that all research involving human subjects must be carried out in an ethical manner. Respondents should be given the following basic information: the name of the organization, who is paying

for the research, a brief description of the purposes of the research, a statement of confidentiality and finally the assurance that cooperation is purely voluntary. In most cases signed consent forms are not needed; consent being implied by completion of a questionnaire. One exception to this would be in cases where information is obtained that could be harmful if misused.

With mailed questionnaires the cosmetic aspect of the survey is very important (Alreck and Settle, 1985). It must do the entire job of winning cooperation, capturing the data, and returning it to the researcher. The response rate will be greatest when first class postage stamps are affixed. Response rate is least when bulk mail permits are used (Maclean and Genn, 1979). A cover letter, or letter of transmittal, must explain the project and win the cooperation of the recipient. It should answer questions likely to arise in the mind of the person who receives the letter. It should also state that the respondent is not required to complete it, that they may withdraw from the survey at any time and when any identifying numbers will be removed. Timing the mailing is important from the standpoint of possible bias, or response rate due to outside influences. The best time of the month is the middle rather than before, at, or the end of the month. Similarly the best time of the week is the middle rather than the beginning or the end. During the period when completed returns are received it is wise to keep a complete record of how many survey were sent, how many are still out at any given point, and how many have been returned (Alreck and Settle 1985).

Fuller (1988) states that the first step to developing a sample is to define the sample frame. Most sampling schemes fall into three general

classes, for the purposes of this study the most appropriate scheme occurs when the sampling is done from a more or less complete list of individuals in the population to be studied. Systematic samples have an advantage over simple random sampling in that it is not necessary for the list to have all the names numbered. With a systematic sample the researcher determines the number of entries on the list and the number of elements from the list that are to be selected. Dividing the latter by the former will produce a fraction, for example $1/30$, which means that one out of every thirty on the list is to be sampled. In order to select a systematic sample, a start point is designated by choosing a random number from one to thirty. The randomized start ensures that it is a chance selection process, from that start the researcher takes every thirtieth person on the list. Sample size is a decision with no right answers; many methods have been used, specified percentages, statistical methods which determine estimates of sampling error, and so-called standard survey studies with specified sample sizes. A sample of one hundred and fifty will describe a population of fifteen thousand or fifteen million with the same degree of accuracy. From a statistical standpoint as one increases from fifty the precision increases steadily up to sample sizes of one hundred fifty to two hundred at which point it tends to level off (Fuller, 1988).

Alreck and Settle (1985) feel there are several sampling techniques which can be used. When the sample frame consists of a list of sample units, the most common method of selecting a random sample from the list is to select every 'nth' name, where n is calculated by dividing the number of units in the sample into the number on the list. The actual

starting point on the list should be picked randomly. The response rate need only be estimated and include a sufficient number to be contacted, so that the data collection yields an adequate number of respondents to satisfy the sample size requirements. The selection of respondents would remain a random selection. In all mail surveys there will be some non-response bias; young people may be too busy to respond, while retired people have time on their hands and do respond. If this occurs it will be apparent when the demographic data are analyzed. Sample size has outside limits which should be considered before determining the actual sample size. A sample of less than thirty respondents will provide little certainty to be practical; usually experienced researchers regard one hundred as the minimum sample size when the population is large. It is seldom necessary to sample more than ten percent of the population to obtain adequate confidence.

Once data have been collected by a survey they must be put into a form for analysis by computer. The process of coding or data reduction involves five separate phases: 1) formatting or organizing the data, 2) designing the code, the rules by which a respondent's answers will be assigned values that can be processed by machine, 3) coding, the process of turning responses into standard categories, 4) data entry, keying the data onto storage media so the analytic software can read them, and 5) data cleaning, doing a final check on the data file for accuracy, completeness, and consistency prior to the onset of analysis (Fuller, 1988). Data should be formatted according to the requirements of each analytic software package. The code is a set of rule for translating answers into numbers, it is critical that it be reliable so as to allow

appropriate interpretation of the data. Codes should be assigned for missing data; don't know answers can be treated as not ascertained or as a separate category of missing data. Once data entry is complete it is most important that it be checked for legal codes and completeness.

Sight-editing of completed questionnaires should be done to determine if it is acceptable for processing. Once the questionnaires have been assembled the data should be keyed into a computer file on a disk or diskette. Once the data has been keyed to file it should always be process edited to ensure the data is clean and ready for analysis. If this is not done the analysis routines may fail to execute or if they do run may generate reports with erroneous results. Data should be checked for deviation from record format or field range. Some questions may need to be recoded if the data is to be meaningful. Examples of the need for recoding may be years of schooling or formal education. Questions to determine level of knowledge may need to have the responses reversed. Age may need to be recorded into ten year categories to enable bar charts to be printed with a more meaningful portrayal. Once data are entered the data processing or analysis can be done (Alreck and Settle 1985).

According to Fuller (1988) researchers have a scientific obligation to provide a full description of the details of the procedures used that could affect those estimates. There are two general functions of a good methodological description. The first is to provide a good understanding of how well sample estimates are likely to describe the population from which the sample was drawn. It is not enough simply to state the author's conclusions on this matter; detailed calculations relevant to precision and bias should be presented that will permit readers to make their own

assessments. And the second function is to provide the procedural details needed to replicate a data collection effort and/or detect procedural differences between surveys that would affect comparability.

Conscientious researchers will include a description of sampling strategies and response rates in addition to the sample size when reporting the survey. The following is a brief outline of information that should be reported about any survey: 1) the sample frame, sampling procedures, including any deviations from simple random sampling, 2) field results, the disposition of the initially designated sample, which describes the number of respondents, and the number of nonresponses, 3) a brief description of questionnaire design procedures, including any pretesting that was done, 4) for a major report, a reproduction of the entire questionnaire, and 5) finally the quality control and checking procedures that were used during coding, data entry, and preparing the data file for analysis.

A brief overview of the possible kinds of error in surveys usually is an appropriate introduction to a methodological section on a survey. Numerical estimates of the amount of sampling error should be included. Finally the methodological section should include information about the reliability and validity of the major measures used in a survey (Fuller, 1988). One way to measure reliability is to measure the internal consistency of a instrument (Sax, 1974).

Summary

From the review of literature it can be concluded that the grass plant has long held a most important place in the history of life on this

planet. Grasses have been present since well before recorded time, forming a most important place in all lives. The grass plant, as an ornamental, has a history of perhaps two centuries. Today, however, ornamental grasses are a flourishing, important part of landscape gardening.

It can also be seen in the history of the Extension Service, that for seventy-five years Extension has also held an important place in the lives of the people of the United States. It has, through its commitment to education, accomplished much. Extension has made use of the many educational methods available. It has transferred learning and knowledge from the land-grant universities to millions of people, always with the desire to better the lives of those people.

The final section of this chapter shows what is required in order to meet the needs of the user. It is important that a needs analysis must be conducted in order to fulfill those needs. A needs analysis that is effective requires a well planned survey, with the questionnaire being perhaps the most important part of that survey.

CHAPTER III. METHODS AND PROCEDURES

This chapter describes the methods and procedures used to implement the research. The decisions on appropriate methods and procedures were based on the specific objectives. The steps followed in the needs assessment were conducted concurrently with the research on ornamental grasses: 1) identification of population and sample, 2) development of an instrument, 3) data collection, 4) coding of data, and 5) selection of data analysis techniques.

The research study was both a descriptive and experimental one. The descriptive method used was a process for identifying educational needs, which is called a needs assessment. This is a systematic way to identify educational deficiencies or problems, as well as a way of determining these educational needs. Caffarella (1982) pointed out the necessity of identifying client needs during the extension program planning process. The experimental method consisted of an ongoing replicated study of grass plants grown in a field situation and in one gallon containers.

