Journal of Agricultural Education
Volume 36, Number 3, pp. 43-49
DOI: 10.5032/jae.1995.03043

4-H MEMBER KNOWLEDGE AND PERCEPTION OF AGRICULTURE

Martin J. Frick, Assistant Professor
Montana State University

Robert J. Birkenholz, Associate Professor
University of Missouri

Krissanna Machtmes, Graduate Student
Purdue University

Abstract

This study was conducted to assess the knowledge and perceptions of 4-H members in a midwestern state regarding agriculture, food, and natural resources. Data were collected from 550 respondents but did not constitute a representative sample of all 4-H members. However, the results of this study may have implications for agricultural literacy educational initiatives on a practical basis. Three objectives were specified for this study as follows: 1) to assess the level of agricultural knowledge among 4-H members; 2) to assess the level of positive perceptions about agriculture among 4-H members; and, 3) to describe the demographic variables of 4-H members that may influence their agricultural literacy. 4-H members were most knowledgeable about the Natural Resources and Marketing of Agricultural Products concept areas, whereas the lowest group mean knowledge score was the Plant concept area. The 4-H members group produced lower (most positive) perception mean scores for the Natural Resources and Animal Science concept areas, whereas the highest (least positive) score was in the Policy concept area. Respondents who indicated their farms were between 10 and 50 acres and who had experience in raising plants, gardens, or crops, and who were enrolled in high school agricultural education produced lower knowledge of agriculture scores than those who did not possess those characteristics. However, 4-H members who lived on a farm produced higher knowledge of agriculture scores than those who did not possess those characteristics. 4-H members who lived on a farm produced less positive perception of agriculture scores while 4-H members who indicated their farms were between 10 and 50 acres and were also enrolled in high school agricultural education produced more positive perception of agriculture scores.

Since the release of the National Academy of Science (NAS) report entitled, *Understanding Agriculture-New Directions for Education* (1988), the agricultural education profession has devoted much attention to increasing the agricultural literacy of our nation's society. According to the National Academy of Sciences' Committee on Agricultural Education (1988), "Achieving the goal of agricultural literacy will produce informed citizens able to participate in establishing the policies that will support a competitive agricultural industry in this country and abroad." If the improvement of America's agricultural literacy is to succeed, the knowledge and perception of agriculture should be assessed within various segments of our society.

Before measuring the agricultural literacy level of a particular segment of our society, the concept of literacy must be examined. In the past, literacy usually referred to some minimum level of reading and writing skills. Bornmuth (1975) suggested that the list of materials will always differ from person to person and situation to situation and therefore offered the definition of literacy as "the ability to respond competently to real-world reading tasks" (p 65). Sticht (1975) defined functional

literacy as "the possession of those literacy skills needed to perform some reading task imposed by an external agent between the reader and a goal the reader wishes to obtain" (pp. 4-5). Kirsh and Guthrie (1978) pointed out that reading the same material (i.e., a magazine) is functional for some people and leisure reading for others.

The ability to competently read required work-related materials was defined as occupational literacy by Rush, Moe and Storlie (1986). More recently, the ability to read packages, traffic signs, and a bus schedule has been included in the modern definition of basic literacy (Miller, 1989). The evolution of these definitions helps characterize the basic concept of literacy. The level of skill (knowledge) needed to be literate is a relative measure without absolute standards. Functional agricultural literacy does not imply a perfect level of understanding about agriculture, but rather a minimum level.

The first step in improving the agricultural literacy level of a population is to determine the current literacy level. This study sought to provide baseline data regarding the level of agricultural knowledge and perception in a major national youth organization that has traditionally been associated with agriculture. If educational initiatives designed to improve America's agricultural literacy are to succeed, a bench mark that verifies the level of agricultural knowledge and perception should be determined.

Purpose and Objectives

The purpose of this study was to assess the level of knowledge about and perception toward agriculture in the United States of 4-H club members in a midwestern state.

Three objectives were specified for this study as follows: 1) to assess the level of agricultural knowledge among 4-H members; 2) to assess the level of positive perceptions toward a agriculture among 4-H members; and, 3) to describe the demographic variables of 4-H members that may influence their agricultural literacy.

