A STUDY OF THE EDUCATIONAL IMPACT OF A RESULT DEMONSTRATION PROGRAM ON THE PARTICIPATING 4-H CLUB MEMBERS AND THEIR PARENTS

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TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

BASIC DATA TABLES

CHAPTER I

INTRODUCTION

The Cooperative Extension Service of Oklahoma has long been described as the educational arm of Oklahoma State University. This description is apt because the extension staffs in each county of the state have as their purpose the interpretation and dissemination of information to the people of Oklahoma. One of the methods of disseminating information that has been employed is the result demonstration. Historically, these demonstrations have been established by farm people under the leadership of the county agents. The chief purpose of the demonstration has been to cause a gain in the acceptance by farmers of proven practices.

The importance of result demonstrations is pointed out by Kelsey and Hearns as they refer to the Smith Lever Act of 1914, which stated in part: "...that cooperative agriculture extension service shall consist of giving instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications, and otherwise."[1]

A result demonstration is conducted by a farmer or a 4-H member under the supervision of an extension worker to show locally the value of a recommended practice. In 1960, 172,257 result demonstrations were

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[1]L. D. Kelsey and C. C. Hearns, Cooperative Extension Work (New York, 1949), pp. 128-129.

cooperatively established by 10,982 extension workers in the nation. This averages over 17 demonstrations per worker.[2]

During the period November, 1959 to October 31, 1960, agents of the Oklahoma Extension Service established 11,904 result demonstrations.[3] An estimated ten percent of these result demonstrations involved the cooperation of senior 4-H Club members.

Research related to result demonstrations has been conducted to establish the effects of the result demonstration program on individual farm families, the farm communities, and the related industries. The National Plant Food Institute, the Tennessee Valley Authority and many institutions of higher learning have been engaged in studying the effects of the result demonstration on the adoption of new practices. Some of the recent studies include research by Ronald Brady of Colorado State University, The National Plant Food Institute, and the U. S. Tennessee Valley Authority.[4,5,6]

Numerous studies have been conducted in the following general areas of 4-H Club work: 4-H membership, 4-H leadership, 4-H activities and

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[2]A. S. Gordy, Extension Activities and Accomplishments, 1960, U. S. Extension Service Circular 533 (1960), pp. 6-12.

[3]Oklahoma Extension Service, ed., Combined Annual Report of County Extension Workers, 1960 (Stillwater, Oklahoma), p. 3.

[4]Ronald Paul Brady, "The Value of the TVA Test-Demonstration Program in Colorado" (unpub. M.S. thesis, Colorado State University, 1962).

[5]A Study of Farmers' Attitude Toward the Use of Fertilizer: Analytic Report. National Plant Food Institute (Washington, 1957).

[6]Andrew W. Baird and Wilfred C. Bailey, Test-Demonstration and Related Areas: Review of Literature. Preliminary Reports in Sociology and Rural Life, No. 11 (State College, Mississippi State University Agricultural Experiment Station, 1959).

projects, 4-H camps, 4-H parents, 4-H enrollment, 4-H contests, and 4-H objectives. Some examples of the research in 4-H club work are: George F. Akers' study to determine what perception 4-H adult and junior leaders have of the role of assistant county agent; Kellett W. Hathorne's study of the relationship between school officials and the 4-H club program in Louisiana; and Clarence H. Westfahl's study of the factors effecting 4-H membership in Wisconsin.[7,8,9]

This author's review of literature has not revealed any studies that relate to the 4-H member and the result demonstration. The closest related studies were studies that dealt with the method demonstration.[10,11]

The conclusion is therefore made that while 4-H club members have often been used to conduct result demonstrations under the supervision of extension workers, researchers have not attempted to measure the effect of this experience on the 4-H club member.

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[7]George F. Aker, "The Role of the Assistant County Agent as Perceived by 4-H Adult and Junior Leaders," Research in Cooperative Extension Work (University of Wisconsin, 1958), pp. 1-3.

[8]Kellett W. Hathorne, "A Study of Relationships Between School Officials and the 4-H Club Program in Louisiana," Research in Cooperative Extension Work (University of Wisconsin, 1958), pp. 15-18.

[9]Clarence H. Westfahl, "Some Factors Affecting Nine-Year-Old 4-H Membership in Wisconsin," Research in Cooperative Extension Work (University of Wisconsin, 1962), pp. 49-51.

[10]Helen Petrakis, "Four-H Club Members' Perception of a Method Demonstration," Research in Cooperative Extension Work (University of Wisconsin, 1962), pp. 24-28.

[11]Hubert J. Mocaldo, "Some Factors that Influence the Use of the Method Demonstration by 4-H Club Members as a Club Activity in the Wisconsin 4-H Club Program," Research in Cooperative Extension Work (University of Wisconsin, 1958), pp. 22-27.

Purpose of this Investigation

This study was conducted to evaluate the educational impact of a result demonstration program on the participating 4-H members and their parents.

The primary questions to be answered in this study are as follows:

1. Does participation in the result demonstration program contribute to the 4-H member's knowledge regarding concepts of the basic scientific principles involved?
2. Does the expressed interest of the 4-H member toward science and education change as a result of participation in the result demonstration program?
3. Do parents change their education goals for their children as a result of contact with the result demonstration program?

The effectiveness of the result demonstration program was measured by gains in knowledge of the participating 4-H club members and by the changes in expressed interests of the participating 4-H members and their parents. The changes in knowledge were determined by pretests and posttests related to the result demonstration program. Changes in expressed interest were determined by means of a questionnaire completed by the participating 4-H members and their parents before participating in the result demonstration program and again upon completion of the result demonstration program. Both the achievement test and the interest questionnaire were developed by the investigator.

The achievement test was designed to measure knowledge in three broad subject matter areas of agronomy; botany, soil physiology, and

plant nutrition. The test was a multiple choice, objective type instrument pretested for reliability and validity upon subjects comparable to those included in the final study. Posttests given were exact duplications of the pretest initially administered. Appendix A presents a duplication of the achievement test with the correct responses checked.

Interest questionnaires were developed for both the 4-H member participants and their parents. The student interest instrument was designed to measure changes in the expressed interest of the 4-H member toward science and education as a result of participation in the result demonstration program. The parents' instrument was designed to measure changes in the parents' educational goals for their children as a result of contact with the result demonstration program.

The posttest interest instruments were exact duplicates of the pretest interest instruments administered. Appendix B presents duplicates of the interest instruments used.

Importance of the Study

For years, 4-H members have been involved in establishing result demonstrations in cooperation with the Oklahoma Extension Service. In all of these demonstrations, the assumption has been that the 4-H members derived sufficient educational benefits to justify such an involvement. This study attempts to support or reject this basic assumption. If this assumption is valid, then it should be supported by experimental evidence. Lack of supporting evidence would seem to indicate that a need exists for a thorough evaluation of the involvement of 4-H members in the demonstration program.

Relationship of this Study to the TVA-OSU Grain Sorghum Tests

This study was conducted in conjunction with a result demonstration program sponsored by the Oklahoma Extension Service and the Tennessee Valley Authority. The cooperative venture by the Oklahoma Extension Service and the Tennessee Valley Authority was to demonstrate the value of TVA experimental fertilizers. One facet of the joint project was concerned with accurately demonstrating the relative value of certain fertilizers and fertilizer treatments in terms of crop yields and crop "quality".

A series of thirty-five grain sorghum field tests was conducted by senior 4-H Club boys during 1964. This activity was designed to provide relevant information on the value of TVA ammonium nitrate as a fertilizer source for grain sorghum. Two levels of nitrogen were used. One replication of the high level of nitrogen included the micro element zinc. All of the grain sorghum field tests used the grain sorghum variety O.K. 612.

Agronomic responses were to be measured in terms of nutrient statuses of plant tissue, grain yields, and protein levels on grain. The summer of 1964 was very dry, however, and no agronomic results were obtained.

In addition to establishing the grain sorghum field tests, the participating 4-H members and their parents were presented three formal classes related to grain sorghum production. The three classes covered botany, soil physiology and fertility, and plant nutrition. Each of the classes was taught by a different instructor from the specialist staff of the agronomy section of the Oklahoma Cooperative Extension Service. The three training sessions were designed to provide the participating

4-H Club member with more scientific training than afforded by the result demonstration programs of the past. (See Appendix C)

In the past, the result demonstration programs involving 4-H members have not necessarily included formal training sessions. The normal procedure has been to afford the participating 4-H member with the minimum training required to establish, maintain, and harvest the field test plot. Any additional training received was more or less accidental or coincidental.

Design of the Study

This study was designed with three major objectives in mind:

1. To determine if participation in the 4-H Club grain sorghum demonstration program contributes to the 4-H members knowledge regarding concepts of the basic scientific principles involved.
2. To determine if the expressed interests of the 4-H member toward science and education change as a result of participation in the result demonstration program.
3. To determine if parents change their educational goals for their children as a result of contact with the 4-H grain sorghum demonstration program.

The research design included an experimental group and a control group. The experimental group was selected from six counties. The experimental group established the grain sorghum field tests and attended three special training sessions. The control group was selected from four counties located adjacent to the counties from which the experimental group was selected. The control group received no special training nor

did they participate in any special result demonstration program sponsored by the Oklahoma Extension Service during the period of time of this study.

Both the experimental and the control groups received a pretest and a posttest designed to measure knowledge gained in botany, soil physiology and fertility, and plant nutrition during the four-month period of the study. The experimental and control groups also completed the expressed interest instrument both before and after the experiment.

By design, the independent variable involved in this study is participation or lack of participation in the TVA-OSU program. Dependent variables are: the pretest and posttest scores made on the student achievement test by the participating 4-H Club members of the experimental and control groups, pretest and posttest scores made on the student interest test by the 4-H members of the experimental and control groups, and the pretest and posttest scores made on the parents' instrument by the parents of the 4-H Club members of the experimental and control groups.

Limitations

This study has a number of limitations. Factors recognized as limitations are listed below. There was an attempt to control these factors wherever possible. However, in some cases, control was not possible or feasible.

1. The participants knew they were involved in a study. Therefore, they may have been influenced by the "Hawthorne Effect." No attempt was made to control or measure the "Hawthorne Effect." However, both groups were aware of being involved in the study.

2. The study was limited to one specific result demonstration program. Because of this, caution should be taken in the generalization of the findings as they relate to the participants of other result-demonstration programs.
3. Previous experience of the 4-H members and parents may have postively or negatively affected results. Attempts were made to include only 4-H members and parents who had not previously participated in a similar result demonstration program.
4. Since this type of result demonstration is generally considered to be a 4-H boy activity, this study included only 4-H Club boys. No attempt was made to measure the educational impact of a result demonstration on 4-H Club girls.
5. The extent of cooperation from parents was recognized as a possible limitation at the beginning of the study. One of the criteria for the selection of the 4-H members to participate was agreement of the parents to cooperate with the 4-H members and Extension personnel. Parents who agreed to cooperate at the beginning of the study proved to be most cooperative throughout the entire program.
6. The expressed interest of the 4-H members and the stated goals of the parents for the 4-H members future education may not reflect the true interests of the individuals. This problem is inherent to all studies where measures are taken on the verbal level as opposed to the behavioral level.
7. There might be other factors which may have influenced interest changes of the 4-H Club boys during the course of this study. Some of the influences might stem from activities in other youth

organizations such as church, boy scouts and school. In the selection of the subjects for this study, it was assumed that the effects of these various activities were randomized within the groups.

Clarification of Terms

Certain frequently used terms in this dissertation require specific definition. These terms are:

1. The term "4-H Club members" shall refer to boys who are members of the Oklahoma 4-H Clubs and are between the ages of fourteen and twenty-one.
2. "Student achievement instrument" or "student achievement test" refers to the test developed by this writer to measure changes in knowledge of the 4-H Club members who participated in this study. (Appendix A).
3. "Student interest instrument" refers to the questionnaire developed by this writer to measure changes in expressed interest toward education and science of the 4-H members who participated in this study. (Appendix B).
4. "Parents' instrument" shall refer to the questionnaire developed by this writer to measure changes in the parents' educational goals for their children as a result of contact with this study. (Appendix B).
5. "Oklahoma Extension Service" or "Extension Service" shall refer to the Cooperative Agriculture and Home Economics Extension Service as defined in the Smith-Lever Act of 1914.
6. "T.V.A." shall refer to the Tennessee Valley Authority.

Organization of the Study

Chapter I consists of a brief review of introduction of the problem for study, its need, design, limitations, and identification of terms.

Chapter II presents a brief history of result demonstrations and a brief review of research related to this study.

Chapter III outlines the procedures used for conducting the research and the development of the three instruments used for gathering the data.