Population and Sample

The population for this study were landscapers, gardeners, growers and sellers. The accessible population for this study were Extension clientele who had completed the Master Gardeners course, members of the Iowa Nurserymans' Association, and garden center retailers. These groups were accessible as membership or mailing lists were available. The samples were drawn from these groups randomly. Plans for administering the survey called for the questionnaire to be mailed to the selected persons on the mailing lists. It was determined that one hundred and

fifty responses was the needed response rate. Fuller (1988) states that as the sample increases to one hundred and fifty, the level of reliability increases, irrespective of the population size. From one hundred and fifty to two hundred this levels off, and above two hundred no increase in reliability is noted. Every eighth person on the mailing lists was identified, with the starting point randomly selected; this group formed the primary group. It was then determined that an additional forty people were needed for the secondary group. Every thirtieth person on the mailing lists was identified, again with the starting point randomly selected; this group formed the secondary group. These selection rates produced ninety Master Gardeners in the primary group and twenty-five in the secondary group. In the professional group, drawn from the Iowa Nurserymans' Association and the mailing list of garden center retailers, these selection rates produced sixty in the primary group and fifteen in the secondary group. All questionnaires were identified to allow substitution of those questionnaires not returned from the primary group with questionnaires sent to the alternate group. This procedure was based on the substitution process whereby the estimated number of non-responses from the primary group is determined; this number then becomes a secondary group which is sent out with the primary group. Responses from this group are substituted for the non-responses within the primary group (Alreck and Settle, 1985). Once it was determined that all responses had been received, the alternate group questionnaires were substituted for those questionnaires not returned by the primary group.

Development of Instrument

As this study was based on a survey of the population research, it involved the use of a mailed questionnaire. Content of the questionnaire was determined using the researcher's background, a review of the literature, and in consultation with faculty of the Iowa State University. The questionnaire covered the following aspects; growth, uses, culture, sale, and production of ornamental grasses. It was also necessary to study the aspect of the needs of winter protection for grasses by the two populations. All of these concerns were covered, together with adequate explanations of those terms which might not be clear to respondents with differing areas of interest.

The questionnaire was grouped into three areas. The first group of four questions determined the current level of knowledge and if the respondent was currently growing or selling ornamental grasses. This required a response to sixteen items. The second group of five questions determined the information that the respondents needed in order to be successful with ornamental grasses. These questions covered content and format of a bulletin, and sources of information used by the respondent. This required a response to thirty items. The final five questions were demographic in nature. Respondents were asked to select the best answer to describe their characteristics. Questions were in a format which required ratings on a five-point Likert scale.

The questionnaire was reviewed by faculty of the Department of Agricultural Education and Studies and the Department of Horticulture, Iowa State University. State Extension specialists also reviewed the questionnaire and made suggestions on content and format. These steps

were necessary as a check for validity. As a test of the questionnaire fifteen were given to members of the Department of Horticulture, Iowa State University, and members of the Ames Garden Club. This review and testing resulted in several suggestions for improvement in the wording of both the cover letter and the questionnaire. Questions with possibly ambiguous meaning were reworded.

A cover letter was included with the questionnaire. The letter outlined the reasons for the study, the nature of participation, confidentiality, usefulness of the study, and also asked for assistance from the participants.

The University Human Subjects Review Committee certified the project for this research and reviewed the questionnaire. The review of the questionnaire was without comment.

Data Collection

The survey was mailed on 19 March, 1990 to the sample. The questionnaire, with the return address and postage stamps affixed, requested that the respondents return them by 1 April, 1990. All questionnaires were coded prior to mailing to enable the researcher to determine which group the questionnaire was from. Four questionnaires were returned by the Post Office as undeliverable; all four were from the Master Gardener mailing list. By 4 April, 1990 the return rate of the questionnaires had slowed, and by 10 April 1990 it was considered to have ended.

After substitution of the secondary group into the primary group responders, the final response rate was 84 of 150 or 56%. The usable data

sample was 55.3%. Based on the sub-samples, Master Gardeners had a response rate of 59% and the commercial sample 52%. The higher response rate agreed with what was the anticipated response from Master Gardeners (Relf, O'Dell and Kushad, 1990).

Coding of Data

As questionnaires were received, they were reviewed carefully for completeness. One questionnaire was not used as it was returned with the notation that the respondent was not familiar with the subject matter.

Information obtained from the questionnaires was coded by the researcher and data were transferred and stored using the central computer facilities of Iowa State University.

The accuracy of coding was determined by the row length. The row length was fifty-five columns. In addition, column thirty-eight, a yes-no column coded as 0,1, was checked for correct data. A random sample of entered questionnaires was checked for coding accuracy. After the first statistical program, FREQUENCIES, was run, a final check of data entry was performed. Inconsistent data were not found.

Analysis of Data

Data were collected and stored in a file on the Iowa State University mainframe computer, with back-up storage on a floppy-disc. Data were analyzed using the Statistical Package for the Social Sciences (SPSS-X) for the survey questionnaire and SAS for the ornamental grass studies. The alpha level was set at a .05 level of significance.

The following SPSSX statistical procedures were used to analyze the

survey data:

1) The program FREQUENCIES was used for descriptive statistics. Frequency counts, percentages, means, and standard deviations were performed on all items in the data collection instrument.

2) The program SORT CASES BY, SPLIT FILE BY was used to split the file into two sub-groups, Master Gardeners and commercial respondents. This allowed further statistical analysis based on these sub-groups.

3) The program T-TEST was used to test significant differences between the two sub-groups in their responses to information needs, sources of information, and demographic data.

4) The program ONEWAY was used to test significant differences between sources of information used where demographic data were considered.

5) The program RELIABILITY (Cronbach's alpha) was used to test internal consistency of forty-three items considered in the survey. The Cronbach alpha composite coefficient measured the reliability of the survey. Reliability is the extent to which measurements can be depended upon to provide consistent information.

6) Percentages were calculated for survivability in the ornamental grass trials.

Ornamental Grass Studies

Ornamental grass study

This study was conducted on the Turfgrass Research Plots at the Iowa State University Horticulture Research Station near Ames, Iowa. The study was conducted on a Nicollet (fine-loamy, mixed mesic, aquic hapludall)

soil with a Ph of 6.9, and 2.3% organic matter. A complete fertilizer, 5-10-5 (N-P-K) was applied at the rate of 1 lb N/1000 sq. ft. prior to tilling. The purpose of the study was to investigate the suitability of eleven species of ornamental grass to the Iowa climate and to report the growth habits of the grasses in Iowa. It was expected that the study would run for five to eight years. The eleven species in the study are bluestem Andropogon, feather grass Stipa, fountain grass Pennisetum, hair-grass Deschampsia, moor grass Molinia, northern sea oats Chasmanthium, reed grass Calamagrostis, ribbon grass Phalaris, silver grass Miscanthus, switch grass Panicum, and wild rye Elymus. A total of thirty-four cultivars of these eleven species (Table 10), two plants of each cultivar, were planted in mid-September of 1989. The grass plants were supplied at a substantial discount by the Kurt Blumel Nursery in Maryland, a premier ornamental grass nursery in the United States.

The area chosen for the study was on the west side of the turfgrass maintenance building. Sixty-eight individual plots measuring 4 feet by 5 feet were placed in a bow shaped bed measuring 270 feet by 5 feet. The grasses were planted with the tallest, giant Chinese silver grass Miscanthus floridulus 'Giganteus', in the center. The remaining grasses were placed, in descending size, with the two plants of each cultivar being planted on the right and left of the center grass plot. Each plot was of sufficient size to allow adequate growth of the grasses and to enable them to grow without competition. The plants were well watered at establishment and were watered regularly until freezing.

Data on survivability were taken when it was felt that growth had commenced for all species. This date was 1st June 1990. This was not a

replicated trial. The procedures used to analyze the data were frequency counts, percentages, means, and standard deviation.

Ornamental grass field trial

This trial was conducted at the Iowa State University Horticulture Research Station near Ames, Iowa. The trial was conducted on a Nicollet (fine-loamy, mixed mesic, aquic hapludall) soil with a Ph of 6.9, and 2.3% organic matter. A complete fertilizer, 5-10-5 (N-P-K) was applied at the rate of 1 lb N/1000 sq. ft. prior to tilling. The trial had fourteen ornamental grasses in a field nursery planting with a total of two hundred and ten plants. The fourteen grasses in the trial are listed in Table 11. The purpose of this trial was to investigate the suitability of these species of ornamental grass to the Iowa climate.

These grasses were started from seed in the greenhouse, potted into four inch pots in June and allowed to develop in the greenhouse. They were moved in July to shade at the Iowa State University Horticulture Research Station near Ames and allowed to harden-off prior to transplanting in August. The experimental design was a randomized, complete block with three replications. The rows were 4 feet apart, with plants 12 inches apart within the row. Five plants of each grass were planted per replication. The grasses received irrigation for the remainder of the growing season.

Data on survivability were taken when it was felt that growth had commenced for all species. This date was 1st June 1990. The procedures used to analyze the data were frequency counts, percentages, means, and standard deviation.

