CHAPTER 3

METHODOLOGY OF THE STUDY

The purpose of this study was to determine the characteristics of the turfgrass industry in the year 2020 in order to recommend curriculum content for turfgrass course work in agricultural education programs. The major sections of Chapter III are:

1. Statement of the Problem
2. Purpose of the Study
3. Objectives of the Study
4. Design of the Study
5. Selection of the Method
6. Selection of the Panel of Experts
7. Development of the Instrument
8. Validation of the Instrument
9. Collection of Data
10. Analysis of Data
11. Time Frame for the Study
12. Summary

Statement of the Problem

Curriculum content must not solely be based on the past or the present if graduates are to be prepared for the jobs of the future. Curricula should be based on the skills that students will need to function in a fast-paced and constantly-changing society (Ruff, Shylo, & Russell, 1981). Developing timely curriculum in a rapidly changing

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society is difficult but is a task that must be accomplished if agricultural education is to fulfill its role in the education of tomorrow's work force. A futuristic research strategy utilizing the Delphi technique is an accepted approach to curriculum development.

A review of the literature revealed very little concerning futures research in the turfgrass area and nothing that had specific implications for determining turfgrass curriculum content in agricultural education programs. A study by Flanders (1988) on the nursery/landscape industry and another by Varnadore (1989) on the meats industry were excellent models for futuristic curriculum planning in agricultural education. Also, McAllister (1992) on the forestry industry and Combs (1994) in home economics education offered similar excellent models.

Program planning is often done in reaction to a societal change, but rarely do educational planners use futures research as a basis for planning. Futures research can guide planning, while one develops curriculum based on the objectives gained from this planning. The literature search revealed very little research on the future of turfgrass programs and the curriculum.

Purpose of the Study

The purpose of this study was to determine characteristics of the turfgrass industry in the year 2020 in order to recommend curriculum content of turfgrass course work in agricultural education programs of the future. This study was conducted in the belief that curricula should be planned with a futures perspective, based on future characteristics of a particular industry. The justification for this study was that adequate information concerning the turfgrass industry in the year 2020 does not exist and that current agricultural education (turfgrass) curriculum does not prepare students for turfgrass careers in the future.

Objectives of the Study

The primary purpose of this study was to determine the characteristics of the turfgrass industry in the year 2020 in order to recommend curriculum content for turfgrass course work in agricultural education programs of the future.

The specific objectives that were developed to guide this study are as follows:

1. To identify the general characteristics of the turfgrass industry in the year 2020.

2. To determine whether the Delphi technique was a viable means of eliciting a consensus among those nominated to a panel of turfgrass industry experts as to the description of the turfgrass industry in the year 2020.

3. To determine the work force requirements of the turfgrass industry and the educational requirements of those employed in the turfgrass industry in the year 2020.

4. To make recommendations for curriculum content in turfgrass course work in agricultural education programs in order to prepare students for jobs in the turfgrass industry of the future.

5. To develop a demographic profile of those nominated to the panel of experts based upon: (a) education, (b) age, (c) sex, (d) race, and (e) turfgrass industry work experience.

Design of the Study

The Delphi technique, usually considered a quasi-qualitative research method, was employed to gather expert opinion and thought. The development of the Delphi technique has been credited to researchers Dalkey and Helmer at the RAND Corporation during the 1950's. The technique has been intended for use "whenever a consensus is

needed from persons who are knowledgeable about a particular subject. For example, it can be used to identify problems, define needs, establish priorities, and identify and evaluate solutions" (Borg & Gall, 1988, p.413). Through a series of sequential questionnaires, a variety of data can be collected, including judgments, opinions, and attitudes on a particular topic (Adler & Ziglio, 1996; Van de Ven & Delbecq, 1974; Rojewski, 1990).

The advantages of the Delphi technique have traditionally included: allowing for expert opinion without physically bringing the group together, equal access to input, no single domineering participant, assured anonymity, and time for reflective observation and analysis of responses (Brodzinski, 1979; Sackman, 1975, Adler & Ziglio, 1996). The technique has also proven to be effective in identifying key professional characteristics (Miller & Seagren, 1991), in developing a portrait or profile of particular needs or desires (Miller, Spurgin, & Holder, 1991), and in curriculum focus for the future (Combs, 1994; Flanders, 1988; McAllister, 1992; Varnadore, 1989).

Selection of the Method

The Delphi technique was selected as the best method to conduct the study. Studies by Flanders (1988), Varnadore (1989), and McAllister (1992) used the Delphi technique in related fields for determining curriculum content in agricultural education programs.