Chapter IV contains the results of findings regarding the cooperative grain sorghum demonstration program as measured by knowledge gains and expressed interest change of the participating 4-H Club members. Chapter IV also includes the data and results of findings of the "parents' instrument" as defined on page ten.

Chapter V contains discussion and conclusions drawn from Chapter IV. A summary and recommendations are also listed in Chapter V.

CHAPTER II

BACKGROUND OF THE PROBLEM

The purpose of this chapter is to present background information related to this study. Specifically, this chapter presents a discussion of the situation in the Oklahoma 4-H Club program, the recent trends in Oklahoma agriculture, and selected research findings that have implications for this study.

Characteristics of the Oklahoma 4-H Club Program

The Oklahoma 4-H Club is a voluntary educational program for people between the ages of nine to twenty-one years. It is the youth educational program of the Land-Grant University of Oklahoma, the Oklahoma Extension Service, and the United States Department of Agriculture in cooperation with the county government and schools. The 4-H Club program is financed by three levels of government--Federal, State and County.[1]

The primary aim of the 4-H Club program is to provide opportunities for mental, physical, social, and spiritual growth.[2] More specifically

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[1]Ira J. Hollar, "Hand-out 14" (unpub. report, a presentation to the Directors of the Oklahoma School Activities Association, Oklahoma City, April, 1962), p. 1.

[2]Ibid., p. 2.

the objectives are to help young people to----"Gain knowledge, skills, and qualities for a happy family life. Enjoy useful work, responsibility, and satisfaction in accomplishment. Value research and learn scientific methods for making decisions and solving problems. Know how scientific agriculture and home economics relate to our economy. Explore career opportunities and continue education. Appreciate nature, understand conservation, and use resources wisely. Foster healthful living, purposeful recreation and leisure. Strengthen personal standards and philosophies. Acquire attitudes, abilities, and understanding to work well with others. Develop leadership talents and skills to become better citizens."[3]

The Oklahoma 4-H Club program is almost entirely organized within the primary and secondary school systems of Oklahoma. The schools provide a teacher who serves as an advisor to the 4-H Club work in matters concerning the school. Monthly meetings are held by the 4-H Club members during regular school hours in a room provided by the school for this purpose.

In 1942, Works and Lessor wrote, "In many places the 4-H Club is tied up, to some extent at least, with a nearby rural school, and educators agree that this is a desirable arrangement. The schools' emphasis on basic general principles often adds to the educational values of 4-H Club projects and the projects in turn enrich the school activity program...".[4] Ira J. Hollar, State 4-H Club Leader of Oklahoma estimates

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[3]This is 4-H (PA-526 FES, USDA, U. S. Gov't Printing Office, October, 1962), p. 17.

[4]George A. Works and Simon O. Lesser, Rural America Today (Chicago, 1942), p. 140.

that 85 percent to 90 percent of the 4-H Clubs are organized within the local school systems.[5] The arrangement whereby the 4-H Clubs of Oklahoma are organized within the schools appears to be satisfactory in a majority of schools as evidenced by the high percent of 4-H Clubs that are organized within the schools.

The 4-H Clubs that are not organized with the local schools are organized on a community basis with only local leaders sponsoring the club. These clubs meet in the home of a local leader or some public room available to such groups. The community 4-H Club, as they are often called, must meet either after school or on Saturdays.

The trends evidenced in Oklahoma 4-H Club membership has been toward less total enrollment. Table I shows a steady drop in 4-H Club membership from 1950 through 1964. The Oklahoma 4-H Club enrollment in 1964 was 21,176 4-H members or 27 percent less than the 1950 enrollment.

Farm youth represent a smaller proportion of the Oklahoma 4-H Club enrollment than in the past. (See Table II). In 1953, the farm youth represented 67 percent of the total 4-H Club enrollment in Oklahoma. By 1964, farm youth represented 52 percent of the total 4-H Club enrollment or fifteen percent less than in 1953. While the farm youth are becoming proportionately less, the urban and rural non-farm youth are becoming proportionately greater in terms of total Oklahoma 4-H Club enrollment. This trend toward proportionately fewer farm youth and proportionately more urban and rural non-farm youth may be partially explained by the corresponding drop in the number of farms in Oklahoma for this period.

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[5]Ira J. Hollar, personal letter, dated July 8, 1965.

TABLE I*

OKLAHOMA 4-H CLUB ENROLLMENT BY YEARS

1950	77,676
1951	77,510
1952	76,332
1953	74,977
1954	72,848
1955	71,187
1956	67,647
1957	65,289
1958	61,658
1959	61,415
1960	60,774
1961	
1962	
1963	
1964	56,500

*Date provided by Ira J. Hollar, State 4-H Club Leader from his 1961 plan of work and an unpublished table of statistics.

TABLE II*

PERCENT OF THE OKLAHOMA 4-H CLUB ENROLLMENT BY RESIDENCE

YEAR	FARM	RURAL NON-FARM	URBAN
1953	67%	18%	15%
1958	55%	22%	23%
1964	52.07%	27.59%	19.5%

*Farm refers to 4-H members who live on a farm.
Rural Non-Farm refers to 4-H members who live in a city or town with a population of less than 2500.
Urban refers to 4-H members who live in a city or town with a population of 2500 or more.

Trends in Oklahoma Agriculture

The number of Oklahoma farms has dropped steadily since 1935 when Oklahoma farms numbered 213,325. By 1940 the number of farms had dropped to 179,687 and by 1950 to 142,246. During the period from 1950 to 1959 farm numbers dropped to 94,676 farms. The average size of Oklahoma farms increased during this same period from 166 acres in 1935 to 378 acres in 1959. The average value of Oklahoma farms has also steadily increased since 1935. In 1935 the average value of Oklahoma farms was $3,677.00. In 1959 the average value of Oklahoma farms was $31,155.00. The increase in value is due in part to the inflation brought about by World War II and the increase in the average size of farms.[6]

Total personal income has increased steadily in Oklahoma since 1950 but farm income has not increased proportionately. The total personal income for Oklahoma increased from two billion five hundred and fourteen million dollars in 1950 to four billion six hundred and sixty-four million dollars in 1962. During this same period, total farm income fluctuated from a high of three hundred and forty million dollars in 1951 to a low of one hundred and fifty-nine million dollars in 1956.

The average farm income in Oklahoma for the first five years of the 1950's was higher than the last five years. For the period 1950 through 1954 the average annual farm income was 289 million dollars. For the period 1955 through 1959 the average annual Oklahoma farm income was two hundred and eighteen million dollars or down 24.56 percent from the previous five-year period.

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[6]Nelson W. Peach, Richard W. Poole, and James D. Tarver, County Building Block Data for Regional Analysis (Oklahoma Research Foundation, Oklahoma State University, Stillwater, 1965), p. 559.

Oklahoma farm income for the period 1960 through 1962 was better than the five-year period from 1955 through 1959 but still not as good as the first five years of the 1950's. The average annual farm income for the period 1960 through 1962 was two hundred and eighty six million dollars or six million dollars less than the average for the 1950 through 1954 period.[7]

While gross farm income may be described as steady to lower in recent years, the total farm production costs have continued to increase. The total farm production costs of Oklahoma have increased from 394 million dollars in 1950 to 549.6 million dollars in 1962. (Table III). During the twelve-year period from 1950 through 1962, farm expenses increased by 39.4 percent.[8] This situation of increased production costs with steady to lower gross farm income is often currently referred to by farmers as the price-cost squeeze.

One means the Oklahoma farmer has employed to combat the price-cost squeeze has been to increase production through the use of chemical fertilizer. Since 1954 the use of fertilizer in Oklahoma has nearly tripled. In 1954 a total of 122,205 tons of fertilizer was consumed in Oklahoma. This figure increased every year, except one, until 1964 when Oklahoma consumed 347,848 tons of fertilizer. Every indication points to continued rapid expansion in fertilizer usage in Oklahoma. Fertilizer consumption for the State is expected to approach one million

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[7]Peach, p. 556.

[8]Farm Income 1949-62 (U.S. Department of Agriculture, Economic Research Service, Fis-191 supplement, August, 1963), pp. 40-67.

TABLE III

TOTAL FARM PRODUCTION EXPENSES[9]

Year	U.S. Millions of Dollars	Okla. Millions of Dollars
1950	19,297	394.
1951	22,165	460.9
1952	22,600	460.
1953	21,366	408.
1954	21,664	402.8
1955	21,862	400.5
1956	22,594	401.6
1957	23,371	403.
1958	25,272	471.2
1959	26,200	482.2
1960	26,242	502.
1961	27,091	530.1
1962	28,202	549.6

[9] Farm Income 1949-62 (U.S. Department of Agriculture, Economic Research Service, FIS-191 Supplement, August, 1963), pp. 40-67.

tons within the next ten years.[10]

The Diffusion Process

If today's farmer is to survive, he must adopt the most modern and efficient farming techniques. The Agricultural Extension Service has the responsibility to disseminate the findings of agricultural research to the farmer. The educational task of the Agricultural Extension Service is not complete until the farmers are motivated to adopt the improved farming practices.

Studies on the adoption of new practices have shown that all people do not adopt a new practice at the same time. Some people adopt a new practice very quickly, others wait a long time before adoption, while others may never adopt a new practice. To determine these individual differences, researchers obtained the data from a number of adoption studies of farmers. The farmers were then divided into five groups according to time of adoption. These five groups were innovators, early adopters, early majority, late majority, and laggards.[11]

The five groups of adopters were defined as follows:

Innovators: the first 2.5 percent to adopt a new practice. These people have larger than average farms, are well educated, usually come from well established families and usually have a large amount of risk capital.

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[10]B. B. Tucker and F. P. Gardner, "Fertilizer Trends in Oklahoma," (Department of Agronomy, Oklahoma State University, 1964), pp. 1-11.

[11]Andrew W. Baird and Wilfred C. Bailey, Test Demonstration and Related Areas: Review of Literature. Preliminary Reports in Sociology and Rural Life, No. 11 (State College, Mississippi State University Agricultural Experiment Station, March, 1960), p. 9.

Early Adopters: the next 13.5 percent who adopt a new practice. They are younger than the average farmer, have a higher than average education, and participate more in the formal activities of the community. Their neighbors consider them a good source of information.

Early Majority: the next 34 percent to adopt a new practice. This group is slightly above average in age, education, and farming experience. They are active in community affairs, but are not formal leaders. This group attends farm meetings and demonstrations, and must be sure an idea will work before they adopt it.

Late Majority: the 34 percent of farmers who adopt a new practice after the average farmer is already using it. These people have less education, are older than the average farmer, and represent the majority of the membership in community organizations.

Laggards: the final or last 16 percent to adopt a new practice. The people in this group have the least education, are the oldest, have the smallest farms and the least capital, and are the least active in formal organizations.

Baird and Bailey state that "...the farmers decision to adopt a new practice may be considered as a process in which (a) he hears about a new practice, (b) he becomes interested in the new practice and discusses it's advantages and disadvantages with others, (c) he evaluates and tries the new practice before deciding to adopt, and (d) with the final step being adoption of the new practice." The farmer uses radio,

television, technical resource people, and neighbors and friends as a source of information at each step of the adoption process. However, neighbors and friends are most important at the evaluation stage.[12] One method commonly employed by agricultural extension to expedite the evaluation stage of adoption has been the result demonstration.

History of the Result Demonstration

The Agricultural Extension Service has continually developed new ways of reaching more people. However, of all the methods employed over the years, the result demonstration has continued to be a basic tool in serving all groups. A result demonstration is used to prove the advantages of a recommended practice or a combination of practices. Theoretically, the demonstrator learns by following the recommended practice, by observing, and by keeping a record of results. The demonstrator becomes his own teacher as well as the teacher of his neighbors. The neighbors learn by observing the demonstration and obtaining information from the demonstrator.[13]

The first successful result demonstration was the Community Demonstration farm at Terrill, Texas, established in 1903 on the land of Walter C. Porter. This demonstration of scientific agriculture on the land was the beginning of the Agricultural Extension Service now known around the world. Dr. Seaman A. Knapp, the father of demonstration in

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[12]Andrew W. Baird and Wilfred C. Bailey, Test Demonstration and Related Areas: Review of Literature. Preliminary Reports in Sociology and Rural Life, No. 11 (State College, Mississippi State University Agricultural Experiment Station, March, 1960), p. 10.

[13]Joseph Cannon Bailey, Seaman A. Knapp, Schoolmaster of American Agriculture (New York: 1945), pp. 151-158.