Ornamental grass container overwintering trial

This trial was directed toward the commercial grower and retail nursery industry. A concern of the commercial business is the overwinter protection of plants. This trial had sixteen species of ornamental grass in one gallon containers, with a total of two hundred and forty plants. The sixteen grasses in the trial are listed in Table 12. The purpose of the trial was to determine the survivability of grasses in containers during the winter.

These grasses were started from seed in the greenhouse, potted into four inch pots in June and allowed to develop in the greenhouse. They were repotted into one gallon containers with a greenhouse potting mix consisting of four parts Canadian peat, four parts perlite and two parts of sterilized field soil. In July they were moved to shade at the Iowa State University Horticulture Research Station to harden-off before being placed on nursery beds under irrigation in August. The pots were moved to the over-wintering area and covered the 14th November 1989 before a killing frost.

The experimental design was a randomized, complete block with three replications. Five plants per replication of each grass were set in place. The three replications were covered as one block, fifteen pots deep and sixteen pots wide; fifteen pots filled with soil completed the block. The grasses received irrigation and were sprayed with a Flowable fungicide, Daconil 2787. Ground Force (Chlorophacinone), a rodenticide pellet, was placed between the containers and around the grass plants before covering. The method of protection chosen was a low-cost system using protective mats of plastic and straw. This method consisted of a 4

mil white polyethylene sheet being placed over the containers, followed by a layer of straw one foot deep, and a final covering sheet of 4 mil white polyethylene. The edges of the mat were secured with rail-road ties.

The grasses were uncovered the 20th April 1990 when it was considered unlikely that a severe cold spell would return.

Data on survivability were taken when it was felt that growth had commenced for all species. This date was 1st June 1990. The procedures used to analyze the data were frequency counts, percentages, means, and standard deviation.

Summary

This chapter outlined the methods and procedures used to implement this descriptive and experimental study.

In the descriptive study the sample included one hundred and ninety people drawn from a mailing list consisting of Master Gardeners, members of the Iowa Nurserymans' Association, and retail garden center operators. The instrument was developed by the researcher and reviewed for validity and tested for reliability. The total return rate of questionnaires was 56% and the usable rate of return was 55.3%. A response rate of fifty-six percent is considered good for a general mailing according to Dillman (1978). Results from that response rate are generalizable to the population. Information from questionnaires was coded and stored on the Iowa State University mainframe computer. Accuracy of coding was verified.

Data for the needs analysis were analyzed using the Statistical Package for the Social Sciences (SPSS-X). The statistical procedures used

to analyze the data included; frequency counts, percentages, means, standard deviation, oneway anova, analysis of variance, and t-tests. A 0.05 level of significance was set in all tests.

In the experimental study two ornamental grass trials and one ornamental grass study were conducted. These trials were started in 1989. It was anticipated that these would continue for five to eight years. Data were analyzed using the SAS Institute Inc (SAS). The statistical procedures used to analyze the data included: frequency counts, percentages, means, and standard deviation. A 0.05 level of significance was set in all tests.

CHAPTER IV. FINDINGS AND DISCUSSION

The information in this chapter was organized under the following headings: 1) reliability and limitations of the survey, 2) audience characteristics, 3) needs assessment, 4) analysis of relationships, 5) survivability of ornamental grasses, and 6) major findings. In each case the information was presented in a table, results were summarized, and the findings of the data were discussed.

Reliability and Limitations of the Survey

The Cronbach alpha coefficient of reliability was 0.86. This indicated that the consistency of the responses was acceptable, since the coefficient was greater than 0.65, which is the minimum recommended for research purposes (Nunnally, 1982).

The populations for the study were not perfectly representative of the producers and users, the two potential audiences for extension horticulture information. The use of Master Gardeners, members of the Iowa Nurserymen's Association, and garden center retailers in the survey population limited the generalization of the study to these three groups rather than the whole general population of potential users. The Master Gardeners may be less representative of their respective general population of potential users than the Iowa Nurserymen's Association and garden center retailers, since almost all the professional people do either belong to the association or are listed as a retailer. Not all private gardeners are Master Gardeners; therefore, use of the group could be considered as using a biased population. This group, however, due to its familiarity with the Extension Service and extension publications, was

a population which could be interested in the results of the survey. The use of a random sample from the population in the state could have resulted in surveys not being returned simply as a result of non-familiarity with the extension service and its publications. Relf, O'Dell, and Kushad (1990) felt that the use of Master Gardener program participants was productive in a survey, due to their interest in horticultural topics.

Audience Characteristics

For the purpose of this research the sample was divided into two groups, Master Gardeners and commercial people (Iowa Nurserymen's Association and a list of retail garden center operators). For brevity the term "commercial" will be used in all tables. This section will report the demographics of the respondents with respect to: place of residence, years of horticultural schooling, age, current participation with ornamental grasses, and current level of knowledge.

The following data reports the population of the place of residence of the respondents (Table 1). There were eighty-three responses to this question. In the overall survey response the largest group of respondents, twenty-nine (34.9%), were from towns with populations of 5,000 to 49,999. The next largest group of respondents were from metropolitan areas, with twenty-three (27.7%). The third largest group were rural residents, fifteen (18.1%).

This ranking was repeated for the Master Gardener respondents. The commercial respondents, however, reversed the first and second ranking, with more respondents in a metropolitan area. The respondents were fairly evenly divided between the various population groupings.

Table 1. Population of respondents' place of residence

(n=83)

Population	All respondents		Master Gardeners		Commercial	
More than 50,000	23	27.8%	13	24.5%	10	33.3%
5,000-49,999	29	34.9%	20	37.8%	9	30.0%
2,500-4,999	6	7.2%	5	9.4%	1	3.3%
Less than 2,500	10	12.0%	5	9.4%	5	16.7%
Live in rural area	15	18.1%	10	18.9%	5	16.7%
Total	83	100.0%	53	100.0%	30	100.0%

The responses to the question covering years of schooling in horticultural subjects show the following data (Table 2). The figure given shows the mean years of horticultural education for all respondents, for the Master Gardeners, and for the commercial group. A t-test showed no significant difference (.05) between the two groups.

Table 2. Years of schooling in horticulture (Group 1 = Master Gardeners and Group 2 = commercial) (n=80)

	Mean	S.D.	t value	Prob.
All respondents	1.45			
Group 1	1.14	1.89	-1.97	0.052
Group 2	2.00	1.87		

The following data reports the respondents' age (Table 3).

Respondents were asked their year of birth. Data were entered in increments of ten years; ages ranged from two (2.5%) respondents in the 21-30 age category, to seven (8.6%) respondents in the 71-80 age category. The 31-40 age category was the largest, with twenty-six respondents (32.1%). The remainder were found evenly among the remaining three age categories; 41-50, 51-60, 61-70. Forty-seven percent of the respondents were over fifty.

The two youngest respondents were found in the commercial group, while only two of the seven oldest respondents were commercial respondents. A t-test showed there was no significant difference (.05) in the age categories between the Master Gardeners and the commercial group.

Table 3. Age of respondents

(n=81)

Age category	All respondents		Master Gardeners		Commercial	
21-30	2	.5%	0		2	6.9%
31-40	26	32.1%	18	34.6%	8	27.6%
41-50	15	18.5%	10	19.2%	5	17.2%
51-60	16	19.8%	9	17.3%	7	24.1%
61-70	15	18.5%	10	19.2%	5	17.2%
71-80	7	8.6%	5	9.6%	2	6.9%
Missing	2		1		1	

Forty respondents (50.6%) reported growing or selling ornamental grasses (Table 4). The number of plant species ranged from one to eight, with two grasses being the most frequent with 10 respondents (12.4%). The mean number of grasses was 3.35.

Twenty (66.7%) commercial respondents had grasses, and twenty Master Gardeners (41.5%) had grasses. This shows a greater degree of familiarity with ornamental grasses among commercial respondents.

Table 4. Respondents who grow or sell ornamental grasses

Number of grasses	All respondents n=81		Master Gardeners n=51		Commercial n=30	
No grasses	41	49.4%	31	58.5%	10	33.3%
One	9	11.2%	8	15.7%	1	3.3%
Two	10	12.4%	6	11.8%	4	13.3%
Three	2	.6%	1	2.0%	1	3.3%
Four	7	8.7%	2	3.9%	5	16.7%
Five	6	7.5%	0		6	20.0%
Six	3	.8%	1	2.0%	2	6.7%
Seven	1	.2%	1	2.0%	0	
Eight	2	.6%	1	2.0%	1	3.3%
Missing	2		2		0	

The data for the current level of knowledge of the respondents with ornamental grasses showed the following. Thirty-nine respondents (47.0%) did not answer any of the questions which assessed knowledge. This was broken down to twenty-two Master Gardeners (41.5%) and seventeen commercial respondents (56.7%).