Methodology

Population and Sample

Since the study was a pilot project, an intact population of 4-H members was assessed to provide baseline data reflecting the knowledge and perceptions of United States residents towards agriculture and the food industry. The intact population included 864 4-H members who were on campus for the annual state 4-H conference. The 4-H members who attended the conference were not purposefully selected by 4-H personnel to attend the conference. A total of 550 surveys were collected and used for analysis. This represented a usable response rate of 63% of the subjects who attended the conference.

Instrumentation

A data collection instrument organized in three sections was developed for this study. The instrument included a knowledge section, perceptions section, and demographics section. The instrument was developed using Grick's (1990) Delphi study as the basis. However, for this study, Frick's eleven agricultural literacy concepts were collapsed into seven areas. The concept areas were: (a) Significance of Agriculture, (b) Policy in Agriculture, (c) Agriculture's Relationship with Natural Resources, (d) Plant Science, (e) Animal Science, (f) Processing of Agricultural Products, and (g) Marketing of Agricultural Products.

A pilot test of the data collection instrument was conducted using four university class sections of a World Food and Society course taught during Fall Semester, 1992. The reliability of the knowledge section of the instrument was assessed by calculating a Kuder-Richardson 20 (KR-20) coefficient over all knowledge statements. The KR-20 coefficient statistic was calculated because categorical data were analyzed. The KR-20

computed for the knowledge section of the instrument was .85.

The perception section of the instrument was assessed by computing a Cronbach's alpha coefficient as a measure of instrument reliability. The Cronbach's alpha coefficient statistic was calculated because interval data were analyzed. The Cronbach's alpha computed for the items included in the perception section was .90. For the purpose of this study, another pilot study was conducted using 22 4-H members not involved in the main data collection procedure to determine instrument reliability and to surface any questions or concerns.

Procedures used to estimate the instrument's reliability were the Kuder-Richardson 20 for Section I (knowledge about agriculture with a true/false/don't know format) and Cronbach's Alpha for Section II (perception towards agriculture with a 5-point Likert scale). The estimates of reliability for the instrument (35 items each) used in this study were .79 for the knowledge section and .81 for the perception section. A national panel of experts in agricultural literacy reviewed the instrument for content validity. In the judgment of the expert panel, the instrument was considered to be a valid tool for use in assessing agricultural literacy concepts.

The knowledge section directed respondents to answer with "True, "False," of "Don't Know" to each of 35 statements (i.e., five statements for each knowledge concept area) to which respondents were directed to use a 5 point Likert response scale ranging from Strongly Agree (1), to Neutral (3), to Strongly Disagree (5).

Demographic variables in Section III included: gender, race, home location, population of nearest town, acreage of parents who farm, if relatives worked on a farm, if relatives worked in an agribusiness, agricultural courses taken, membership in FFA, involvement in raising animals or pets, involvement in raising gardens or crops, news sources read, and highest grade level completed.

Data Collection and Analysis

The data were collected using optically scanned answer sheets which instructed respondents to indicate their responses using #2 lead pencils. Data analysis was completed using procedures available through the Statistical Analysis System (SAS) on the University of Missouri mainframe computer.

Results

Of the 550 respondents, 361 (65.6%) were female and 189 (34.4%) were male. The group primarily consisted of white respondents where as minorities made up about ten percent of the respondents. Fifty percent of the respondents noted that they were from a farm and 68 percent indicated that they lived nearest a community with a population under 10,000. Only 18 percent of the respondents indicated that they were also FFA members. Ninety-five percent of the respondents had been involved in raising animals or pets and 89 percent indicated that they had been involved in raising plants, gardens, or crops. Television was the most common medium used for news source by the respondents. Only 11 (2%) of the respondents indicated they had completed 11th or 12th grade.

Knowledge About Agriculture

The first objective was to assess the level of agricultural knowledge among 4-H members. Analysis involved the computation of means and standard deviations for the knowledge of agriculture scores for all respondents. The 4-H members produced a mean knowledge of agriculture score of 23.07 out of a possible score of 35. The standard deviation was 4.96. The highest possible score for each of the knowledge concept scales was 5. The highest group mean knowledge scores for the seven concept areas were found to be the Natural Resources and Marketing of Agriculture Products

concept areas, whereas, the lowest group mean knowledge score was the Plant concept area. Table 1 presents the mean scores and standard deviations for the total knowledge score and the seven concept areas represented in the knowledge section of the instrument. Collective responses to some of the Knowledge items by the 4-H members were considered worthy of noting by the researchers and are located in Table 2.