American agriculture, directed this educational experiment at Terrill, Texas.[14]

In 1963, farmers did not readily accept the findings of agricultural research and were reluctant to accept new farming methods. In fact, it was necessary to guarantee the farmer at Terrill, Texas, against financial loss before he would agree to change his farming methods. As demonstration farms grew more numerous and the resistance to change in farming methods was reduced, the guarantee against financial loss was abandoned as a means of soliciting farm cooperators in the demonstration program.

The Terrill demonstration aroused widespread interest from the very beginning. By the end of the 1903 crop year, there was an almost universal demand in that section of Texas for the organization of demonstration farms like that at Terrill. Today, result demonstrations are found in virtually every county in the nation and in many counties abroad.[15]

Related Research

Much has been written about the use of demonstrations in farmer education. Most of this literature is purely descriptive of the demonstrations. In this regard Bailey writes "For example, in one ten year period the Extension Service Review carried 54 articles concerning demonstrations. These were described and evaluated in terms of what the

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[14]Andrew W. Baird and Wilfred C. Bailey, Test Demonstration and Related Areas: Review of Literature. Preliminary Reports in Sociology and Rural Life, No. 11 (State College, Mississippi State University Agricultural Experiment Station, 1959), p. 2.

[15]Ibid., p. 3.

agent and the cooperator learned. Only seven articles touched on the diffusion of information to neighbors."[16]

Research related to result demonstrations has been related for the most part to adult demonstrations conducted by adult farmers. However, the many adult type demonstrations conducted by the farm youth of Oklahoma is mute testimony to the fact that adults are not the only ones who establish adult type result demonstrations. A good example of an adult type result demonstration program conducted by youth is the "Oklahoma 4-H Wheat Fertilizer Demonstration Contest" sponsored by the Oklahoma Plant Food Educational Society. In this program, the participating 4-H Club member agrees to plant a minimum of five acres of wheat, leave an acre of the wheat unfertilized, and fertilize a minimum of four acres according to a fertilizer recommendation based upon a current soil test. There can be no doubt that the sponsors of this program and the many similar programs have as one of their purposes to educate adult farmers in the immediate area of the 4-H Club member's wheat plot, of the advantages of fertilizing wheat. The 4-H Club member, in serving this objective, is a means to an end.

The research related to result demonstrations has disregarded the educational impact of the result demonstration program on 4-H Club members even though 4-H Club members have been actively engaged in the result demonstration program since before the beginning of the Cooperative Extension Service. The Corn Clubs, which served as fore-runners to the Agricultural Extension Service and the 4-H Clubs, had as one objective, to raise the level of income of adult farmers through

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[16]Wilford C. Bailey, "Result Demonstrations and Education," Journal of Cooperative Extension, II (Spring, 1964), p. 15.

demonstrating improved farming methods with organized youth organizations.[17]

Baird and Bailey, in their review of literature related to result demonstrations, never mentioned any studies regarding youth as cooperators in establishing result demonstrations.[18] More recently, Bailey wrote another article reviewing the research related to result demonstration work only to again exclude any mention of research studies related to youth and result demonstration.[19] Perhaps this exclusion of research on youth's role in the result demonstration program was intentional by these writers. However, this researcher is inclined to believe after a thorough review of available literature that Baird and Bailey omitted the youth aspect of result demonstrations because this area has not been deliberately researched.

Characteristics of the Senior 4-H Member

As stated earlier, one basic premise for involving 4-H Club members in result demonstrations is that the 4-H Club member gains useful knowledge through participation. Normally, the result demonstrations are conducted by Senior 4-H Club members. In Oklahoma, Senior 4-H Club members are defined as 4-H Club members between the age of fourteen and twenty-one years. The majority of Senior 4-H members are between the

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[17]O. B. Martin, The Demonstration Work (3rd ed., San Antonio, 1941), pp. 28, 29.

[18]Andrew W. Baird and Wilfred C. Bailey, Test Demonstration and Related Areas: Review of Literature. Preliminary Reports in Sociology and Rural Life, No. 11 (State College, Mississippi State University Agricultural Experiment Station, 1959), p. 2.

[19]Wilfred C. Bailey, "Result Demonstrations and Education," Journal of Cooperative Extension, II (Spring, 1964), p. 15.

age of fourteen and eighteen as most boys and girls drop from the 4-H Club program upon graduation from high school. The age requirement of senior 4-H members coincides with the ages described by Hurlock as early adolescence and late adolescence. Hurlock lists early adolescence as the period from 13 through 16 years of age, and late adolescence as from 17 through twenty-one.[20]

During the age of adolescence the boys and girls are seeking admittance into the adult world. Adolescence is the period when boys and girls find themselves in the frustrated state of being too old to behave like a child and too young and immature to be given the freedom and responsibility of an adult. It is the period of transition between childhood and adulthood. To facilitate this transition the adolescent must master several developmental tasks in order to be happy and well-adjusted in our culture.

Havinghurst lists the developmental tasks of the adolescent as follows:

1. Achieving new and more mature relations with age mates of both sexes.
2. Achieving a masculine or feminine role.
3. Accepting one's physique and using one's body effectively.
4. Achieving emotional independence of parents and other adults.
5. Achieving assurance of economic independence.
6. Selecting and preparing for an occupation.
7. Preparing for marriage and family life.
8. Developing intellectual skills and concepts necessary for

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[20]Elizabeth B. Hurlock, Adolescence Development (2nd ed., New York, 1955), p. 4.

civic competence.

9. Desiring and achieving socially responsible behavior.
10. Acquiring a set of values and an ethical system as a guide to behavior.[21]

The developmental tasks of adolescence hold educational implications for the 4-H Club program as well as the secondary schools and colleges. The ten objectives of the 4-H Club program listed earlier in this chapter closely parallel Havinghurst's developmental tasks of adolescence. For example, Havinghurst's first developmental task states "Achieving new and more mature relations with age mates of both sexes," and a similar 4-H Club objective states "Acquire attitudes, abilities, and understanding to work with others." While the objectives of the 4-H Club program are broader than the developmental tasks of Havinghurst, they are quite similar.

Summary

Two trends are evident in the Oklahoma 4-H Club movement. First, the total membership has decreased steadily for the past decade. Second, the proportion of non-farm youth comprising the total membership is steadily increasing. The implications of these trends are also twofold. The Extension Service must adjust its program to better meet the needs of the non-farm members if it desires to continue to attract the non-farm youth. The Extension Service must also evaluate its present educational programs for rural youth to locate the causes for the continued decline in membership by farm youth. The trend toward fewer farmers with larger

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[21]Robert J. Havinghurst, Human Development and Education (New York, 1953), pp. 111-158.

units may be one cause of the decline in the 4-H Club membership of farm youth but certainly not the only cause. Only a small percentage of the eligible youth in many rural communities are enrolling in 4-H Club work. For example, only 28 percent of the eligible farm youth of Garfield County, Oklahoma, are currently enrolled in 4-H Club work. Goals to adjust or design a program that will continue to attract non-farm youth to enroll in 4-H Club work and goals to increase the enrollment of farm youth may appear to be in conflict. However, the areas of interest, educational goals, and expressed needs of farm and non-farm youth are very similar today. The goal then becomes one of developing a youth program based on those needs and interests of youth which are common to both farm and non-farm youth.

The objectives of the 4-H Club program are worded differently but for all practical purposes are the same as the developmental tasks listed by Havinghurst.[22,23] If one can assume then that the objectives of the 4-H Club program are valid, then the ways and means of reaching these objectives should be evaluated. Of the many teaching methods and techniques employed by the Extension Service in the conduct of the 4-H program, the result demonstration was selected for this study.

The result demonstration has been employed as a method of adult and youth education since the beginning of the Extension Service. In many cases the result demonstration has been an organized program for the 4-H Club members with the dual purpose of providing an educational experience for the child and his parents while providing the friends

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[22] *This is 4-H*, p. 17.

[23] Havinghurst, pp. 111-158.

and neighbors a practical demonstration of an improved practice to observe. The assumption has been that the educational benefits accrued by the 4-H Club member justified his involvement in the program. The apparent lack of evidence to support this assumption provided the basis for this study.

CHAPTER III

PROCEDURE

The purpose of this chapter is to present the methodology used in designing, investigating, and analyzing the problem under study. The study was designed to evaluate the educational impact of a result demonstration program on the participating 4-H Club members and their parents.

Relationship to TVA - OSU Grain Sorghum Tests

The study herein reported is related to a program for field testing experimental fertilizers that was jointly sponsored by the Tennessee Valley Authority and the Department of Agronomy of Oklahoma State University. Specifically, the cooperative venture was to field test and demonstrate the value of TVA ammonium nitrate when used on grain sorghums. The TVA's responsibility in the field tests was to provide the fertilizer for the field tests and the Agronomy Department's responsibility was to supervise the establishment, maintenance, collection of data, and evaluation of the field tests. (See Appendix D). The actual work involved in establishing the field tests was performed by senior 4-H Club members under the supervision of their local county agents and representatives of the Agronomy Department of Oklahoma State University. The purpose of the study herein reported was to evaluate the educational

impact of the experiences provided the 4-H Club members who established, maintained, and harvested the field test plots of the TVA-OSU grain sorghum tests.

Description of the Procedures Followed and the Organization of the TVA-OSU Grain Sorghum Tests

Thirty-five field tests were established by thirty-five senior 4-H Club members. Steps followed in establishing the field tests are as follows:

STEP ONE: Counties were selected where the field tests were to be established. The counties selected were counties where grain sorghum was either presently being produced or a recognized economic potential to produce grain sorghum existed. The counties selected were also selected for their proximity to each other as well as to Stillwater. All the counties selected bordered and were within 65 miles of Stillwater. The counties selected were: Kingfisher County, Garfield County, Logan County, Lincoln County, Noble County, and Pawnee County.

STEP TWO: The 4-H Club members were selected from each of the counties selected. The criteria for selecting the 4-H members were as follows:

(a) must have been a 4-H Club member (boys only).

(b) must have been from a family who operates a farm and produces grain sorghum.

(c) parents of the 4-H members must have been agreeable to the project.

All the 4-H members from the six experimental counties selected who met the above criteria were selected to participate in the program.

STEP THREE: Instruction was given to the 4-H Club members regarding the establishment of the field test plots and in regard to grain sorghum production. The county agricultural agent of each of the experimental counties arranged the time and place for these meetings and Dr. Ed LeGrand of the OSU Agronomy Department presented the instruction. The pretest instruments were also administered by this researcher at these sessions.

STEP FOUR: The TVA fertilizer and the OK 612 grain sorghum seed was delivered to the participating 4-H boys at the close of the first instruction session as outlined in Step Three above.

STEP FIVE: A second period of instruction was presented to the participating 4-H members in late June and early July after the grain sorghum tests were planted. This lesson on soil physiology and fertility was presented by Mr. Elmo Bauman, Extension Agronomist of Oklahoma State University. (See Appendix C). The county agricultural agents of the various counties arranged the time and place of the meeting and notified the 4-H Club members of the meeting.

STEP SIX: Personal visits were made to all field tests during July and August. These visits were made by Mr. Elmo Bauman, Dr. Ed LeGrand, and Dr. Gene Allred of the Oklahoma State University Extension Agronomy Section. This researcher visited three of the test plots in the company of Dr. Gene Allred, Section Leader, of the Extension Agronomy Section. The purpose of these visits was to stimulate the interest of the 4-H member and their parents through personal contact. Dr. Allred's discussion with the 4-H Club member and his parents centered around the problems they had encountered in establishing the grain sorghum test plots and their feelings about the project.

STEP SEVEN: The final training session was administered the last two weeks in August and the first week in September. Dr. Ed LeGrand taught this session on plant nutrition. Again, the county agricultural agents made the necessary arrangements for the meetings and notified the 4-H members and their parents. The posttest instrument was administered to the 4-H members and their parents following this lesson.

STEP EIGHT: The final step in the field test program was the harvest and evaluation of the grain sorghum test plots. However, because of the exceptionally dry summer, the grain sorghum plots did not produce and no yield data was obtained.

Organization of this Study in Relation to the TVA-OSU Grain Sorghum Tests

The purpose of this study was to evaluate the educational impact of a result demonstration program on the participating 4-H members and their parents using the previously described TVA-OSU grain sorghum tests and the cooperating 4-H members and their parents as the treatment and experimental groups respectfully.

The experimental design selected for this study was the equivalent group method. This method provided control for some of the non-experimental influences such as maturity.

Selection of Control Group

Since all of the eligible 4-H Club members of the experimental counties were involved in the grain sorghum tests, it was necessary to seek a control group from counties adjacent to the experimental counties. The four counties selected as control counties were Blaine County,

Canadian County, Grant County, and Major County. All the 4-H Club members in the control counties who met the following criteria were included in the control sample:

(a) must have been a 4-H Club member (boys only);

(b) must have been from a family who operated a farm that produced grain sorghum;

(c) must have been 13 years of age by January 1, 1964.