Linstone and Turoff (1975) listed five conditions of a problem that usually indicate whether the Delphi technique is a valid methodology. The characteristics are:

1.   The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis.

2. The individuals needed to contribute to the examination of a broad or complex problem have no history of adequate communication and may represent diverse backgrounds with respect to experience and expertise.

3. More individuals are needed than can effectively interact in a face-to-face exchange.

4. Time and cost make frequent group meetings infeasible.

5. The heterogeneity of the participants must be preserved to assure validity of the results. (pp. 74-75)

Following are the conditions present in the study which indicated that the Delphi technique was a valid methodology:

1. The data collected in the study did not lend itself to precise analytical techniques. The results are based on the collective judgments of a panel of experts.

2. The panel of experts who participated in the study represented a diverse background throughout the turfgrass industry.

3. The number of participants (25) on the panel of experts made the possibility of equal opportunity for complete expression and interaction unlikely.

4. The geographical distribution of the panel of experts from across the United States (Figure 1) made a group meeting infeasible.

5. The researcher sought to preserve the independent thinking of the diverse panel of experts. There may have been some who would have dominated the meetings and therefore influenced other members of the panel.

Selection of the Panel of Experts

A panel of nationally-recognized experts in the turfgrass industry was needed to participate in the research study. To prevent researcher bias, a pool of possible experts was obtained through a thorough nomination process. A review of human resources in turfgrass management provided the national pool of turfgrass specialists to be consulted for nominations of turfgrass experts. To select members of the Delphi panel of experts, nomination letters were mailed to these turfgrass-related representatives of land grant institutions (teaching, research and extension), college and technical school personnel (teaching and demonstration), and executive or administrative personnel of related professional associations (Appendix A). From this group, the Golf Course Superintendents Association of America was the primary professional organization for turfgrass managers in the United States with over 100 chapters, 47 student chapters, and a total membership exceeding 21,000. The investigator was an educational member of the Golf Course Superintendents Association of America.

These representatives were contacted by the researcher through written correspondence and asked to nominate five persons who they felt would be best qualified to forecast the future directions of the turfgrass industry (Appendix B). Nominators were informed that the criteria for nomination included the professionals who have sufficient knowledge and experience to objectively express opinions concerning the future of the turfgrass industry. Approximately two weeks after the initial contact, a reminder letter was mailed to the non-respondents (Appendix C).

The 38 members of the chosen panel of experts were selected from a list of 428 total nominations which consisted of 194 different people. A total of 110 nomination forms were returned with five or fewer nominations. The 38 individuals receiving 3 or more nominations were selected for the panel of experts. They were contacted by

facsimile correspondence and asked to serve on the Delphi panel (Appendix D) addressing the future characteristics of the turfgrass industry. The panel of experts was geographically dispersed across the United States (Figure 2).

Development of the Instrument

An intensive review of the literature revealed no instrument suitable to collect data for the objectives of the study. The investigator developed the format for the instrument, based on the specific requirements of the study which involved the identification of subjective categories from the literature review. Such categories included personnel education and staff development, technology, availability of turfgrass cultivars, turfgrass management services, legal issues, chemical issues, environmental issues, best management practices, and other issues and/or circumstances. These categories were circulated as the first round of the instrument for individual responses from each member of the Delphi panel of experts (Appendix E).

A "guide question" and a "sample statement" were composed and included in round one of the Delphi technique, focusing on the subject area of each category. The Delphi panel of experts was instructed to read the "guide question" and "sample statement," then develop statements that describe how the category will appear or function with respect to the turfgrass industry in the year 2020.