These questions consisted of: a list of eight grasses from which the respondents were asked to select the ornamental grasses, and a list of five planting situations from which the respondents were asked to select the most appropriate planting situations for ornamental grasses. A possible reason for non-response is that the overall level of knowledge of ornamental grasses was low. The mean score of those respondents who answered these questions was 47.6 out of a possible 59, or 80.6%. Master Gardeners scored 47.7 while commercial respondents scored 47.2. This would show that those respondents had a good level of knowledge, equivalent to a low "B" grade. The percent of non-responders was lower for Master Gardeners which might indicate that they had a higher level of knowledge.

Needs Assessment

This section will suggest a format for an extension bulletin; it will report those items of information considered important by the respondents and the format in which the information should be presented. This section will also report on the preferred sources of information. It will look at whether increased interest would lead to the purchase of books on ornamental grasses and the plans of respondents as it relates to their future use of ornamental grasses.

Fifteen topics for inclusion in a bulletin on ornamental grasses were

rated (Table 5). The first thirteen topics were listed as important or very important for inclusion in a bulletin by all respondents. The remaining two topics, bamboos and growth of nursery plants were rated as somewhat important.

Data for the two sub-groups showed minor changes in ranking. The means for these topics were not significantly different from each other. Thirteen topics were rated important or very important by the Master Gardeners. The remaining two topics, bamboos and growth of nursery plants were rated as somewhat important. Fourteen topics were rated by commercial respondents as important or very important. Growth of plants in the nursery and the propagation of nursery plants were placed at the bottom of this category. This could indicate that very few of the commercial respondents produced perennial plants. Bamboos were rated as somewhat important.

The following data reports the characteristics, in their order of importance, of a bulletin (Table 6). Three items, easy reading format, broad coverage of the subject and color photographs were considered important. The other two items were rated as somewhat important, with in-depth technical coverage rated as the least important. This would agree with the findings of Grieshop, Bone and Frankie (1990). In an evaluation of a California Extension publication they found that Master Gardener volunteers preferred an easy reading format.

The two sub-groups rated these in the same order. The Master Gardeners had a mean score for each characteristic which was slightly higher than the mean for the commercial respondents. The t-test showed no significant difference between the two sub-groups.

Table 5. Rating of topics in order of importance by all respondents, and sub-groups (n=76)

Topic	Mean all	S.D.	Mean Master Gardener	S.D.	Mean commercial	S.D.
Grasses for the Midwest	4.79	.44	4.80 [1]	.46	4.79 [1]	.41
Plants for the area	4.74	.55	4.78 [2]	.51	4.69 [2]	.60
Uses for ornamental grasses	4.65	.58	4.68 [3]	.60	4.62 [3]	.56
Design of planting area	4.35	.94	4.33 [6]	.99	4.38 [4]	.86
Prep. of planting area	4.29	.76	4.35 [5]	.72	4.21 [6]	.82
Fertilizer needs	4.23	.85	4.24 [7]	.90	4.21 [5]	.77
Garden care of plants	4.23	.98	4.39 [4]	.91	3.97 [10]	1.05
Commercial source of plants	4.08	1.00	4.08 [8]	.90	4.07 [8]	1.16
Winter care container plant	3.99	1.19	4.00 [9]	1.21	3.97 [9]	1.18
Sedges for Midwest	3.97	1.10	3.91 [11]	1.18	4.08 [7]	.95
Increase plants in garden	3.88	.99	4.00 [10]	1.00	3.68 [12]	.18
Propagate nursery plants	3.75	1.15	3.81 [12]	1.09	3.64 [13]	1.25
Rushes for the Midwest	3.68	1.27	3.66 [13]	1.37	3.73 [11]	1.08
Growth of nursery plants	3.44	1.21	3.33 [15]	1.16	3.63 [14]	1.31
Bamboos for the Midwest	3.31	1.44	3.36 [14]	1.48	3.22 [15]	1.40

Table 6. Rating of bulletin characteristics by importance

(n=80)

Characteristic	Mean all	S.D.	Mean Master Gardener	S.D.	Mean commercial	S.D.
Easy reading format	4.30	.81	4.33	.83	4.24	.79
Broad coverage of the subject	4.22	.76	4.23	.79	4.21	.73
Color photographs of the grasses	3.97	1.11	4.06	1.07	3.83	1.20
Low cost	3.39	1.25	3.48	1.28	3.21	1.20
In depth technical coverage	3.09	1.01	3.14	.95	3.00	1.12

Data reporting the rating for sources of information used by all respondents appear next (Table 7). Bulletins were rated as the most important source, with videotapes, meetings, television, friends, classes and satellite programs all rated as being used some. College credit classes were reported as being little used.

Master Gardeners reported essentially the same as all respondents.

Data for commercial respondents show a mean of all sources of information which was somewhat lower than the Master Gardeners. Bulletins were rated with a slightly higher mean. The order of television and friends or neighbors was reversed from that of the Master Gardeners. Satellite programming was also reported as being little used. There was no significant difference in sources of information for both sub-groups.

The rating of videotapes in second place as a source of information has implications for future delivery of information on ornamental grasses.

The findings on source of information agree with the following authors. Pounds (1985) stated that an Extension study in Michigan found that books and pamphlets were a most important source of occupational or professional information. A creative component study at Iowa State University found that Master Gardeners were satisfied with the delivery of portions of their program by satellite telecast (Eckles, 1987). The low rating for satellite telecasts in this study may indicate a lack of familiarity by respondents to this source of information. Decker and Merrill (1990) reported in a study by Cornell University that dairy farmers liked the use of a videotape as part of a workshop. Furthermore, the videotape program led to improvement in knowledge and a change in attitude among farmers.

Table 7. Rating of sources of information by importance

(n=75)

Source of information	Mean all	S.D.	Mean Master Gardener	S.D.	Mean Commercial	S.D.
Bulletin	4.14	.98	4.10	1.04	4.21 [1]	.88
Videotape	3.33	1.22	3.36	1.13	3.28 [2]	1.40
Meeting	3.22	1.20	3.35	1.22	3.00 [3]	1.16
Television	3.08	1.23	3.20	1.22	2.88 [5]	1.24
Friend or neighbor	2.99	1.14	3.02	1.13	2.92 [4]	1.19
Class	2.96	1.27	3.02	1.27	2.84 [6]	1.28
Satellite program	2.76	1.28	2.91	1.26	2.48 [7]	1.30
College credit class	2.19	1.29	2.13	1.25	2.28 [8]	1.37

The following data report the respondents' level of future interest in ornamental grasses. It reports the likelihood of their buying a book on ornamental grasses. A surprisingly high percentage, forty-eight people (64%), reported they would be interested in buying a book.

The data also showed that the interest the respondents had in ornamental grasses was fairly high. The mean of 3.26 indicates that they were somewhat likely to start growing or to increase the number of plants that they had.

Analysis of Relationships

This section looks first at the relationship between the sources of information used by all respondents and the population of their place of residence. Secondly, it compares the sources of information used by all respondents and their age group. Finally, a paired t-test was run on the following data: topics of interest for inclusion in a bulletin, important characteristics of a bulletin, future interest in ornamental grasses, and sources of information used by the respondents. The paired data were analyzed on the responses of Master Gardeners and commercial respondents.

The Oneway Anova compares the sources of information with the population of the respondents' place of residence (Table 8). Respondents whose residence was either metropolitan or towns of 5,000 or larger rated the top four sources of information in the following order: 1) bulletins, 2) videotapes, 3) television, and 4) meetings. Residents of small towns of 2,500-4,999 rated their top four sources as: 1) bulletins, 2) meetings, 3) classes, and 4) videotapes. Residents of towns of less than 2,500 rated their top four sources as: 1) bulletins, 2) videotapes, 3)

meetings, and 4) television. Rural residents rated the following as their order of preference: 1) bulletins, 2) videotapes, 3) meetings, and 4) television. Residents of towns of less than 2,500 rated all sources with the exception of bulletins and video tapes as of little use. In all groups college credit classes were rated as little used. No two groups were significantly different at the 0.05 level.