Table IV lists the control counties and the number of subjects from each county who participated in the study.

Of the seventy-six 4-H Club members of the control sample who took the pretest instruments, a total of eight were not available for posttesting because they had moved out of the county. The eight control subjects who were not available for posttesting were subsequently dropped from the study and no use was made of their pretest scores in the analysis of the data.

TABLE IV

ATTRITION OF THE CONTROL GROUP BY COUNTY

County	Members in Control Group	
	Beginning of Study	Completion of Study
Grant	17	16
Blaine	21	17
Canadian	18	16
Major	20	19
TOTAL	76	68

Attrition of the Experimental Group

The experimental groups received formal training in addition to establishing and maintaining a grain sorghum field demonstration plot. The formal training was presented to the various members of the experimental group listed by county in Table V. Only two of the original thirty-sevel 4-H members in the experimental group dropped from the program, and they dropped after the first formal training session.

TABLE V

ATTRITION OF THE EXPERIMENTAL GROUP BY COUNTY

County	4-H Members in Experimental Group	
	Beginning of Study	Completion of Study
Kingfisher	5	4
Garfield	6	6
Logan	5	5
Noble	9	9
Pawnee	7	7
Lincoln	5	4
TOTAL	37	35

Development of the Instruments

Three instruments were developed for use in this study. The three instruments were the student achievement test, the student interest instrument, and the parent interest instrument.

The test questions of the student achievement interest test were developed from the lesson outlines of the three formal classes to be presented to the experimental group. (Appendix C). Each lesson outline was prepared by the Extension Agronomist who was to present the lesson. After the questions for the achievement test were drafted, the test items were reviewed by the Extension Agronomy section for content validity. Reliability of the student achievement test was checked on twenty-two 4-H club members from Yale, Oklahoma.

The student achievement test was first administered to the twenty-two 4-H Club members of Yale on April 21, 1964. The reliability of the student achievement test was computed from the twenty-two scores using the split-half method. Table VI lists the results of this computation.

The student achievement test was administered the second time to the Yale students on April 28 or exactly one week after the first administration. Twenty of the twenty-two 4-H Club members previously tested were available for retest. Using the test retest method of determining reliability, a correlation coefficient of .70 was derived with a standard error of the estimate of 2.46.[1] For further details see Table VI.

The achievement test questions were developed from the lesson outlines of the three formal classes presented to the experimental group.

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[1]Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education (2d ed., New York, 1961), p. 176.

TABLE VI

RELIABILITY OF ACHIEVEMENT TEST[2]

	April 21, 1964 Split-half Method	April 28, 1964 Test Retest Method
N	22.	20.
r	.4538	.7055
r_{11}	.62	
SE	1.7287	2.4648
S_o	1.89	3.39
S_e	1.97	4.26
S_t	1.93	3.84

r = correlation coefficient

r_{11} = estimated reliability of the full length test using Spearman-Brown prophesy formula

SE = standard error of measurement

S_o = standard deviation of odd scores

S_e = standard deviation of even scores

S_t = standard deviation of combined scores

[2]Robert L. Thorndike and Elizabeth Hagan, Measurement and Evaluation in Psychology and Education (2d ed, New York, 1961), pp. 178-179.

Subsequently these questions were grouped by subject matter area into three subtests identified as Botany and Plant Pathology subtest, Soil Physiology and Fertilization subtest, and Plant Nutrition subtest. (See Appendix F). Following the final administration of the tests to the control and experimental groups, correlations were computed between the subtests to determine if the subtests were actually measuring different things. Table VII lists the intercorrelations of the subtests for the control group, and Table VIII lists the intercorrelations for the experimental group. The highest coefficient of correlations obtained was .3763.

The student interest instruments and the parent interest instrument were developed as questionnaires with forced choice responses. The first seven items of the parent interest instrument were designed to be answered by the parents of both the experimental group and the control group. Items 8, 9, and 10 of the parents instrument were designed to be answered by the parents of the experimental group only. No test for reliability was made for the interest instruments.

Administering the Instruments

All pretesting was conducted during the last three weeks of May and the first week of June. Posttesting was conducted during the last two weeks in August and the first two weeks in September.

Most of the testing was administered by this writer. However, in the instances where it was not possible for this researcher to administer the tests, special instruction was given to the person who was to administer the test. The tests were administered to the 4-H Club members of the experimental group and control group, and parents of the

TABLE VII

INTERCORRELATIONS OF THE SUBTESTS OF THE STUDENT ACHIEVEMENT TEST FOR THE CONTROL GROUP

A. Pretest Correlations

Subtests	Subtests	
	Soil Physiology and Fertilization	Plant Nutrition
Botany and Plant Pathology	.2491	.2399
Soil Physiology and Fertilization		.2203

B. Posttest Correlations

Subtests	Subtests	
	Soil Physiology and Fertilization	Plant Nutrition
Botany and Plant Pathology	.2663	.0313
Soil Physiology and Fertilization		.3763

TABLE VIII

INTERCORRELATIONS OF THE SUBTESTS OF THE STUDENT ACHIEVEMENT TEST FOR THE EXPERIMENTAL GROUP

A. Pretest Correlations

Subtest	Subtest	
	Soil Physiology and Fertilization	Plant Nutrition
Botany and Plant Pathology	.2215	.1997
Soil Physiology and Fertilization		.1594

B. Posttest Correlations

Subtest	Subtest	
	Soil Physiology and Fertilization	Plant Nutrition
Botany and Plant Pathology	.3335	.1626
Soil Physiology and Fertilization		.0525

experimental group at small group sessions held in the respective counties. The parents of the 4-H Club members of the control group were the exception, and they were mailed the parent instrument with a self-addressed, postage-paid envelope to return the completed questionnaire. A total of thirty-two of the sixty-seven parents of the control group responded by mail to both the pretest and posttest parents instrument.

CHAPTER IV

RESULTS OF THE STUDY

This chapter relates the results of the study as measured by three instruments developed especially for this study. For clarity in reporting, the findings are organized into four sections: pretest score comparisons, changes in 4-H members' interest, changes in parents' educational goals for children, and group comparison on the student achievement instrument.

Pretest Score Comparisons

A total of 102 4-H Club members completed the pretest and posttest achievement instruments, including 35 4-H members in the experimental group, and 67 in the control group.

One of the assumptions made in the investigation was that the variances of achievement test scores of the two groups of 4-H members was common or equal. To check this assumption an F test was calculated using the pretest achievement scores of experimental group and the control group.[1] Basic Table III in Appendix A lists the computations of this test. The analysis shows no significance when comparing the lower calculated F value of 1.35 to the tabulated F value of 1.62 at the 5 percent level.

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[1]Deabold B. VanDalen, Understanding Educational Research (New York, 1962), p. 320.

Therefore, a logical assumption is that pretest results of the achievement test demonstrate the conclusion that the two groups are similar. On this basis, the two groups are then suitable for posttest use in the study, since their basic knowledge of Agronomy is similar as measured through the test instruments.

Group Comparisons on the Student Achievement Instrument

The most significant effort of this study was to determine if participation in the 4-H grain sorghum demonstration program contributes to the 4-H Club members knowledge regarding concepts of the basic scientific principles involved. The pretest and posttest scores of the student achievement instrument were used to evaluate the change shown by the experimental group compared with that shown by the control group.

The computations used in comparing the pretest and posttest scores of the experimental group with the pretest and posttest scores of the control group are presented in Table IX. The statistical method used was the t test for comparisons of changes as described by McNemar.[2]

The use of the t test as a basis for judging significance is based on the following assumptions: (1) normality of sampled population, and (2) common, or equal, variances.[3]

The calculated t value indicates there was a significant difference in the knowledge gained by the experimental group when compared to the knowledge gained by the control group. The calculated t value of 2.72

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[2]Quinn McNemar, Psychological Statistics (3rd ed., New York, 1962), pp. 79-106.

[3]Ibid., p. 105.

TABLE IX

CALCULATIONS OF t TO COMPARE CHANGE OF EXPERIMENTAL GROUP'S ACHIEVEMENT TEST SCORES TO CHANGES IN THE CONTROL GROUP'S ACHIEVEMENT TEST SCORES[3]

$$t = \frac{D_E - D_c}{\sqrt{S_{D_E}^2 + S_{D_C}^2}}$$

$$= \frac{2.75 - .23}{\sqrt{.6555 + .1989}}$$

$$= \frac{2.52}{\sqrt{.8544}}$$

$$= \frac{2.52}{.9243}$$

$$t = 2.7263^{**}$$

Where:

$D_E = \bar{X}_{E_2} - \bar{X}_{E_1}$

$D_c = \bar{X}_{c_2} - \bar{X}_{c_1}$

SD_E = Standard error of the difference for the experimental pre and posttests.

SD_c = Standard error of the difference for control pre and posttests

$t(100)_{.05} = 1.98^{**}$

$t(100)_{.01} = 2.63^{**}$

[3]McNemar, pp. 102-104.

exceeded the tabular t value of 1.98 at the .05 level of significance. This difference was also significant at the .01 level of significance.

Change in 4-H Club Members Interest

One purpose of this study was to determine if the expressed interest of the 4-H member toward science and education changed as a result of participation in the result demonstration program. To answer this question the 4-H Club members were given the expressed interest test both before and after the experiment. (See Appendix B). A summary of the questions and responses of the experimental and control groups is presented in Basic Data Table V.

Level of Aspiration

Table X lists the responses to the three questions on the interest questionnaire that were directed toward determining the educational aspirations of the 4-H Club members. All respondents of both the experimental group and the control group indicated they planned to complete high school on both the pretest and the posttest. Both groups also responded about the same when asked if they planned to attend college. On the pretest a total of 31 respondents or 88 percent of the experimental group and 81 percent of the control group, indicated they wanted to attend college. On the posttest two of the experimental group or 5.71 percent of the experimental group changed their response from a "no" or "undecided" to a "yes", they wanted to attend college. During this same period of time, only 1.47 percent of the control group changed their response from an "undecided" or "no" to a "yes", they wanted to attend college.

A third question was asked to determine how the students felt about

TABLE X

CHANGE IN RESPONSES TO QUESTIONS RELATING TO EDUCATIONAL ASPIRATIONS

Question 2: "Do you plan to graduate from High School?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	35	35	0	---	68	68	0	---
No	---	---	---	---	---	---	---	---
Undecided	---	---	---	---	---	---	---	---

Question 3: "Do you want to attend college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	31	33	+2	5.71	55	56	+1	1.47
No	1	2	+1	2.85	3	0	-3	4.41
Undecided	3	0	-3	8.57	10	12	+2	2.91

Question 7: "Do you look forward to school starting in the fall?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	24	26	+2	5.71	45	45	0	0
No	7	4	-3	8.57	12	11	-1	1.47
Don't Care	4	5	+1	2.85	11	12	+1	1.47

school. Forty-five of the control group and twenty-four of the experimental group responded "yes" on the pretest to the question, "Do you look forward to school starting in the fall?". No change was made by the control group in the number of "yes" answers to the question on the posttest, but two of the experimental groups changed their response from "no" or "don't care" on the pretest to "yes" on the posttest.

Educational Preferences:

Questions one, four, and five were designed to uncover changes in educational preferences which might occur as a result of participation in the result demonstration program. (See Table XI). Absolutely no change was indicated in the responses of the experimental group to the question, "Do you like to study science in school?" However, six respondents or 8.82 percent of the control group did change their response to this question from a "yes" on the pretest to a "no" or "undecided" on the posttest.

Question number four was designed to record changes in expressed preference for specific areas of college education. Since agronomy was the broad field of endeavor to which the experimental group was to receive training, the supposition was that the training would either influence the group for or against the area according to their experience. The question also listed several other scientific fields in hopes of finding the effects of scientific training in agronomy on the experimental group's interest in other fields of scientific endeavor. "Something else" was listed as a possible choice indicating some field other than a field of scientific endeavor. Eleven percent of the experimental group changed from one of the four listed fields (agronomy, chemistry, engineering, and education) to the choice of "something else" on the

posttest. Only one or 2.85 percent of this change was away from agronomy however. The control group responded differently with five respondents or 7.35 percent changing their preference from agronomy to either a response of "engineering," "education," or "something else." The only other field which suffered a net loss on the control group's posttest was chemistry which dropped from eight to seven.