For the nine categories, 512 statements were collected from the first round of the Delphi technique (Appendix G) as follows:
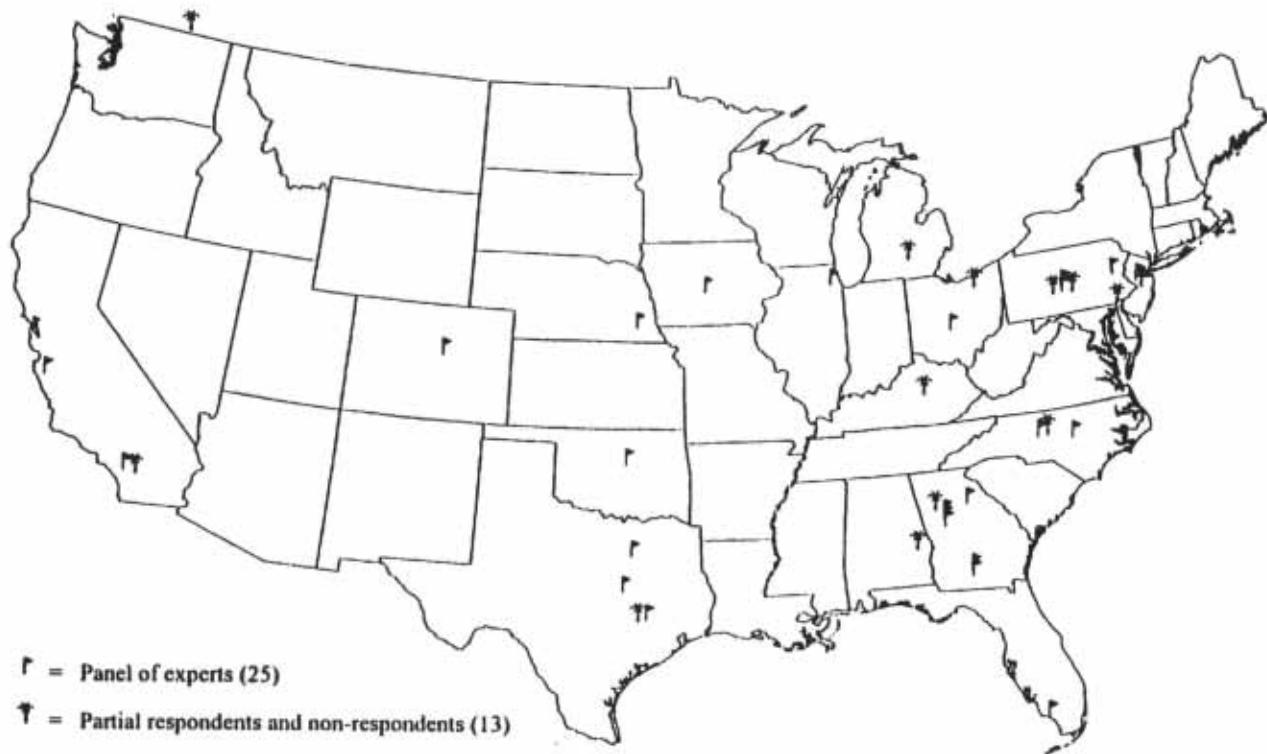
Category Number	Number of Responses
1	75
2	63
3	62

r = Panel of experts (25)

T = Partial respondents and non-respondents (13)

<u>Figure 2</u>. Location of the Panel of Experts.

Category Number	Number of Responses (cont.)
4	45
5	43
6	60
7	59
8	52
9	53

These responses were developed into a draft of the Delphi instrument consisting of 164 items in the nine categories. This draft (Appendix H) was reviewed by a panel of 20 persons with expertise in the turfgrass industry, in futures research, and/or in education (Appendix I). This review panel assisted in the refinement of the document into a 147-item instrument to be circulated in round two of the Delphi technique to the panel of experts.

The instrument used in the study was set up with a Likert-type five-point scale as follows: SD for Strongly Disagree, D for Disagree, U for Undecided, A for Agree, and SA for Strongly Agree. To use the scale in an ordinal manner, each point on the scale was assigned a number, ranging from 1 for Strongly Disagree to 5 for Strongly Agree.

Validation of the Instrument

The necessity, and procedure, for determining content validity has been well documented (Ary, Jacobs, & Razavieh, 1979; Gay, 1976). The instrument was reviewed for face and content validity by a panel of 20 persons (Appendix I) with expertise in the turfgrass industry, in futures research, and/or in education.

Reviewers were provided with the 164-item draft copy of the instrument for examination and review. If any important areas were omitted, then they added them to

the copy. They were asked to comment on the wording and accuracy of all questions. Appreciation was expressed to this review team. Suggestions of the reviewers were incorporated in the final draft of the 147-item instrument.

Collection of Data

The collection of data for this study followed the format established by Flanders (1988), Varnadore (1989), and McAllister (1992). The initial facsimile materials to the 38 experts included a cover letter, the first-round instrument with instructions, and directions to return to the researcher by fax. The cover letter explained the purpose and the significance of the study, stated the obligations of the participants, gave the time frame of the study, and provided an assurance of confidentiality for individual responses. Copies of the first-round instrument and cover letter are found in Appendix E.