Table 1. Means and Standard Deviations of Agriculture Knowledge Scores by 4-H Members (n=550)

Concept Area[a]	Mean	SD
Significance	3.55	1.06
Policy	2.84	1.26
Natural Resources	3.84	1.06
Plants	2.66	1.26
Animals	3.35	1.06
Processing	2.95	1.21
Marketing	3.86	1.23
Total[b]	23.07	5.14

[a]Ranged from 0 - 5; [b]Ranged from 0 - 35

Objective three, was in part, satisfied by stepwise regression analysis for the 4-H member mean knowledge of agriculture score. Results of the stepwise regression analysis are presented in Table 3. Three demographic characteristics were found to be significant predictors of knowledge of agriculture scores for the 4-H member respondent group. Collectively, the three predictor variables accounted for 9.7 percent of the total variance in the knowledge of agriculture score.

Table 2. Summary of Selected Knowledge Responses by 4-H Members

Response	Percent
True that there are more farmers in the US than 10 years ago	80
True that pesticide use has increased crop yield	70
True US doesn't sell grain on world market	66
True that biotechnology has increased pest resistance of plants	50
False that profits as farmers strive maximum crop yields	77
False that biotechnology has increased US animal production	62
Felt very little of US produced grain is exported	59

Three demographic characteristics produced negative regression coefficients. The three characteristics were: (a) size of farm; (b) experience in raising plants, gardens, or crops; and, (c) enrolled in high school agricultural education. It was determined that persons who possessed those characteristics produced lower knowledge of agriculture scores than those who did not possess those characteristics (Table 3).

Perceptions About Agriculture

The second objective was designed to assess the level of agricultural perceptions among 4-H members. Analysis involved the computation of means and standard deviations for the perception of agriculture scores for all respondents. The overall mean perception of agriculture score for the 4-H members was 80.20 with a standard deviation of 12.88. Lower perception scores reflected more positive perceptions of agriculture. The 4-H

Table 3. Stepwise Regression Analysis of the Knowledge of Agriculture Score for the 4-H Members

Variable[a]	b	F	P>F
Size of farm	-7.41	16.41	.0001
Raising plants, gardens, or crops	-1.28	13.79	.0001
High school agriculture education	-2.52	10.4	.0001

[a]Variables coded: No = 0, Yes = 1; Intercept = 26.38; Model R^2 = .097

member group produced lower (more positive) perception mean scores for the Natural Resources and Animal Science concept areas, whereas, the highest (least positive) score was in the Policy concept area. The mean perception scores and standard deviations for the seven concept areas and total perception are presented in Table 4. Collective responses to some of the Perception items by the 4-H members were considered worthy of noting by the researchers and are located in Table 5.

Table 4. Means and Standard Deviations of Agriculture Perception Scores by 4-H Members (n=550)

Concept Area[a]	Mean	SD
Significance	11.62	2.67
Policy	12.63	2.66
Natural Resources	10.34	2.17
Plants	11.02	2.23
Animals	10.70	2.61
Processing	11.82	3.01
Marketing	12.07	2.94
Total[b]	80.20	12.88

[a]Ranged from 0 - 5; [b]Ranged from 0 - 35

Objective three, was in part, satisfied by regression analysis for the 4-H member mean perception of agriculture score. Results of the stepwise regression analysis are presented in Table 6. Two demographic characteristics were found to be significant predictors of perception of agriculture scores for the 4-H member respondent group. Collectively, the two predictor variables accounted for 4.3 percent of the total variance in the perception of agriculture score.