Question five asked the 4-H members to mark either agronomy, chemistry, engineering, or education as the field they would least like to study. The field most often listed in both the experimental group and the control group was education. There was very little difference in the pretest and the posttest responses of the experimental group, and absolutely no changes of the number of respondents from the experimental group who listed agronomy as the field they would least like to study. The number of respondents in the control group who listed agronomy as the field they would least like to study increased from thirteen on the pretest to seventeen on the posttest. The field of education was the most often listed as the least desired course of study by both groups. The posttests of both groups showed an increase in the number of respondents who listed education as the field least desired. A total of forty-two or forty percent of all respondents listed education as the least desired field of study.

TABLE XI

CHANGE IN RESPONSES TO QUESTIONS RELATED

TO EXPRESSED EDUCATIONAL PREFERENCE

Question 1: "Do you like to study science in school?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	30	30	0	--	58	52	-6	8.82
No	3	3	0	--	5	9	+4	5.88
Undecided	2	2	0	--	5	7	+2	2.91

Question 4: "If you did attend college, which of the following would you most prefer to study?

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	7	6	-1	2.85	6	1	-5	7.35
Chemistry	2	3	+1	2.85	8	7	-1	1.47
Engineering	8	5	-3	8.57	20	22	+2	2.91
Education	2	1	-1	2.85	6	9	+3	4.41
Something Else	16	20	+4	11.4	28	29	+1	1.47

Question 5: "Which would you least like to study?

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	5	5	0	0	13	17	+4	5.88
Chemistry	6	4	-2	5.71	18	13	-5	7.35
Engineering	8	9	+1	2.85	14	13	-1	1.47
Education	16	17	+1	2.85	23	25	+2	2.91

Occupational Preference

One assumption often made is that the 4-H Club program leads youth into the field of agriculture. Questions eight, nine, and ten listed in Table XII were designed to check this assumption. (See Table XII). When asked on the pretest "Would you like to be a county agent or an agronomist?", six of the experimental group responded "yes"; eleven responded "undecided". After receiving the treatment, the experimental group responded to this question with seven "yes'", seventeen "no's", and eleven "undecided". The "undecided" responses decreased by seven or twenty percent of the respondents, the "no" responses increased by six or seventeen percent of the respondents, and the "yes" responses increased by one. Very little change occurred in pretest and posttest responses of the control group on this question. The total "yes" responses were eleven on the posttest as compared to twelve on the pretest, the "no" responses were twenty-seven on the posttest as compared to twenty-six on the pretest, and there was no change in the total "undecided" responses.

In response to the question "Would you like to be a farmer?", seven or twenty percent of the responses of the experimental group changed from "yes" or "undecided" on the pretest to "no" on the posttest. On this same question the control group had a pretest-posttest change of only two responses representing less than three percent of the total control group responses.

There was a preponderence of agreement between the control group and the experimental group on the need for a man starting farming today to have some education beyond a high school education. Only one respondent in each group listed a response on the posttest that differed

TABLE XII

CHANGE IN RESPONSES TO QUESTIONS RELATED

TO EXPRESSED OCCUPATIONAL PREFERENCE

Question 8: "Would you like to be a county agent or agronomist?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	6	7	+1	2.85	12	11	-1	1.47
No	11	17	+6	17.1	26	27	+1	1.47
Undecided	18	11	-7	20.	30	30	0	0

Question 9: "Would you like to be a farmer?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	19	16	-3	8.57	39	37	-2	2.91
No	5	12	+7	20.	8	8	0	0
Undecided	11	7	-4	11.4	21	23	+2	2.91

Question 10: "Do you think a man starting farming today should have some education beyond a high school education?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	35	34	-1	2.85	64	65	+1	1.47
No	--	--	--	--	3	3	0	0
Undecided	--	1	+1	2.85	1	--	-1	1.47

from his posttest response.

Participation in Future Result Demonstrations

The posttest responses of both the control group and the experimental groups showed a decline in the number of respondents who would be interested in participating in another demonstration program starting soon after this project was concluded. The total "yes" responses of the experimental group dropped from twenty-nine on the pretest to twenty-five on the posttest. (See Table XIII). This change of four represented 11.4 percent of the total experimental respondents. The control group's reaction to the question was forty "yes" responses on the pretest and thirty-four "yes" responses on the posttest for a net loss of six responses. These six responses represented 8.82 percent of the total respondents in the control group. (See Table XIII).

Interpretation of Responses

While no statistical analysis was made of the responses to the student interest questionnaire, certain value judgments or inferences were implied when the changes in the pretest and posttest responses of the experimental group and the changes in the pretest and posttest responses of the control group were compared. The comparisons imply the following:

1. Participation in the TVA-OSU result demonstration did:
   (a) negatively affect the 4-H Club members expressed opinions toward becoming a farmer;
   (b) negatively affect the 4-H Club members opinion toward becoming a county agent or an agronomist.
2. Participation in the TVA-OSU result demonstration program

TABLE XIII

CHANGE IN RESPONSES TO QUESTION RELATED TO INTEREST

IN PARTICIPATION IN FUTURE RESULT DEMONSTRATIONS

Question 6: "Would you be interested in cooperating in another demonstration program involving a different crop and starting this fall?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	29	25	-4	11.4	40	34	-6	8.82
No	1	2	+1	2.85	2	9	+7	10.29
Undecided	5	8	+3	8.57	26	25	-1	1.47

did not appreciably affect:

(a) the 4-H Club members expressed interest in seeking a high school or college education;

(b) the 4-H Club members expressed preference of a field of study in college;

(c) the 4-H Club members willingness to participate in another result demonstration.

The results would indicate that participation in the TVA-OSU result demonstration program negatively affected the 4-H Club members expressed opinion toward becoming a farmer, a county agent, or an agronomist. The writer feels that this is due in part to the drouthy conditions that prevailed during the result demonstration program. It is quite possible that the members of the experimental group were more closely involved with the economic aspect of farming than were the members of the control group. When the grain sorghum test plots completely dried up and when no returns were realized in terms of either recognition or money, the participating 4-H Club members could quite naturally be expected to be discouraged.

A second possible explanation for the experimental groups increased response against agriculture as a career may have been the training sessions they attended. By attending the training sessions the 4-H member may have realized that the field of agronomy, the work of a county agent, and the knowledge required for modern farming was not as he expected. After the participating 4-H member was exposed to this knowledge, he may have simply decided against any of the fields as a career or a life-time occupation.

The positive effects of participation in the TVA-OSU result

demonstration program were impossible to evaluate in some cases. For example, on the pretest all or almost all of the respondents in both the control group and the experimental groups responded that they planned to complete high school and attend college. In this situation it is not possible to assess what influence, if any, participation in the result demonstration might have had on the 4-H members plans to complete high school and attend college.

Changes in Parent's Educational Goals for Children

The parents' instrument was designed to measure changes in their educational goals for their children as a result of contact with the result demonstration program. The questions and responses of the parents of both the experimental group and control group are listed by groups and discussed in the text of this chapter.

Educational Expectations

Parents of both groups were in almost total agreement to the first three questions on both the pretest and the posttest and did not appreciably change their responses from pretest to posttest. (See Table XIV). All parents responded on the posttest that they wanted their children to graduate from high school and attend college. Two of the parents of the control group indicated they were undecided about college for their children on the pretest but changed their response in favor of college on the posttest. All parents but one agreed on both tests that a young man starting farming needed some education beyond high school. One of the parents of the experimental group was undecided on pretest but changed his response to favor additional education on the posttest.

TABLE XIV

PARENT RESPONSES RELATED TO EDUCATIONAL ASPIRATIONS FOR CHILDREN

Question 1: (Asked of all parent respondants.) "Do you want your children to graduate from high school?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	32	0	---	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	---	---	---	---	---	---	---	---

Question 2: "Do you presently desire that your child attend and graduate from college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	30	32	2	6.21	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	2	---	---	---	---	---	---	---

Question 3: "Do you think a young man starting farming today should have some education beyond a high school education?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	31	32	1	3.12	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	1	---	---	---	---	---	---	---

The parents of both groups were also in close agreement on Question 6 which asked, "If your son plans to farm, would you encourage him to attend college?". Without exception, the parents of the experimental group responded "yes" to this question on both tests. One of the parents of the control group responded "no" on the pretest when all others responded "yes". On the posttest, however, three of the control group's parents responded other than "yes". Two responded that they were "undecided" and one responded "no" to the question. (See Table XV).

TABLE XV

QUESTION 6 OF PARENTS' QUESTIONNAIRE

Question 6: "If your son plans to farm, would you encourage him to attend college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	32	0	--	31	29	-2	6.21
No	--	--	--	--	1	1	0	--
Undecided	--	--	--	--	--	1	+1	3.12
No Response	--	--	--	--	--	1	+1	3.12

Occupational Preference

Parents of both the experimental group and the control group were asked to respond to questions regarding the course of study they would most prefer or least prefer for their son. (See Tables XVI, XVII, and XVIII). The pretest-posttest responses on Question 4 showed very little change for the experimental group (6.21 percent net change in response). The change, however, was away from agronomy toward education and child's preference. During the same period, parents of the control group had a net change of response of 15.6 percent toward agronomy and chemistry and away from engineering and education.

TABLE XVI

QUESTION 4 OF PARENTS' QUESTIONNAIRE

Question 4: "If you were advising your son in enrolling in a course of study at college, which of the following would you most prefer he study?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	12	10	-2	6.21	5	8	+3	9.37
Chemistry	4	4	0	--	5	7	+2	6.21
Engineering	14	14	--	--	15	12	-3	9.37
Education	2	3	+1	3.12	7	5	-2	6.21
Child's Preference	--	1	+1	3.12	--	--	--	--

The parents were also asked in Question 5 to select the field of study they would least prefer their son to study. (Only 3.2 percent of the parents of the experimental group listed agronomy as the least preferred field of study at the beginning of the result demonstration program.) An additional 18 percent of the parents of the experimental group listed agronomy as "least preferred" at the conclusion of the result demonstration program. For the same period of time no changes occurred in the total response toward agronomy by the parents of the control group. However, a like change did occur in the responses of the parent control group but in different fields. Thirty-two percent of the parent control group listed education as the "least preferred" field of study for their son on the pretest and 43 percent listed education as "least preferred" on the posttest.

TABLE XVII

QUESTION 5 OF PARENTS' QUESTIONNAIRE

Question 5: "Which would you least prefer your son to study in college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	1	7	+6	18.75	8	8	0	--
Chemistry	12	10	-2	6.21	9	9	0	--
Engineering	4	4	0	--	5	1	-4	12.5
Education	15	10	-5	15.60	10	14	+4	12.5
Child's Preference	--	1	+1	3.12	--	--	--	--

Table XVIII lists the responses of the parents to the question, "Would you encourage your son to become a farmer?". Both the parents of the experimental group and the parents of the control group divided their responses almost equally between "yes", "no", and "undecided" on the pretest. However, on the posttest, an additional 9.37 percent of the responses were given as "yes" by the experimental group while 6.21 percent less responses were given as "yes" by the control group. Three less "no" responses were recorded by the experimental group on the posttest, and four more "no" responses were recorded on the posttest.

TABLE XVIII

QUESTION 7 OF PARENTS' QUESTIONNAIRE

Question 7: "Would you encourage your son to become a farmer?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	12	15	+3	9.37	11	9	-2	6.21
No	10	7	-3	9.37	10	14	+4	12.50
Undecided	10	10	0	--	11	8	-3	9.37
No Response	--	--	0	--	--	1	+1	3.12

Participation in Additional Result Demonstration

Tables XIX, XX, and XXI list the responses to three questions asked of the parents of the experimental group regarding the value of the result demonstration program of the type in which their children participated. All parents responded "yes" on the pretest when asked, "Do you think field demonstrations such as this grain sorghum demonstration are educational to the children who are not going to be farmers?" On the posttest two respondents changed their responses to this question to "undecided". (See Table XIX).

TABLE XIX

QUESTION 8 OF PARENTS' QUESTIONNAIRE

Option	Experimental Group			
	Pretest	Posttest	Diff.	% Resp.
Yes	32	30	-2	6.21
No	—	—	—	—
Undecided	—	2	+2	6.21

Twenty-eight of the parents agreed on the pretest that more "demonstrations such as this are needed to promote improved farm practices," while four of the respondents remained undecided. On the posttest, one parent changed his response from "undecided" to "more".

TABLE XX

QUESTION 9 OF PARENTS' QUESTIONNAIRE

Option	Experimental Group			
	Pretest	Posttest	Diff.	% Resp.
More	28	29	+1	3.12
Less	—	—	—	—
Don't Know	4	3	-1	3.12

The last question on the parent instrument asked if the parent would permit his boy to participate in a similar demonstration program beginning in the fall following the completion of this demonstration program. All the parents agreed on the pretest that they would permit their child to participate in another program. On the posttest, two of the parents responded "undecided" and one parent responded "no".