Approximately one week after the first correspondence, a reminder facsimile and another copy of the instrument were faxed to the non-respondents (Appendix F). The results of the first round were organized and documented (Appendix G). Thirty-four of the 38 (90%) experts filled out and returned their first-round instrument, indicating their willingness to participate. The results of the first round were summarized and organized into the draft instrument (Appendix H) for review for face and content validity by the review panel (Appendix I). Suggestions of the reviewers were incorporated in the final draft of the 147-item instrument and circulated as round two (Appendix J).

Round two was faxed to the 34 members of the panel of experts. Each participant was faxed the second-round instrument with directions for completion using the five-point Likert scale (SD, D, U, A, SA). After 14 days, a reminder facsimile was faxed to the non-respondents with another copy of the second round instrument (Appendix K). Thirty of the 38 experts completed and returned the round two document. The results of

the second round were tabulated and summarized. A copy of the round-two instrument and cover letter can be found in Appendix J. A copy of the follow-up letter can also be found in Appendix K.

Round three was faxed to the 30 participating members of the panel of experts. Each participant was sent the third-round instrument along with the median answers from the second round and their own answers from the second round. The 30 participants were asked to reconsider their answers based on the results supplied from the second round. Participants were also asked to justify answers which differed from the median.

Twenty-five of the 38 experts returned their round-three instrument after one follow-up facsimile. A copy of the round three instrument and the cover letter can be found in Appendix L. A copy of the follow-up letter can be found in Appendix M.

Analysis of Data

The data from the first round instrument were carefully transcribed and summarized into the draft for the second-round instrument, which was reviewed for content and face validity. The data collected from the second-round instrument were transferred to computer files. The investigator manually completed the transfer of data and triple checked the instruments and computer answer sheets for accuracy. As a final numerical check, student workers assisted the investigator in comparing the computer sheets to the each respondent's answer. The data were submitted for SAS analysis to the Director of the Office of Information Technology and Statistical Services at the University of Georgia College of Agricultural and Environmental Science Coastal Plain Experiment Station, Tifton, GA (SAS Institute, 2000).

The 147 items on the Delphi instrument were rated by each respondent on a five-point Likert scale from Strongly Disagree to Strongly Agree. The scale was converted to a numerical value for statistical analysis as follows:

1	=	SD	=	Strongly Disagree
2	=	D	=	Disagree
3	=	U	=	Undecided
4	=	A	=	Agree
5	=	SA	=	Strongly Agree

Analysis of the data for the study consisted of primarily descriptive statistics using a practical, non-parametric approach (Conover, 1971). Means and standard deviations were calculated (Table 6), and the Pearson product-moment correlation coefficient (Table 7) and the Wilcoxon matched-pairs signed-ranks test (Table 8) were computed. Also, the composite score, as used by Dillon and Wright (1980), was also calculated for each item. As an additional test, the medians and interquartile ranges (Appendix P) were calculated to further determine convergence of opinion (Conover, 1971).

Time Frame of the Dissertation

The time schedule for completion of this research is as follows:

October 10, 1994: Human Subjects Approval.

November 18, 1994 - January 31, 1999: Form Delphi panel.

February 1 - February 15, 1999: Administer Round 1 to Delphi panel.

February 16, 1999 - February 15, 2001: Develop Delphi instrument.

February 16 - March 21, 2001: Advisory committee review of Delphi instrument.

March 22 - April 11, 2001: Administer Round 2 to Delphi panel.

April 12 - April 17, 2001: Analyze Round 2 data.

April 18 - May 28, 2001: Administer Round 3 to Delphi panel.

May 29 - June 4, 2001: Analyze Round 3 data.

June 12, 2001:   Draft copy to advisory committee.

June 12, 2001:   Announce defense of dissertation to graduate school.

June 26, 2001:   Defense of dissertation with advisory committee.

July 16, 2001:   Graduate School check of final copy.

July 27, 2001: Final copy to graduate school.

Summary

This chapter states the planned methodology to achieve the objectives of the study. This study used a facsimile-delivered Delphi instrument to determine the characteristics of the turfgrass industry in 2020.

Data were collected from a panel of 25 nationally nominated experts. Panel members were chosen through an extensive nomination process, resulting in institutional and geographical distribution across the United States.

The Delphi instrument was generated from a review of the literature and first-round responses of the panel members. The instrument was reviewed for content and face validity by a 20-member review committee. The study consisted of three rounds, using the Delphi instrument. Primarily, descriptive statistics were used to analyze the data.

As the characteristics of the turfgrass industry in 2020 were determined, implications on curriculum development were realized. This study will provide a future mechanism for curriculum development in the field of turfgrass management.