The second Oneway Anova compares the sources of preferred information with the age of the respondents (Table 9). The six age groups were combined into three for this analysis. The 21-40 age group rated the following in the top four: 1) bulletin, 2) meeting, 3) video tapes, and 4) television. The 41-60 age group rated their top four as follows: 1) bulletin, 2) video tapes, 3) television, and 4) class. The oldest respondents rated their top four as: 1) bulletin, 2) friend or neighbor, 3) video tapes, and 4) meetings. In all groups college credit classes were rated as little used. No two groups were significantly different at the 0.05 level.

The paired t-test showed no significant difference between the responses of Master Gardeners and commercial respondents. Tables reporting the t-test on topics of interest for inclusion in a bulletin are found in the Appendix.

Table 8. Oneway Anova, sources of information with population (n=75)

	Bulletin	Meeting	Class	Satellite	Television	Video	Friend	College
>50,000	3.96	3.09	2.86	2.91	3.14	3.38	2.96	2.05
5000-49999	4.17	3.09	2.91	2.77	3.18	3.22	3.09	2.32
2500-4999	4.67	4.00	3.83	2.83	3.00	3.17	3.00	2.33
<2500	4.00	2.80	2.50	2.40	2.30	3.10	2.56	2.20
Rural	4.31	3.73	3.18	2.75	3.50	3.75	3.17	2.09
Overall Mean	4.15	3.23	2.96	2.76	3.08	3.33	2.99	2.19
F	.78	1.62	1.17	.26	1.45	.51	.43	.15
Prob	.54	.18	.33	.90	.23	.73	.79	.96

Table 9. Oneway Anova, sources of information with age

(n=75)

	Bulletin	Meeting	Class	Satellite	Television	Video	Friend	College
21-40	4.37	3.63	3.19	2.78	3.22	3.33	2.85	2.22
41-60	4.19	3.00	3.04	2.83	3.04	3.60	2.96	2.24
61-80	3.80	3.00	2.53	2.67	2.94	3.11	3.35	2.06
Overall Mean	4.15	3.25	2.97	2.77	3.09	3.37	3.02	2.19
F	2.05	2.44	1.49	.09	.29	.88	1.07	.10
Prob	.14	.10	.23	.92	.75	.42	.35	.90

Survivability of Ornamental Grasses

Ornamental grass study

These grasses showed the following survival rates after the first winter (Table 10). The data were collected 1 June 1990 when the warm season grasses had started into growth, determined by showing signs of new shoot growth. Data were reported as fifty percent survival when one plant lived, one died. This was not a replicated trial. At least one more winter will be required before a definitive plant list can be determined.

Table 10. Survival rate of ornamental grass study 1989-1990 n=2

Common / Botanical Name	100 % survival	50 % survival	100 % kill
1. Giant Chinese Silver Grass <u>Miscanthus floridulus</u> 'Giganteus'			X
2. Silver Feather <u>Miscanthus sinensis</u> 'Silberfeder'		X	
3. Tall Purple Moor Grass <u>Molinia caerulea</u> ssp <u>arundinacea</u> 'Sky Racer'	X		
4. Tall Purple Moor Grass <u>Molinia caerulea</u> ssp <u>arundinacea</u> 'Windspiel'	X		
5. Japanese Silver Grass <u>Miscanthus sinensis</u>			X
6. Japanese Silver Grass <u>Miscanthus sinensis</u> 'November Sunset'		X	
7. Tall Purple Moor Grass <u>Molinia caerulea</u>	X		
8. Tall Purple Moor Grass <u>Molinia caerulea</u> ssp <u>arundinacea</u> 'Staefa'	X		
9. Switch Grass <u>Panicum virgatum</u>		X	

Table 10. (continued)

Common / Botanical Name	100 % survival	50 % survival	100 % kill
10. Feather Reed Grass <u>Calamagrostis acutiflora stricta</u>	X		
11. Mountain's Friend <u>Molinia caerulea</u> ssp <u>arundinacea</u> 'Bergfreund'	X		
12. Karl Foerster's Feather Reed Grass <u>Calamagrostis arundinacea</u> 'Karl Foerster'	X		
13. Tall Purple Moor Grass <u>Molinia caerulea</u> ssp <u>arundinacea</u> 'Transparent'	X		
14. Big Blue Stem <u>Andropogon gerardii</u>	X		
15. Scottish Tufted Hair Grass <u>Deschampsia caespitosa</u> 'Schottland'	X		
16. Variegated Maiden Grass <u>Miscanthus sinensis</u> 'Morning Light'			X
17. Giant Feather Grass <u>Stipa gigantea</u>			X
18. Giant Blue Wild Rye Grass <u>Elymus giganteus</u> 'Vahl Glaucus'	X		
19. Small Japanese Silver Grass <u>Miscanthus oligostachys</u>			X
20. Red Switch Grass <u>Panicum virgatum</u> 'Haense Herms'	X		
21. Red Switch Grass <u>Panicum virgatum</u> 'Rehbrun'	X		
22. Red Switch Grass <u>Panicum virgatum</u> 'Rotstrahlbusch'		X	
23. Fountain Grass <u>Pennisetum alopecuroides</u>			X
24. Feather Grass <u>Stipa capillata</u>	X		

Table 10. (Continued)

Common / Botanical Name	100 % survival	50 % survival	100 % kill
25. Northern Sea Oats <u>Chasmanthium latifolium</u>			X
26. Tufted Hair Grass <u>Deschampsia caespitosa</u> 'Bronzeschleier'	X		
27. Tufted Hair Grass <u>Deschampsia caespitosa</u> 'Goldgehaenge'	X		
28. Tufted Hair Grass <u>Deschampsia caespitosa</u> 'Tautraeger'	X		
29. Late Blooming Tufted Hair Grass <u>Deschampsia caespitosa tardiflora</u>	X		
30. Tufted Hair Grass <u>Deschampsia caespitosa</u> 'Goldstaub'	X		
31. Blue Wild Rye <u>Elymus glaucus</u>	X		
32. Purple Moor Grass <u>Molinia caerulea</u>	X		
33. Sorceress of the Bog <u>Molinia caerulea</u> 'Moorhexe'		X	
34. Golden Variegated Ribbon Grass <u>Phalaris arundinacea luteo-picta</u>	X		

Ornamental grass field trial

The grasses were evaluated on 30 May 1990 to determine survivability after the first winter (Table 11). The study had fifteen plants of each species. Data report the percent of those plants that were alive. These results are preliminary, and several more years will be required before a definitive plant list can be determined.

Table 11. Survival rate of ornamental grass field trial 1989-1990 n=15

Common name	Botanical name	Percent alive 30 May
1. June Grass	<u>Koeleria cristata</u>	100.0
2. Hairy Mellic	<u>Melica ciliata</u>	86.6
3. Canada Wild Rye	<u>Elymus canadensis</u>	100.0
4. Switch Grass	<u>Panicum virgatum</u>	100.0
5. Prairie Dropseed	<u>Sporobolus heterolepis</u>	80.0
6. Sideoats Grama	<u>Bouteloua curtipendula</u>	86.6
7. Pampas Grass	<u>Cortaderia selloana</u>	0.0
8. Blue Fescue	<u>Festuca ovina</u> 'Glauca'	86.6
9. Big Blue Stem	<u>Andropogon gerardii</u>	73.3
10. Feather Top Fountain Grass	<u>Pennisetum villosum</u>	0.0
11. Sand Hills Big Blue Stem	<u>Andropogon hallii</u>	40.0
12. Little Blue Stem	<u>Andropogon scoparius</u>	93.3
13. Bottle Brush Grass	<u>Hystrix patula</u>	100.0
14. Quaking Grass	<u>Briza media</u>	100.0
LSD 0.05		16.5

Ornamental grass container overwintering trial

Insufficient equipment prevented the recording of temperatures under the insulating cover. Data collected from a similar trial, protected by the same method, showed the following temperatures: in December a minimum air temperature of -20°F resulted in a crown temperature of 21°F and a soil temperature of 25°F; in January a maximum air temperature of 61°F resulted in a crown temperature of 42°F and a soil temperature of 42°F. The grasses were evaluated on 30 May 1990 to determine survivability

(Table 12). The study had fifteen plants of each species. Data report the percent of those plants that were alive.

Further studies will be needed on these grasses to determine their suitability for Iowa. These results are preliminary, and several more years will be required before a definitive plant list can be determined.