TABLE XXI

QUESTION 10 OF PARENTS' QUESTIONNAIRE

Option	Experimental Group			
	Pretest	Posttest	Diff.	% Resp.
Yes	32	29	-3	9.37
No	—	1	+1	3.12
Undecided	—	2	+2	6.21

Interpretations of Responses

In the absence of a statistical tool to measure the significance of the changes in the pretest and posttest responses of the two groups of parents, significance becomes a matter of value judgment. In the judgment of this writer, the parent questionnaire implies the following.

As a result of contact with the result demonstration program, parents of the experimental group of 4-H members:

(a) did not decrease their desire for their children to complete high school and attend college; (Since the parents of both groups were in almost unanimous agreement on this point, it was not possible to assess any positive effects of the program.)

(b) did not change their opinion that a young man starting farming should have additional education beyond a high school education; (No assessment of the positive influence of the result demonstration was possible due to the nearly unanimous agreement of all respondents on the need for additional training.)

(c) increased their responses in favor of encouraging their sons to become farmers;

(d) increased the number of responses which listed Agronomy as the field of study they least preferred their son to study in college.

The writer feels that the increase response listing agronomy as "least preferred" was mostly due to the parents increased awareness of the nature of the field of agronomy and the parents' observation of his sons responses to the three training sessions.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Since the beginning of the Cooperative Agriculture Extension Service, the result demonstration has been employed as a teaching tool. Historically, these demonstrations have been established by adult farm people or 4-H Club members under the leadership of the County Agents. The chief purpose of the demonstration has been to cause a gain in the acceptance by farmers of proven practices.

Extensive research has been conducted to measure the effect of result demonstrations in terms of the acceptance of farm practices. However, very little or no studies have been made to measure the educational effects of result demonstration program on the 4-H Club members who are often used to establish the demonstrations.

In this study, an evaluation was made of the educational impact of a result demonstration program on the participating 4-H Club members and their parents. Gains in knowledge and changes in expressed interest of participating 4-H Club members were measured by pretests and posttests especially designed for this purpose. Changes in the parents' educational goals for their children were also measured by pretests and posttests.

The research design included an experimental group and a control group. The experimental group established grain sorghum field tests

and attended three special training sessions. The control group received no special training nor did they participate in any special result demonstration program sponsored by the Oklahoma Extension Service during the period of time of this study.

Differences in knowledge gained was statistically analyzed for significance by means of the t test. No statistical analysis was made for responses to the youth interest questionnaire or the parent questionnaire.

Procedure and Instrumentation

This study was conducted as a companion study to a joint study of the Tennessee Valley Authority and Oklahoma State University. The TVA-OSU study involved thirty-seven 4-H Club members from six Oklahoma counties in the establishment, maintenance, and harvest of grain sorghum field test plots. These 4-H members represented the experimental group of 4-H Club members for this study.

The control group of sixty-eight 4-H Club members were selected from four counties adjacent to the six counties where the experimental group lived. Members of the control group were selected on the basis of age, sex, and type of farm background in an attempt to control these variables. All 4-H Club members of the four control counties who met these requirements were included in the control group.

The study spanned a period of approximately four months. Members and parents of both the experimental group and the control group were tested at the beginning of the study and again at the end of the study.

Three instruments were developed for use in the study. The three instruments were: the student achievement instrument, the student interest instrument, and the parent instrument. The student achievement

instrument, designed to measure knowledge gained, was designed by the writer and subjected to careful examination and constructive criticism by the Extension Agronomy section prior to testing for reliability. Reliability of the student achievement instrument was checked on twenty-two subjects using both test-retest method and the split-half method of determining reliability. Using the test-retest method, a correlation coefficient of .70 was derived with a standard error of the estimate of 2.76. Using the split-half method, a reliability of .62 was estimated using the Spearman-Brown prophecy formula.

The student interest instrument and the parent interest instrument were developed as questionnaires with forced choice responses. No test for reliability was made for these instruments.

Conclusions

1. Participants in the joint TVA-OSU grain sorghum test program significantly increased their knowledge of the scientific principles involved when compared to knowledge gained by the control group. The difference in knowledge gained by the experimental group when compared to knowledge gained by the control group was significant at the .01 level of significance.

2. As a result of participating in the TVA-OSU result demonstration program, the 4-H members of the experimental group appeared to be influenced negatively in their reaction toward farming as a career.

3. As a result of participating in the TVA-OSU result demonstration program, the 4-H members of the experimental group appeared to be negatively affected toward becoming a county agent or an agronomist.

4. Participation in the TVA-OSU result demonstration program <u>did not</u> seem to appreciably affect:

   (a) the 4-H Club members' expressed interest in seeking a high school or college education;

   (b) the 4-H Club members' expressed preference of a field of study in college;

(c) the 4-H Club members' willingness to participate in another result demonstration.

5. As a result of contact with the TVA-OSU result demonstration program, parents of the experimental group of 4-H members were influenced positively in terms of encouraging their sons to become farmers.

6. As a result of contact with the TVA-OSU result demonstration program, parents of the experimental group of 4-H members were influenced against Agronomy as a preferred field of study for their sons.

7. Contact with the TVA-OSU result demonstration program by parents of the experimental group of 4-H did not:

   (a) deplete their desire for their children to complete high school and attend college;

   (b) change their opinion that a young man starting farming should have additional education beyond a high school education.

All but the first of the above findings are based on value judgments of the writer after examination of a tabular comparison of questionnaire responses of the experimental group with the responses of the control group.

One conclusion of the writer was that the 4-H Club members made a significant gain in knowledge as a result of participating in the TVA-OSU result demonstration program. The 4-H members of the experimental group were affected in their expressed choice of occupations and in their expressed choice of a field of study in college. Finally, the parents of the experimental group appeared to be equally affected in their expressed occupational and educational goals for their children.

Recommendations

The implications drawn from the data presented in this study must be viewed in light of the limitations of this study. The results

obtained are only applicable to the 4-H Club members involved in this study. Generalizations of findings to other result demonstration programs may not provide comparable results, and at best, the results obtained should be considered as indicators or trends rather than absolute or definite criteria. Further experimental studies providing comparable data are needed to support these findings in terms of generalization and greater scope of application.

The data revealed significant evidence that this particular result demonstration program was an effective teaching method. However, the teaching method employed not only involved the 4-H Club members in the establishment of a grain sorghum field test plot but in three informal classes of instruction. This presents the question of, which experience, the involvement in the establishment of the demonstration or the classes of instruction, is the most effective teaching tool? Would the classroom-type teaching present the same or nearly the same results in terms of knowledge gained? Would the results have been the same if no classroom instruction had been given?

Still other questions are presented following this study. Would parents with negative attitudes toward a high school or college education change as a result of contact with this result demonstration program? Would 4-H Club members with negative attitudes toward high school and college education be positively affected by participation in such a program?

The writer feels that the severe drouth that prevailed during this study may have affected some of the results. The 4-H Club members who participated in the establishment and maintenance of the grain sorghum plots were no doubt discouraged when the plots dried up like tissue

paper. The discouraging affects of the drouth could have been responsible for the posttest increase in the negative responses towards the field of agronomy and the occupations of county agent and farmer. Would this response have been different if the growing season had been more favorable?

Perhaps the only application this study will have will be to raise questions about the educational effects of result demonstration programs by the Cooperative Extension Service and to stimulate further interest in finding answers to these questions. If additional research is stimulated, then this study will have been worthwhile.

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A P P E N D I X A

BASIC DATA TABLE I

ACHIEVEMENT TEST SCORES OF YALE STUDENTS USED TO COMPUTE RELIABILITY OF ACHIEVEMENT TEST USING SPLIT-HALF METHOD

	Raw Scores		
Name	Odd Score	Even Score	Total Score
B. Hyle	5	7	12
B. Johnston	9	9	18
Walter Burleson	8	9	17
D. Cox	12	9	21
C. Roberton	12	10	22
J. Dickerson	9	11	20
T. Jester	12	12	24
J. Elrod	9	9	18
F. Johnson	8	9	17
L. Dawes	13	11	24
J. Pierce	10	10	20
L. Cox	9	9	18
C. Reeder	10	9	19
E. Belveal	7	5	12
L. Hasle	10	5	15
L. Hyle	7	11	18
J. Acklin	10	9	19
J. Hensley	8	7	15
W. Moore	9	5	14
C. Cox	9	9	18
D. Baker	8	7	15
T. Ford	8	8	16

Where

N = 22
r = .4538
SE = 1.7287
R = correlation coefficiency
SE = standard error of estimate

BASIC DATA TABLE II

TEST SCORES OF MALE STUDENTS USED TO COMPUTE RELIABILITY OF ACHIEVEMENT TEST USING TEST RETEST METHOD

Name	1st Test 4-21	2nd Test 4-28
L. Lilly	21	26
B. Hyle	12	11
B. Johnston	18	16
D. Cox	21	17
J. Dickerson	20	24
T. Jester	24	24
J. Elrod	18	25
F. Johnson	17	21
L. Dawes	24	22
J. Pierce	20	22
C. Reeder	18	21
E. Belveal	12	15
L. Hasle	15	16
L. Hyle	18	16
J. Acklin	19	19
J. Hensley	15	19
W. Moore	14	13
C. Cox	18	18
D. Baker	15	19
T. Ford	16	13

Where

N = 20
r = .7055
SE = 2.4648
R = correlation coefficient
SE = standard error of estimate

BASIC DATA TABLE III

F TEST OF EXPERIMENTAL AND CONTROL

GROUP PRETEST SCORES*

$$F = \frac{\Sigma x^2/(N-1)}{\Sigma x^2/(N-1)}$$

$$= \frac{S_L^2}{S_s^2}$$

$$= \frac{(3.6695)^2}{(3.1505)^2}$$

$$= \frac{13.4652}{9.9256}$$

$$F = 1.3566$$

$$F(66,34)_{.05} = 1.62$$

*Deabold B. Van Dalen, Understanding Educational Research (New York, 1962), p. 320.

BASIC DATA TABLE IV

SURVEY OF POTENTIAL 4-H CLUB ENROLLMENT

OF FARM YOUTH IN GARFIELD COUNTY

April 3, 1966

	Enrollment	
	Actual	Potential
Carrier	48	154
Hillsdale	16	69
Waukomis	48	220
Trum	33	131
Hunter	35	108
Kremlin	45	116
Bison	20	21
Covington	50	226
TOTAL	295	1,045

Note: Actual enrolled farm youth is 28.2% of potential enrollment.

BASIC DATA TABLE V

RESPONSES TO YOUTH INTEREST QUESTIONNAIRE

Question 1: "Do you like to study science in school?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	30	30	0	---	58	52	-6	8.82
No	3	3	0	---	5	9	+4	5.88
Undecided	2	2	0	---	5	7	+2	2.91

Question 2: "Do you plan to graduate from High School?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	35	35	0	---	68	68	0	---
No	---	---	---	---	---	---	---	---
Undecided	---	---	---	---	---	---	---	---

Question 3: "Do you want to attend college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	31	33	+2	5.71	55	56	+1	1.47
No	1	2	+1	2.85	3	0	-3	4.41
Undecided	3	0	-3	8.57	10	12	+2	2.91

Question 4: "If you did attend college, which of the following would you most prefer to study?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	7	6	-1	2.85	6	1	-5	7.35
Chemistry	2	3	+1	2.85	8	7	-1	1.47
Engineering	8	5	-3	8.57	20	22	+2	2.91
Education	2	1	-1	2.85	6	9	+3	4.41
Something Else	16	20	+4	11.4	28	29	+1	1.47

Question 5: "Which would you least like to study?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	5	5	0	0	13	17	+4	5.88
Chemistry	6	4	-2	5.71	18	13	-5	7.35
Engineering	8	9	+1	2.85	14	13	-1	1.47
Education	16	17	+1	2.85	23	25	+2	2.91

Question 6: "Would you be interested in cooperating in another demonstration program involving a different crop and starting this fall?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	29	25	-4	11.4	40	34	-6	8.82
No	1	2	+1	2.85	2	9	+7	10.29
Undecided	5	8	+3	8.57	26	25	-1	1.47

Question 7: "Do you look forward to school starting in the fall?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	24	26	+2	5.71	45	45	0	0
No	7	4	-3	8.57	12	11	-1	1.47
Don't Care	4	5	+1	2.85	11	12	+1	1.47

Question 8: "Would you like to be a county agent or agronomist?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	6	7	+1	2.85	12	11	-1	1.47
No	11	17	+6	17.1	26	27	+1	1.47
Undecided	18	11	-7	20.	30	30	0	0