Table 5. Summary of Selected Perception Responses by 4-H Members

Response	Percent
Agree US citizens pay higher percent of income on food than other countries	85
Agree pesticide can be used safely when producing food	54
Agree organic production is realistic alternative to using pesticides	60
Agree biotechnology has increased crop yield in developing countries	47
Agree hybrid plants result in higher yields	60
Agree only organic methods should be used to produce food	59
Agree farmers should not use chemicals in crop production	69
Agree animals should not be used for food	80

One demographic characteristic produced a positive regression coefficient. This characteristic was "enrolled in high school agricultural education." It was determined that persons who possessed this characteristic produced the most positive perception of agriculture scores.

Futhermore, one demographic characteristic produced a negative regression coefficient. The one characteristic produced a less positive perception of agriculture score.

Table 6. Stepwise Regression Analysis of the Perception of Agriculture Score for the 4-H Members

Variable[a]	b	F	P>F
Size of farm	-1.47	11.02	.0001
High school agriculture education	3.21	7.74	.0001

[a]Variables coded: No = 0, Yes = 1; Intercept = 77.97; Model R^2 = .043

Conclusions

The following conclusions were based on the

findings of this study:

1. The overall mean level of knowledge of agriculture concept areas held by 4-H members is high, but varies widely.

2. Although the 4-H members' overall mean level of knowledge of agriculture is high, responses to particular items by the entire group did not parallel the overall knowledge score.

3. 4-H members were most knowledgeable about the Natural Resources and Marketing of Agricultural Products concept areas, whereas, the lowest group mean knowledge score was the Plant concept area.

4. The overall mean level of perceptions toward agricultural literacy subjects held by 4-H members is positive, but varies by concept area.

5. Although the 4-H member overall mean perception score is high, responses to particular items by the entire group did not parallel the overall perception score.

6. The 4-H member group produced lower (most positive) perception mean scores for the Natural Resources and Animal Science concept areas, whereas, the highest (least positive) score was in the Policy concept area.

7. 4-H members living on farms with experience in raising plants, gardens, or crops, and enrolled in high school agriculture, produced lower knowledge of agriculture scores than those who did not possess those characteristics.

8. 4-H members enrolled in high school agriculture, produced higher perception of agriculture scores, while 4-H members who lived on farms produced lower perception of agriculture scores.

Recommendations

This study provides evidence of the need to further educate a major youth organization regarding the industry which produces and markets the food needed to sustain human life. It should be recognized that the data collected from respondents cannot be generalized to any population on a statistical basis. However, the findings may have practical implications for food and agriculture policy makers, and should direct researchers to further examine the issue of agricultural literacy in this country.

A relatively low knowledge concept mean score was produced in the area of Plants in Agriculture. This concept area appears to be a target area for future educational efforts to enhance the knowledge and understanding of United States citizens. However, there is sufficient room for improvement in the knowledge levels of each of the seven concept areas included in this study. A study should be conducted to determine 4-H members' interest in the subject areas and topics used in the instrument.

Inservice programs should be developed to assist 4-H youth personnel in their efforts to increase the agricultural literacy level of 4-H members. Special attention should be given to those concept areas which receive the lowest Knowledge scores and the highest Perception scores.

Educators who initiate agricultural literacy programs for 4-H youth should recognize the upsurge in membership of urban 4-H clubs and develop agricultural literacy programs to meet the needs of both rural and urban clientele.

References

Bornmuth, J. R. (1975). Reading literacy: Its definition and assessment. In J. B. Carroll & J. S. Chall (Eds.), Toward a Literate Society, (pp. 61-100), New York: McGraw Hill.

Frick, M. J. (1990). A definition and the concepts of agricultural literacy: A national study. Unpublished doctoral dissertation, Iowa State University, Ames.

Kirsh, I., & Guthrie, J. T. (1978). The concept of measurement of functional literacy. Reading Research Quarterly, 13, (485-507).

Miller, J. (1989). Scientific Literacy. Paper presented at the 1989 Annual Meeting of the American Association for the Advancement of Science, San Francisco, CA.

Rush, R. T., Moe, A. J., & Storlie, R. L. (1986. Occupational Literacy Education. Newark, DE: International Reading Association.

Sticht, T. J. (1975). Reading for Working: A Functional Literacy Anthology. Alexandria, VA: Human Resources Research Association.

Understanding Agriculture - New Directions for Education. (1988). Committee on Agricultural Education in Secondary Schools, Board of Agriculture, National Research Council, Washington, DC: National Academy Press.