Table 12. Ornamental grass container overwintering trial 1989-1990 n=15

Common name	Botanical name	Percent alive 30 May
1. June Grass	<u>Koeleria cristata</u>	100.0
2. Hairy Mellic	<u>Melica ciliata</u>	100.0
3. Canada Wild Rye	<u>Elymus canadensis</u>	100.0
4. Switch Grass	<u>Panicum virgatum</u>	100.0
5. Prairie Dropseed	<u>Sporobolus heterolepis</u>	93.3
6. Sideoats Grama	<u>Bouteloua curtipendula</u>	93.3
7. Pampas Grass	<u>Cortaderia selloana</u>	0.0
8. Blue Fescue	<u>Festuca ovina</u> 'Glauca'	100.0
9. Big Blue Stem	<u>Andropogon gerardii</u>	93.3
10. Feather Top Fountain Grass	<u>Pennisetum villosum</u>	0.0
11. Sand Hills Big Blue Stem	<u>Andropogon hallii</u>	93.3
12. Blue Grama	<u>Bouteloua gracilis</u>	86.6
13. Little Blue Stem	<u>Andropogon scoparius</u>	100.0
14. Bottle Brush Grass	<u>Hystrix patula</u>	100.0
15. Viviparous Hair Grass	<u>Deschampsia vivipara</u>	100.0
16. Quaking Grass	<u>Briza media</u>	100.0
LSD 0.05		10.1

Major Findings

The results of the statistical analysis related to the objectives of this research were presented in this chapter. The following statements summarize the major findings of this study:

1. Fifty-six percent of questionnaires mailed were returned.
2. Sixty-three percent of respondents were Master Gardeners.
3. Sixty-two percent of respondents were from towns with populations greater than 5,000.
4. Fifty percent of respondents were growing or selling ornamental grasses.
5. Forty-seven percent of responders did not complete the level of knowledge questions. Of those who did the mean score was forty-eight points out of a possible fifty-nine points (80%).
6. There was no statistical difference between the responses of the Master Gardeners and the commercial respondents.
7. Thirteen of fifteen topics were rated as important or very important for inclusion in an ornamental grass bulletin.
8. Easy reading format and broad coverage of the subject were the two most important characteristics of a bulletin.
9. The top three sources of information were bulletins, videotapes and meetings.
10. Forty-eight respondents (64%) would buy a book on ornamental grasses.
11. A comparison of population and age with preferred sources of information revealed no significant differences at the 0.05 level.

12. Twenty-five of thirty-four grasses in the ornamental grass study survived.

13. Twelve of fourteen grasses in the ornamental grass field trial survived.

14. Fourteen of sixteen grasses in the ornamental grass container trial survived.

CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to conduct a needs assessment related to ornamental grasses. Based on experimental grass studies, it assessed the current knowledge and interest in ornamental grasses and the possible content and format of future delivery of extension programs.

The following objectives were established.

- 1) To determine the suitability of fifty species and cultivars of ornamental grass to the Iowa climate and the growth habits of those grasses in Iowa.
- 2) To determine the knowledge level and interest in ornamental grasses by the two audiences: a. producers, that is, the growers and sellers; b. users, that is, the landscapers and gardeners.
- 3) To determine what information from current research on ornamental grasses is needed by the two audiences.
- 4) To determine if differences in characteristics, knowledge level, interest and information needs exist between the audiences.

Based on the objectives, the following research question was formulated: Do growers and sellers of ornamental grasses need a different level and type of information than do landscapers and gardeners?

The research study was both a descriptive and an experimental one. The descriptive study utilized a mailed questionnaire to identify educational needs and the experimental study was a field trial.

The questionnaire was reviewed by faculty of the Department of Agricultural Education and the Department of Horticulture, Iowa State

University. The University Human Subjects Review Committee certified the project for this research and reviewed the questionnaire. The questionnaire was grouped into three areas. The first group determined the current level of knowledge and activity of the respondents' with ornamental grasses. The second group of five questions considered the information needs of the respondents. The final five questions were demographic in nature. The questions required ratings on a five-point Likert scale.

A cover letter was included with the questionnaire. The accessible population for this study were Extension clientele who had completed the Master Gardeners course, members of the Iowa Nurserymans' Association, and garden center retailers. After substitution of the secondary group into the primary group responders, the final response rate was 84 of 150 or 56%. The usable data sample was 55.3%. Reliability of the survey instrument was measured using the Cronbach alpha coefficient; the alpha coefficient was 0.86.

The following statistical procedures were used to analyze the data: Frequencies, t-tests and analysis of variance. The alpha level was set at a 0.05 level of significance.

The experimental study looked at the adaptability of ornamental grasses to Iowa. The study was designed to determine the suitability of fifty species and cultivars of ornamental grass to the Iowa climate and the growth habits of those grasses in Iowa. Percentages were calculated for survivability.

Conclusions

Demographic data

1) Eighty-three (56%) of questionnaires mailed were returned. Fifty-three (63%) of respondents were Master Gardeners. This was a good response rate, indicating interest in the subject matter.

2) Sixty-two percent of respondents were from towns with populations greater than 5,000. This indicates that a large percentage of respondents live in bigger population areas. This would assist in targeting areas for educational programs.

3) Fifty percent of respondents were thirty-one to fifty years old. Almost fifty percent were over fifty. Only two respondents were under thirty. This indicates a fairly even distribution of ages in all categories except those under thirty.

4) Forty-one respondents had no ornamental grasses. Of the forty respondents with grasses, twenty Master Gardeners, and twenty commercial respondents had a mean of 3.3 plants. Plant numbers ranged from one to eight species. Fifty percent of respondents with ornamental grasses indicates a good number of people already growing ornamental grasses. This should be a base from which to develop greater interest in Iowa.

Needs assessment

1) Forty-seven percent of responders did not complete the level of knowledge questions. Of those who did the mean score was forty-seven point five of a possible fifty-nine. This might indicate that the overall level of knowledge of ornamental grass was poor; however, the mean score of those that did respond was good (80%).

2) The t-test of all items paired between the two groups, Master Gardeners and commercial respondents, showed no statistical differences between the responses of the two groups. The conclusion is that an educational program could be developed that would meet the needs of both groups.

3) The respondents were asked to rate fifteen topics for inclusion in an Extension bulletin. Thirteen of fifteen topics were rated as important or very important for inclusion in an ornamental grass bulletin: the top four were, (1) grasses suitable for the Midwest, (2) list of suitable plants for the area, (3) uses for ornamental grasses, and (4) design in planting areas. Master Gardeners and commercial respondents were not significantly different in their ratings. All remaining topics were rated somewhat important. A similar conclusion can be reached in the case of topics of interest, as both groups rated the topics in the same order of importance.

4) Easy reading format and broad coverage of the subject were the two most important characteristics of a bulletin. This was important for all respondents. These characteristics should be considered when planning extension education programs; in depth, technical information was not important.

5) The top four sources of information were as follows: (1) bulletin, (2) videotape, (3) meeting, and (4) television. The rating of videotapes in second place could indicate an important method of information dissemination for the future.

6) Forty-eight respondents (64%) would buy a book on ornamental grasses, indicating a surprising level of interest in ornamental grasses.

7) When population and age were compared with preferred sources of information, no significant differences at the 0.05 level were noted. This indicated that one educational program could be designed for all.

Ornamental grasses

1. Twenty-five of thirty-four grasses in the ornamental grass study survived. The grasses that died were replanted in the spring of 1990. The unexpected death loss in this study could be a result of planting the grasses later than the recommended planting time.

2. Twelve of fourteen grasses in the ornamental grass field trial survived. The two grasses not surviving were marginal for Iowa.

3. Fourteen of sixteen grasses in the ornamental grass container trial survived. The two grasses not surviving were marginal for Iowa.

Recommendations

Educational program planners should use the results of this study to more closely address the needs of extension horticultural clients with questions and concerns about ornamental grasses. This will allow authors of extension bulletins on ornamental grasses to address the concerns and problems of various users of the bulletin. It will enable authors of extension bulletins to produce bulletins that more precisely meet the needs of the audience for whom they are intended. However, the methodology used to determine the needs of a group with differing interests could easily be utilized elsewhere. For example, it would provide the basis for similar research in the authorship of bulletins or program planning in other closely related subject areas. There is a need,

if interest in ornamental grasses is to grow, for continual information dissemination. This study shows growing interest at present.

The goal of this researcher and Iowa State University is to provide both useful Extension bulletins and Extension education programs. This will utilize the current expertise of the College of Agriculture and the extensive research capabilities of the Iowa State University horticulture station and greenhouses. These resources placed the researcher in a favorable position to answer these questions.