Question 9: "Would you like to be a farmer?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	19	16	-3	8.57	39	37	-2	2.91
No	5	12	+7	20.	8	8	0	0
Undecided	11	7	-4	11.4	21	23	+2	2.91

Question 10: "Do you think a man starting farming today should have some education beyond a high school education?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	35	34	-1	2.85	64	65	+1	1.47
No	—	—	—	—	3	3	0	0
Undecided	—	1	+1	2.85	1	—	-1	1.47

BASIC DATA TABLE VI

RESPONSES TO PARENT QUESTIONNAIRES

Question 1: (Asked of all parent respondents.) "Do you want your children to graduate from high school?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	32	0	---	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	---	---	---	---	---	---	---	---

Question 2: "Do you presently desire that your child attend and graduate from college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	30	32	2	6.21	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	2	---	---	---	---	---	---	---

Question 3: "Do you think a young man starting farming today should have some education beyond a high school education?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	31	32	1	3.12	32	32	0	---
No	---	---	---	---	---	---	---	---
Undecided	1	---	---	---	---	---	---	---

Question 4: "If you were advising your son in enrolling in a course of study at college, which of the following would you most prefer he study?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	12	10	-2	6.21	5	8	+3	9.37
Chemistry	4	4	0	--	5	7	+2	6.21
Engineering	14	14	--	--	15	12	-3	9.37
Education	2	3	+1	3.12	7	5	-2	6.21
Child's Preference	--	1	+1	3.12	--	--	--	--

Question 5: "Which would you least prefer your son to study in college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Agronomy	1	7	+6	18.75	8	8	0	--
Chemistry	12	10	-2	6.21	9	9	0	--
Engineering	4	4	0	--	5	1	-4	12.5
Education	15	10	-5	15.60	10	14	+4	12.5
Child's Preference	--	1	+1	3.12	--	--	--	--

Question 6: "If your son plans to farm, would you encourage him to attend college?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	32	0	--	31	29	-2	6.21
No	--	--	--	--	1	1	0	--
Undecided	--	--	--	--	--	1	+1	3.12
No Response	--	--	--	--	--	1	+1	3.12

Question 7: "Would you encourage your son to become a farmer?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	12	15	+3	9.37	11	9	-2	6.21
No	10	7	-3	9.37	10	14	+4	12.50
Undecided	10	10	0	--	11	8	-3	9.37
No Response	--	--	0	--	--	1	+1	3.12

Question 8: (Asked only of parents in experimental group.) "Do you think field demonstrations such as this grain sorghum demonstration are educational to the children who are not going to be farmers?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	30	-2	6.21	--	--	--	--
No	--	--	--	--	--	--	--	--
Undecided	--	2	+2	6.21	--	--	--	--

Question 9: "As a farmer do you think more or less demonstrations such as this one are needed to promote improved farm practices?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
More	28	29	+1	3.12	---	---	---	---
Less	---	---	---	---	---	---	---	---
Don't Know	4	3	-1	3.12	---	---	---	---

Question 10: "Would you permit your son to participate in a similar demonstration program involving another crop beginning this fall?"

Option	Experimental Group				Control Group			
	Pretest	Posttest	Diff.	% Resp.	Pretest	Posttest	Diff.	% Resp.
Yes	32	29	-3	9.37	---	---	---	---
No	---	1	+1	3.12	---	---	---	---
Undecided	---	2	+2	6.21	---	---	---	---

BASIC DATA TABLE VII

PRETEST AND POSTTEST SCORES OF THE CONTROL GROUP

ON THE STUDENT ACHIEVEMENT INSTRUMENT

Initial	Scores		Initial	Scores	
	Pretest	Posttest		Pretest	Posttest
J. B.	11	17	F. N.	16	16
B. B.	16	14	C. E. R.	20	19
L. D.	21	22	B. L.	20	16
S. H.	17	16	J. M.	28	22
L. M.	20	19	J. P.	16	15
M. M.	15	21	G. P.	18	19
T. M.	17	19	H. R.	21	21
S. S.	14	18	L. S.	20	26
L. B.	18	18	M. Z.	15	14
T. D.	18	24	S. Z.	15	13
C. E.	18	21	K. M.	17	14
R. G.	14	16	B. O.	17	21
D. R. M.	11	12	T. S.	19	18
L. N.	13	18	J. B.	20	12
D. S.	22	21	M. G.	25	27
M. W.	17	20	D. B.	26	13
D. C.	19	22	D. B.	26	21
L. R. C.	20	17	D. G.	23	22
D. D. H.	21	19	G. S.	24	24
L. D. H.	22	23	B. G.	17	21
S. H.	22	19	B. M.	19	16
H. D. Jr.	9	14	L. M.	17	17
J. T.	21	22	C. P.	13	17
J. W.	19	19	D. H.	19	22
W. K.	18	20	L. S.	18	21
J. R.	19	19	S. F.	18	23
J. R.	22	23	L. A.	24	18
T. R.	18	15	S. D.	24	22
L. S.	21	18	J. T.	18	17
R. L. S.	23	24	B. C.	18	18
M. B.	16	16	J. C.	23	24
R. K.	16	17	P. M.	17	20
J. N.	17	18	J. R.	20	22
			J. D. V.	20	18

BASIC DATA TABLE VIII

PRETEST AND POSTTEST SCORES OF THE EXPERIMENTAL GROUP

ON THE STUDENT ACHIEVEMENT INSTRUMENT

Initial	Scores		Initial	Scores	
	Pretest	Posttest		Pretest	Posttest
E. C.	23	25	M. G.	25	25
G. L.	17	24	D. S.	22	23
G. M.	23	25	G. C.	22	25
R. M.	23	26	S. M.	22	27
L. M.	20	30	D. S.	17	26
K. R.	22	24	J. S.	27	31
B. H.	24	27	D. V.	22	27
C. K.	15	24	D. V.	20	30
M. M.	19	23	E. W.	16	22
G. P.	17	22	D. W.	13	22
G. E.	19	25	D. Z.	21	30
E. N.	19	22	E. A.	20	18
R. S.	19	23	D. A.	22	15
R. W.	20	29	G. C.	22	23
D. D.	24	28	L. L. F.	21	26
L. E.	22	23	B. P.	22	14
P. F.	27	18	J. P.	20	23
			L. S.	25	24

A P P E N D I X B

STUDENT INTEREST INSTRUMENT

Name_____Age____Mailing Address_____

Please mark each of the questions according to how you feel or think. There are no right answers to these questions. Remember these answers are confidential. Do not leave any questions unanswered.

1. Do you like to study science in school?
   Yes_____
   No_____
   Undecided_____

2. Do you plan to graduate from high school?
   Yes_____
   No_____
   Undecided_____
   If answer is no, please state why_____
   _____
   _____

3. Do you want to attend college?
   Yes_____
   No_____
   Undecided_____

4. If you did attend college which of the following would you most prefer to study? (Mark one)
   Agronomy_____ Engineering_____
   Chemistry_____ Education_____
   Something else_____

5. Of the following which would you least like to study in college? (Mark one)
   Agronomy_____ Engineering_____
   Chemistry_____ Education_____

6. Would you be interested in cooperating in another demonstration program involving a different crop and starting in the fall?

   Yes_____
   No_____
   Undecided_____

   If answer is no, please state why_____
   _____
   _____

7. Do you look forward to school starting in the fall?

   Yes_____
   No_____
   Don't care_____

8. Would you like to be a county agent or agronomist?

Yes_____
No_____
Undecided_____

9. Would you like to be a farmer?

Yes_____
No_____
Undecided_____

10. Do you think a man starting farming today should have some education beyond a high school education?

Yes_____
No_____
Undecided_____

PARENTS' INSTRUMENT I

Name_____Mailing Address_____

Please mark each of the following questions according to how you feel or think. Mark only one answer for each question. There are no "right" answers to these questions. Your responses to these questions are confidential.

1. Do you want your children to graduate from high school?
   Yes_____
   No_____
   Undecided_____
   If answer is no, please state why_____
   _____
   _____

2. Do you presently desire that your child attend and graduate from college?
   Yes_____
   No_____
   Undecided_____

3. Do you think a young man starting farming today should have some education beyond a high school education?
   Yes_____
   No_____
   Undecided_____

4. If you were advising your son in enrolling in a course of study at college, which of the following would you most prefer he study?
   a. Agronomy_____ c. Engineering_____
   b. Chemistry_____ d. Education_____

5. Which one of the following would you least prefer your son to study in college?
   a. Agronomy_____ c. Engineering_____
   b. Chemistry_____ d. Education_____

6. If your son plans to farm would you encourage him at attend college?
   Yes_____
   No_____
   Undecided_____

7. Would you encourage your son to become a farmer?
   Yes_____
   No_____
   Undecided_____

8. Do you think field demonstrations such as this grain sorghum demonstration are educational to the children who are not going to be farmers? Yes_____
   No_____
   Undecided_____

9. As a farmer do you think more or less demonstrations such as this one are needed to promote improved farm parctices?

   More needed_____
   Less needed_____
   Don't know _____

   If answer is no, please state why_____
   _____
   _____

10. Would you permit your son to participate in a similar demonstration program involving another crop beginning this fall?

   Yes_____
   No_____
   Undecided_____

   If answer is no, please state why_____
   _____
   _____

A P P E N D I X C

OUTLINE FOR CLASS I

GRAIN SORGHUM PRODUCTION (BOTANY LESSON)

I. Introductions:

1. Botanical description of sorghum
2. Origin and history
3. Uses
4. Composition

II. Importance

1. In the United States and world
2. In Oklahoma
3. Leading States
4. Primary use in Oklahoma

III. Cultural Practices

1. Seedbed preparation
2. Time of planting
3. Seeding rate
4. Weed control

IV. Harvesting

1. Time of harvesting
2. Method

V. Material to be Incorporated into the Lecture of Class I

Botany - Study of plants

Ecology - Study of plants in relation to its surroundings

Plant Pathology - Study of plant diseases and their control

Plant Physiology - Study of the life processes of plants

Parts of a grass plant and their role in the life of a plant

1. Node
2. Internode
3. Leaf
4. Stem
5. Roots - Types of root system
6. Buds
7. Inflorescence

Stages of plant growth

1. Germination
2. Vegetative growth
3. Reproductive growth

How plants produce their own food

1. Process of photosynthesis
2. Action of the roots
3. Conductive tissues within the plant (Xylem-phloem)

OUTLINE FOR CLASS II

SOIL PHYSIOLOGY AND FERTILITY

I. Soils - Their formation and characterization as to

   A. Texture

   B. Stage or degree of development

   C. Factors affecting their adaptation to crops

II. Soil Testing

   A. Soil test correlation

   B. Value of soil tests

   C. How used

III. Fertility Requirements of Key Crops

IV. Functions of Various Plant Nutrients

OUTLINE FOR CLASS III

PLANT NUTRITION

I. Soil and Water Relations

- A. Mineral matter of the soil
- B. Organic matter of the soil
- C. Water holding capacity of the soil

II. Absorption of Water

- A. Roots and root system
  - 1. Primary Root System
  - 2. Secondary Root System
- B. Absorption region of roots
  - 1. Root Hairs
- C. Environment factors influencing rate of absorption

III. Enzymes

- A. Definition and kinds
- B. Function of enzymes and catalysts
- C. Production of enzymes by plants

IV. Photosynthesis

- A. Definition and chemical formula
- B. Importance of photosynthesis
  - 1. Responsible for all Plant and Animal Life
  - 2. Responsible for Coal, Oil and Gas
- C. Magnitude and efficiency of photosynthesis
- D. Manufacture of sugars.

V. Supply Route of the Plant

- A. Xylem
  - 1. Responsible for Upward Movement of Salts and Water in Plants
- B. Phloem
  - 1. Responsible for Downward Movement of Sugars in Plants
- C. Lateral movement between xylem and phloem
- D. Accumulation of foods

A P P E N D I X D

DIAGRAM OF TVA-OSU GRAIN SORGHUM TEST PLOTS

Each test plot requires 1 1/2 acres of land. The following diagram should help explain the layout for the plot. If you have any questions, consult with your County Agent.

1/2 Acre	1/2 Acre	1/2 Acre
+	+	+
Recommended starter fertilizer	Recommended starter fertilizer	Recommended Starter fertilizer
	+	+
	50# ammonium nitrate	50# ammonium nitrate
		+
		zinc additive

O.K. 612 Grain sorghum seed will be provided to plant the plot. The plot can be planted using a lister or a grain drill with every other hole plugged. The ammonium nitrate fertilizer and the ammonium nitrate with the zinc added should be applied as a top dress after the grain sorghum is planted or applied as a preplant ahead of planting. Do not apply the ammonium nitrate fertilizers with the seed or at planting time.

A P P E N D I X E

STUDENT ACHIEVEMENT INSTRUMENT

Instructions

This quiz is a part of a research project of Oklahoma State University. The score you make on this quiz is confidential and will not be revealed to anyone.

There are four possible answers to each item. Only one answer is correct! Choose the answer you believe to be correct and mark an "X" through the appropriate letter on the answer sheet.

Example:	Item	Choice
	1.	(a) (b) (c) (X)

Mark an answer for all items. There is no penalty for guessing.

Place your name, address, and school at the top of the answer sheet which is the last page of this test. Please do your best.

4-H Members Instrument No. 1

1. The green coloring matter in a leaf is the
   X a. chlorophyll
   ___b. cell wall
   ___c. nucleus
   ___d. stoma

2. The growth habit of grain sorghum is
   X a. annual
   ___b. biennial
   ___c. perennial
   ___d. none of the above

3. The best type of soil for growing crops is
   ___a. Arid soil
   ___b. semiarid soil
   ___c. sterile soil
   X d. deep, fertile soil

4. Plant proteins contain which of the following plant nutrients
   ___a. zinc
   X b. nitrogen
   ___c. boron
   ___d. Molybdenum

5. The wearing away of soil by wind and water is referred to as
   ___a. gullying
   ___b. drainage
   ___c. flooding
   X d. erosion

6. The soil best at holding water for good plant growth is
   X a. clay
   ___b. loam
   ___c. sand
   ___d. silt

7. In the process of photosynthesis the plants use raw material to manufacture
   ___a. salts
   X b. sugars
   ___c. chlorophyll
   ___d. enzymes

8. Topsoil, unlike subsoi, contains
   ___a. clay
   X b. humus
   ___c. gravel
   ___d. enzymes

9. Bacteria that add nitrogen to the soil do not grow on the roots of
   X a. grain sorghum
   ___b. clover
   ___c. alfalfa
   ___d. soybeans

10. A commercial fertilizer designated as 16-20-0 contains 16 parts of nitrogen and
    ___a. 20 parts of calcium
    ___b. 20 parts of carbon
    _X_c. 20 parts of phosphorus
    ___d. 20 parts of potassium

11. The scientific name of grain sorghum is
    _X_a. Sorghum vulgare
    ___b. Sorghum halepense
    ___c. Sorghum sativa
    ___d. Sorghum officinalis

12. One reason roots cannot carry on photosynthesis is that their cells lack
    _X_a. chlorophyll
    ___b. minerals
    ___c. carbon dioxide
    ___d. xylophin

13. Farmers may neutralize acid soil by adding
    ___a. bacteria
    ___b. fertilizer
    _X_c. lime
    ___d. manure

14. Openings in the outer layer of plant tissue for the passage of gases and water vapor are
    ___a. guard cells
    ___b. air cells
    _X_c. stomata
    ___d. stolon

15. The great dust storms of Kansas and Oklahoma resulted from all of the following except
    ___a. lack of rainfall
    ___b. removal of the grass and shrubs
    ___c. no trees to break the wind
    _X_d. flooding of the areas

16. Most plants take in needed minerals through their
    ___a. flower buds
    _X_b. roots
    ___c. leaves
    ___d. stems

17. A farmer who plants clover in a field that was planted to grain sorghum the year before is practicing
    ___a. contour plowing
    ___b. terracing
    ___c. strip cropping
    _X_d. crop rotation

18. A yellowing of the leaves in grain sorghums due to a deficiency of iron or zinc is known as
X a. chlorosis
___b. nitrogen deficiency
___c. jaundice disease
___d. verdicillum wilt

19. Which of the following symbols is used to represent iron?
___a. Zn
X b. Fe
___c. S
___d. I

20. Weed control is important in grain sorghum production because
___a. weeds use soil moisture that is needed by the sorghum plants
___b. weeds may grow faster than the sorghums and shade the sorghum plants from the sun
___c. weeds use soil nutrients that are needed by the sorghum plants
X d. all of the above

21. A soil with pH of 7 is said to be
___a. strongly acid
___b. moderately acid
___c. basic
X d. neutral

22. Soil testing services are provided to farmers by the
___a. county A.S.C. office
___b. Farmers Home Administration
___c. Soil Conservation Service
X d. county Extension office

23. All of the following except one should be considered in making a fertilizer recommendation
___a. soil test results
___b. past cropping history
___c. expected moisture conditions
X d. availability of seed

24. Which of the following is not a grass plant
___a. wheat
___b. grain sorghum
___c. corn
X d. alfalfa

25. Grain sorghum is a native of
X a. tropical Africa
___b. South America
___c. Europe
___d. Asia

26. When fed to cattle or swine grain sorghum has a feeding value of
    ___a. 70 to 75 percent the value of corn
    ___b. 80 to 85 percent the value of corn
    _X_c. 90 to 95 percent the value of corn
    ___d. 100 percent the value of corn

27. In Oklahoma grain sorghum should be planted
    ___a. in early March to avoid hot winds
    _X_b. after all danger of frost is past and the soil is warm
    ___c. at a seeding rate of 12 lbs. per acre
    ___d. in the dark of the moon

28. The inflorescense of head of sorghum is
    ___a. a spike (similar to wheat)
    _X_b. a panicle (similar to oats)
    ___c. a head (similar to sunflower)
    ___d. a umbel (similar to dill or parsnip)

29. The symptoms of nitrogen deficiency in grain sorghums are
    _X_a. a yellowing of the leaves at the bottom of the plant sometimes called "firing at the bottom"
    ___b. a yellowing of the leaves at the top of the plant
    ___c. uniform yellowing all over the plant
    ___d. an extremely dark green coloring of the sorghum plant

30. In grain sorghum symptoms of lack of moisture
    _X_a. are much the same as for nitrogen deficiency
    ___b. are much the same as for iron deficiency
    ___c. are much the same as for zinc deficiency
    ___d. none of the above

31. Soil tests for micro elements are made
    ___a. on all soil samples
    ___b. on all subsoil samples
    _X_c. on very few samples
    ___d. on acid samples only

32. As a rule of thumb, grain sorghums should not be stored if the moisture content exceeds
    ___a. 12 percent
    _X_b. 14 percent
    ___c. 16 percent
    ___d. 17 percent

Read the following paragraph before answering items 33, 34, and 35.

Mr. Jones planned to plant twenty acres of sweet clover in the spring. The county agent had tested the soil and recommended 100 pounds of P_2O_5 per acre by applied before planting time. The soil test indicated the field to be medium in nitrogen, low phosphorus, high in potash and have a pH of 9.

Later Mr. Jones changed his mind and planted grain sorghums. He also applied the 100 pounds of P_2O_5 as recommended. Moisture conditions were excellent.

33. Farmer Jones' total grain sorghum yield will be limited by
    ____a. too much P_2O_5
    ____b. too much potash
    ____c. too much nitrogen
    _X_ d. available plant nutrient balance in the soil

34. The grain sorghum sprouted and turned yellow. The plants were stunted and unhealthy. The plants were suffering from
    ____a. nitrogen deficiency
    _X_ b. zinc chlorosis
    ____c. phosphorus burn
    ____d. xylometzia

35. Farmer Jones might have expected the sorghum to sprout and turn pale yellow because the soil test indicated
    ____a. the nitrogen level was only medium
    _X_ b. the pH was 9
    ____c. grain sorghums will only grow on acid soils
    ____d. there was too much potassium in the soil

Read the following paragraph before answering items 36, 37, and 38.

The Beetles came to Oklahoma to grow grain sorghum. They felt to be real scientists because they had bought a plant tissue testing kit, but they developed problems with the 12 inch high grain sorghum plants because they had never heard of soil testing. Their plants were sick especially in the lower leaves. These turned yellow beginning at the mid-rib and began to parch and burn, their soil testing neighbor had nice green grain sorghum plants though. You are asked to help them. They tell you that their problem must be not enough zinc in the soil because the plant cell sap by their tissue test is high in nitrates. It had been very cloudy and raining for three days before the test was made and so they knew that the problem wasn't water. Your soil test shows it to be low in organic matter and high in phosphate and potassium. The soil pH of the clay loam soil is 6.0. The Beetles did not recall whether fertilizer had been used or not.

36. What would you do to solve the problem?
    ____a. tell them that it will go away when it quits raining
    ____b. apply zinc fertilizer
    ____c. lime the soil
    _X_ d. apply nitrogen fertilizer

37. Why was the soil organic matter level low and the cell sap nitrate level high
    ____a. plants cannot utilize nitrogen from organic matter decomposition
    ____b. O M breaks down releasing potassium
    _X_ c. nitrates accumulate in cell sap on cloudy days
    ____d. plant protein breaks down to form nitrates on cloudy days

38. The tissue analysis for nitrogen
    ____a. can never help you decide whether or not to side-dress with nitrogen
    ____b. can be used only when the soil has been tested
    ____c. is just a play thing
    _X_ d. can be of real value if other factors such as plant stress due to disease, etc., are considered.

ANSWER SHEET

Name_____ Age_____

Mailing Address_____

School_____

Item	Choice				Item	Choice			
1.	(X)	(b)	(c)	(d)	20.	(a)	(b)	(c)	(X)
2.	(X)	(b)	(c)	(d)	21.	(a)	(b)	(c)	(X)
3.	(a)	(b)	(c)	(X)	22.	(a)	(b)	(c)	(X)
4.	(a)	(X)	(c)	(d)	23.	(a)	(b)	(c)	(X)
5.	(a)	(b)	(c)	(X)	24.	(a)	(b)	(c)	(X)
6.	(a)	(X)	(c)	(d)	25.	(X)	(b)	(c)	(d)
7.	(a)	(X)	(c)	(d)	26.	(a)	(b)	(X)	(d)
8.	(a)	(X)	(c)	(d)	27.	(a)	(X)	(c)	(d)
9.	(X)	(b)	(c)	(d)	28.	(a)	(X)	(c)	(d)
10.	(a)	(b)	(X)	(d)	29.	(X)	(b)	(c)	(d)
11.	(X)	(b)	(c)	(d)	30.	(X)	(b)	(c)	(d)
12.	(X)	(b)	(c)	(d)	31.	(a)	(b)	(X)	(d)
13.	(a)	(b)	(X)	(d)	32.	(a)	(X)	(c)	(d)
14.	(a)	(b)	(X)	(d)	33.	(a)	(b)	(c)	(X)
15.	(a)	(b)	(c)	(X)	34.	(a)	(X)	(c)	(d)
16.	(a)	(X)	(c)	(d)	35.	(a)	(X)	(c)	(d)
17.	(a)	(b)	(c)	(X)	36.	(a)	(b)	(c)	(X)
18.	(X)	(b)	(c)	(d)	37.	(a)	(b)	(X)	(d)
19.	(a)	(X)	(c)	(d)	38.	(a)	(b)	(c)	(X)

A P P E N D I X F

GUIDE FOR SUBDIVIDING ACHIEVEMENT TEST INTO THREE SUBTESTS

Subtest I	Subtest II	Subtest III
Botany and Plant Physiology	Soil Physiology and Fertilization	Plant Nutrition
Questions	Questions	Questions
1	3	4
2	5	7
11	6	9
12	8	18
14	10	20
16	13	29
24	15	30
25	17	33
26	19	34
27	21	35
28	22	36
32	23	37
	31	
	38	

VITA

Charlie Arch Burns

Candidate for the Degree of

Doctor of Education

Title: A STUDY OF THE EDUCATIONAL IMPACT OF A FERTILIZER DEMONSTRATION PROGRAM ON PARTICIPATING 4-H MEMBERS AND THEIR PARENTS

Major Field: Administration

Biographical:

Personal Data: Born in Woodward County, Oklahoma, December 19, 1929; the son of Heber V. Burns and Gladys Burns.

Education: Attended elementary and high school in Woodward County, Oklahoma; graduated from Mooreland High School in May, 1947; received the Bachelor of Science Degree from Oklahoma State University, Stillwater, Oklahoma, in May, 1951, with a major in Animal Husbandry; attended Colorado State University for graduate work; received the Degree of Master of Science from Oklahoma State University, with a major in Rural Adult Education in May, 1963; attended Oklahoma State University for additional graduate work in Education Administration, 1963, 1964; completed requirements for the Doctor of Education degree in July, 1966.

Professional Experience: Served with the United States Army, 1951 - 1953; Assistant County Extension Agent in Kiowa County, Oklahoma, 1953 - 1957; County Extension Agent of Roger Mills County, Oklahoma, 1957 - August 31, 1963; County Agent of Garfield County, Oklahoma, 1965 to present time.