Bulletin format

The results of this survey suggest the following format for an Extension bulletin on ornamental grasses. One bulletin would meet the needs of the Master Gardeners, The Iowa Nurserymans' Association, and garden center retailers. The characteristics considered most important by respondents were easy reading format, broad coverage and color photographs. Low cost was considered somewhat important. The 1990 cost of Iowa Extension bulletins was fifty cents for a five to ten page bulletin, seventy-five cents for eleven to sixteen pages. This price was double if the bulletin contained any number of four color photographs. A bulletin written in the following format would require ten pages plus the cover. The cover could utilize a wrap around color photograph of a landscape with ornamental grasses on the outside, with the title of the bulletin and authors on the front and the Extension statement on the back. The inside front cover should show the table of contents and the acknowledgments. The inside back cover should contain the index. A bulletin following this format, including color photographs, would cost

one dollar fifty cents from the Iowa Extension Service in 1990. This would satisfy the respondents desire for a low cost bulletin.

The contents of the bulletin should cover the following topics. Lay-out constraints may change the sequence of topics, however, the following order is suggested. The bulletin should start with uses for ornamental grasses, the design and preparation of the planting area, fertilizer needs, and the general garden care of ornamental grass plants. This section would require three pages and include several photographs showing various uses of ornamental grasses in the garden. The next section would cover the propagation of plants in the nursery and garden, and the winter care of container plants. The paragraph on container plants should include both garden containers and nursery containers or pots. The winter protection of containers should include a photograph of the covering process, this section would require one page.

A landscape description of the ten most suitable grasses for the Midwest should follow. This description should include the common and botanical name as well as the following characteristics: height of the mature plant; method of propagation; inflorescence color, size, and time of bloom; foliage color and texture; plant form; fall color and winter habit; uses, special soil requirements, site, and other comments. A color photograph of each grass should be included. An additional section should follow which lists other ornamental grasses, sedges and rushes suitable for the Midwest. It should show the common and botanical name and also the hardiness zone. A list of suggested plants for water gardens, shady locations and naturalized areas should also be included. This section would require four pages.

The final two pages of the bulletin should provide the reader with a list of commercial sources of plants and seeds. Also a reference list of books on ornamental grasses and other sources of information should be included. A copy of the zones of plant hardiness from the USDA would complete the bulletin.

Future research questions

Areas of possible future research questioning are directed to the following; writers of ornamental grass bulletins, Horticulture extension specialists, extension educators, future researchers, and ornamental grass researchers.

Writers of ornamental grass bulletins Possible future research questioning might involve a direct survey of all Iowa Nurserymans' Association members. This should look at the number of nursery growers who produce ornamental plants. These producers should be asked to respond to their needs and wants in an Extension bulletin on ornamental grasses. Some Iowa producers of plants belong to the Society of Iowa Florists. This group should be included in any future survey. This would make the determination of need for, and contents of, an Extension bulletin directed to nursery producers only.

Horticulture Extension specialists Additional research should be done on sources of information. Survey respondents placed the use of videotapes second as a preferred source of information. The use of videotapes for the presentation of horticultural topics could be of great interest for the future.

Extension educators While no significant difference was noted, Table 8 and Table 9 do show some difference between groups that should be researched further. The relationship between sources of information used by all respondents and the population of their place of residence, and between sources of information and age is important. Additional research may enable education program planners to target certain groups with their preferred information format.

Future researchers Steps should be taken to encourage a greater percentage of respondents to complete the level of knowledge section of the questionnaire. Questions such as number ten, where the respondent is requested to circle the response which best suits them should be formatted to allow ranking. In selecting the secondary group size, a fifty percent sample should be used in order to obtain sufficient responses.

Ornamental grass researchers The ornamental grass trial started in 1989 should be continued. Additional grasses should be added to the studies, space permitting. An attempt should be made to add additional trials and studies in zone 4 in Iowa. This would allow a definitive list of grasses to be developed for the northern counties in Iowa.

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ACKNOWLEDGMENTS

Many people have helped me with this research. My gratitude to them all, and in particular to the following people.

To my graduate committee members, Dr. Julia Gamon, Dr. Nick Christians, Dr. Alan Kahler, and Dr Nancy Agnew. Their knowledge and assistance, so freely given, was most valuable.

I am especially grateful to my major and co-major professors. To Dr. Julia Gamon for her knowledge and guidance, and for the many long, patient hours devoted to this investigation. To Dr. Nick Christians for his counsel, and the financial support provided by my research assistantship, without which I could not have completed this degree.

To my parents James Eric and Irene Joan Roe, my undying gratitude for their care and love. The example they set awakened a life-long love of learning.

To my children Sara (21), Angela (15), Eric (14), and Alison (8). The joy of my life, they provide the reason for all my endeavors.

To the United States Army, the educational funding provided has made my studies possible.

APPENDIX

	<u>Page</u>
Additional Tables	82
Citation of Scientific Names	84
Cover Letter	86
Questionnaire	87
Human Subjects Research Approval Form	91

Table 13. T-test of bulletin topics (Group 1 = Master Gardeners and Group 2 = commercial)

Variable	Mean	S.D.	T	Probability
Five A Group 1	4.780	0.46	0.03	0.98
Group 2	4.79	0.41		
Five B Group 1	3.92	1.18	-0.60	0.55
Group 2	4.08	0.95		
Five C Group 1	3.66	1.37	-0.23	0.82
Group 2	3.73	1.08		
Five D Group 1	3.36	1.48	0.40	0.69
Group 2	3.22	1.40		
Five E Group 1	4.67	0.60	0.34	0.74
Group 2	4.62	0.56		
Five F Group 1	4.33	0.99	-0.24	0.81
Group 2	4.38	0.86		
Five G Group 1	4.35	0.72	0.79	0.43
Group 2	4.21	0.82		
Five H Group 1	4.25	0.90	0.19	0.85
Group 2	4.21	0.77		
Five I Group 1	4.39	0.91	1.87	0.07
Group 2	3.97	1.05		

Table 13. (Continued)

Variable	Mean	S.D.	T	Probability
Five J Group 1	4.00	1.00	1.38	0.17
Group 2	3.68	0.95		
Five K Group 1	4.78	0.51	0.67	0.51
Group 2	4.69	0.60		
Five L Group 1	4.08	0.90	0.06	0.95
Group 2	4.07	1.16		
Five M Group 1	3.81	1.09	0.62	0.54
Group 2	3.64	1.25		
Five N Group 1	3.33	1.16	-1.02	0.31
Group 2	3.63	1.31		
Five O Group 1	4.00	1.21	0.12	0.90
Group 2	3.97	1.18		

CITATION OF SCIENTIFIC NAMES

Agropyron repens (L.) Beauv.

Agrostis setacea L.

Andropogon gerardii Vitman

Andropogon hallii Hack.

Andropogon scoparius Hitchc. also recognized as *Schizachyrium scoparium*
(Michx.) Nash

Bouteloua curtipendula (Michx.) Torr.

Bouteloua gracilis (H.B.K.) Lag.

Briza media L.

Buchloe dactyloides (Nutt.) Engelm.

Calamagrostis arundinacea L.

Carex panicea L.

Chasmanthium latifolium (Michx.) Yates

Cortaderia selloana (Schult.) A. & G.

Deschampsia caespitosa (L.) Beauv.

Deschampsia vivipara L.

Elymus canadensis L.

Elymus giganteus Vahl.

Elymus glaucus Buckl.

Festuca ovina L.

Festuca rubra L.

Hystrix patula Moench

Juncus squarrosus L.

Koeleria cristata (L.) Pers.

Luzula campestris (L.) DC.
Melica ciliata L.
Miscanthus floridulus (Labilw.) Warb.
Miscanthus oligostachys L.
Miscanthus sinensis Anderss.
Molinia caerulea L.
Panicum capillare L.
Panicum laetum L.
Panicum obtusum H.B.K.
Panicum turgidum Kunth.
Panicum urvilleanum Kunth.
Panicum virgatum L.
Pennisetum alopecuroides (L.) Spreng.
Pennisetum villosum R. Br.
Phalaris arundinacea L.
Sorghastrum nutans (L.) Nash
Sporobolus heterolepis Gray
Stipa capillata L.
Stipa gigantea Trin.
Triticum dicoccoides L.
Triticum vulgare L.

Roger G. Roe
Room 257
Department of Horticulture
Iowa State University
Ames, Iowa 50011

Dear Fellow Horticulturist:

The enclosed questionnaire will be the basis for writing an extension bulletin on ornamental grasses. Your responses will help in determining the format and content of a bulletin on ornamental grasses that you may find useful in the future.

The use of ornamental grasses is becoming more popular. Up until now, most work has been done on the east and west coast, consequently the available publications are more applicable to those climates. We are currently working with ornamental grasses in the Horticulture Department at I.S.U, with the intention of listing those grasses which are adaptable to the upper midwest.

There is a great future for ornamental grasses in the midwestern landscape. It would be hoped that our work will lead to a new area of interest for the gardener and horticulture industry in Iowa. In order for this facet of gardening to develop well, it is important that information on the use of ornamental grasses be produced that will be useful to you.

The information you provide will be held in strict confidence, combined with other responses, and reported only in group summary form. The identification number on the last page will be used to track responses. After it is determined that questionnaires have been returned the identification number will be removed. Please be aware that you are free to withdraw your participation in this survey. If you have any questions, please contact Roger Roe, Department of Horticulture, Iowa State University.

Thank you for taking the time, about 10 minutes, to complete this questionnaire; it will assist us in planning for future extension programs with ornamental grasses in Iowa. Please return this survey by April 1st. You should fold the questionnaire and fasten with a staple or tape. Postage is already attached.

Sincerely,

Dr. Julia Gamon
Department of Agricultural Education
Iowa State University

Roger Roe
Department of Horticulture
Iowa State University

ORNAMENTAL GRASS SURVEY 1990

This survey will be used as a basis for writing an extension bulletin on ornamental grasses.

Ornamental Grasses: Grasses grown for ornamental landscape purposes other than as a turfgrass.

Extension bulletin: A publication of the Cooperative Extension Service. A bulletin could range in size from one page to a dozen or more pages.

Circle the number of your responses or fill in the blank.

1. How familiar are you with ornamental grasses? 1. Not familiar
2. Slightly familiar 3. Somewhat familiar 4. Familiar 5. Very familiar

1	2	3	4	5
---	---	---	---	---

2. To what degree can the following grasses be classified as ornamental?
1. None 2. Little 3. Somewhat 4. Much 5. Very much

a. Big Blue Stem	1	2	3	4	5
b. Quaking Grass	1	2	3	4	5
c. Bent Grass	1	2	3	4	5
d. Indian Grass	1	2	3	4	5
e. Ryegrass	1	2	3	4	5
f. Pampas Grass	1	2	3	4	5
g. Bluegrass	1	2	3	4	5
h. Blue Fescue	1	2	3	4	5

3. How many ornamental grass species do you grow and/or sell? Number_____

4. On a scale of one to five, rate the suitability of growing ornamental grasses in the following areas. 1. Not suitable 2. Slightly suitable
3. Somewhat suitable 4. Suitable 5. Very suitable

a. Grown alone in a flower bed	1	2	3	4	5
b. Beds with perennial or annual flowers	1	2	3	4	5
c. Bed or planter with trees or shrubs	1	2	3	4	5
d. In wild or natural areas	1	2	3	4	5
e. In or on the edge of ponds	1	2	3	4	5

5. How important are each of the topics listed below for inclusion in an extension bulletin for the Midwest? 1. Not important 2. Little importance 3. Somewhat important 4. Important 5. Very important

a. Grasses suitable for the Midwest	1	2	3	4	5
b. Sedges suitable for the Midwest	1	2	3	4	5
c. Rushes suitable for the Midwest	1	2	3	4	5
d. Bamboos suitable for the Midwest	1	2	3	4	5
e. Uses for ornamental grasses	1	2	3	4	5
f. Design of planting areas	1	2	3	4	5
g. Preparation of planting area	1	2	3	4	5
h. Fertilizer needs	1	2	3	4	5
i. General garden care of plants	1	2	3	4	5
j. How to increase plants in the garden	1	2	3	4	5
k. List of suitable plants for the area	1	2	3	4	5
l. Commercial source of plants or seeds	1	2	3	4	5
m. Propagation of nursery plants	1	2	3	4	5
n. Growth of plants in the nursery	1	2	3	4	5
o. Winter care of container plants	1	2	3	4	5
p. Please tell me if I have not covered a topic that would be of interest to you.	_____				

6. How important are the following characteristics of a bulletin? 1. Not important 2. Little importance 3. Somewhat important 4. Important 5. Very important

a. Include color photographs of grasses	1	2	3	4	5
b. Broad coverage of the subject	1	2	3	4	5
c. In depth technical coverage	1	2	3	4	5
d. Easy reading format	1	2	3	4	5
e. Low cost	1	2	3	4	5

7. Would you or do you have enough interest in ornamental grasses to buy a book on the subject?
1. NO 2. YES
8. How likely are you to grow or increase the number of ornamental grasses in your garden or commercial operation in the future?
1. Unlikely 2. slightly likely 3. Somewhat likely 4. Likely 5. Very likely
- | | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| 9. To what extent would you use the following sources of information on ornamental grasses? 1. None 2. Little 3. Some 4. Much 5. Very much | | | | | |
| a. Bulletin | 1 | 2 | 3 | 4 | 5 |
| b. Meeting | 1 | 2 | 3 | 4 | 5 |
| c. Class | 1 | 2 | 3 | 4 | 5 |
| d. Satellite program | 1 | 2 | 3 | 4 | 5 |
| e. Television | 1 | 2 | 3 | 4 | 5 |
| f. Video tape | 1 | 2 | 3 | 4 | 5 |
| g. Friend or neighbor | 1 | 2 | 3 | 4 | 5 |
| h. College credit class | 1 | 2 | 3 | 4 | 5 |
10. Which best describes you? Circle all that apply to you.
1. Hobbyist/gardener
2. Professional gardener/landscaper
3. Garden center/nursery retailer
4. Nursery grower/plant wholesaler
5. Other _____
11. How familiar are you with extension publications? 1. Not familiar
2. Slightly familiar 3. Somewhat familiar 4. Familiar 5. Very familiar
- | | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| | | | | | |

12. What is the population of your city/town?
1. More than 50,000
 2. 5,000-49,999
 3. 2,500-4,999
 4. Less than 2,500
 5. Live in rural area
13. How many years of schooling have you had in horticultural subjects?
____years
14. What year were you born?_____

PLEASE RETURN BY APRIL 1ST

FOLD HERE SO THAT RETURN ADDRESS SHOWS AND FASTEN WITH STAPLE OR TAPE

RETURN TO:

Roger G. Roe

Room 257, Department of Horticulture

Iowa State University

Ames, Iowa 50011

IOWA STATE UNIVERSITY

(Please follow the accompanying instructions for completing this form.)

91

Title of project (please type): Ornamental Grass Survey 1990

I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are properly protected. Additions to or changes in procedures affecting the subjects after the project has been approved will be submitted to the committee for review.

Roger G. Roe 15 February 1990
Name of Principal Investigator Date Signature of Principal Investigator

Room 257 Horticulture 294 0022
Campus Address Campus Telephone

Signatures of others (if any) Date Relationship to Principal Investigator
2-16-90 Major Professor

ATTACH an additional page(s) (A) describing your proposed research and (B) the subjects to be used, (C) indicating any risks or discomforts to the subjects, and (D) covering any topics checked below. CHECK all boxes applicable.

- Medical clearance necessary before subjects can participate
- Samples (blood, tissue, etc.) from subjects
- Administration of substances (foods, drugs, etc.) to subjects
- Physical exercise or conditioning for subjects
- Deception of subjects
- Subjects under 14 years of age and (or) Subjects 14-17 years of age
- Subjects in institutions
- Research must be approved by another institution or agency



ATTACH an example of the material to be used to obtain informed consent and CHECK which type will be used.

- Signed informed consent will be obtained.
- Modified informed consent will be obtained.

Anticipated date on which subjects will be first contacted: Mar 01 90
Month Day Year

Anticipated date for last contact with subjects: May 31 90
Month Day Year

If Applicable: Anticipated date on which audio or visual tapes will be erased and (or) identifiers will be removed from completed survey instruments: May 31 90
Month Day Year

George G. Karas 2/16/90 Agricultural Education & Studies
Signature of Head or Chairperson Date Department or Administrative Unit

Decision of the University Committee on the Use of Human Subjects in Research:

Project Approved Project not approved
George G. Karas 2/22/90 _____
Name of Committee Chairperson Date Signature of Chairperson