High School Students' Perceptions and Knowledge about Agriculture based upon Location of the High School

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Abstract

The Oxford English Dictionary defines agriculture as "the science and art of cultivating the soil; including the allied pursuits of gathering in the crops and rearing livestock; tillage, husbandry, [and] farming (in the widest sense)". This study uses the word "farming" synonymously with "agriculture." The purpose of this study is to explore how a young person's perception of agriculture is affected by his or her environment and education. Three high schools within a twenty mile radius of Cornell University were surveyed, including both "urban" (19,859 people) and rural populations. Rural populations were represented by a school with an agricultural science program as well as a school without. High School students were surveyed specifically on their knowledge and perceptions of farming in New York.

Introduction

Agriculture's role in our society is changing. In 1900, 41% of the American population was employed in agriculture, as compared to 1.9% of the population in 2002 (Dimitri, Effland, and Conklin, 2006). The American economy once revolved around agriculture, but advances in technology and machinery now allow for fewer, larger farms. Fewer children live on or near farms and/or have relatives employed by the agricultural industry than ever before. They also have diminishing access to agricultural education within the school system. In 2001, more than 35 high school agriculture programs closed due to the lack of qualified educators (National FFA Organization, 2007).

Limited contact with agriculture and little or no agriculture education results in the lack of an agricultural knowledge base; students instead learn about agriculture through secondary and tertiary sources, such as television, books, and internet (Ruth, Lundy, and Park, 2006). Agricultural stereotypes are created and perpetuated from this lack of knowledge. Such stereotypes can further discourage an interest in pursuing a college agricultural program and a career in the field.

Past studies have found varying levels of agricultural literacy among students based upon school setting and availability of agriculture education. In a study conducted in rural Missouri, the agricultural knowledge and perception of students in schools with an agriculture program were compared to those with no programs. The results concluded that students in schools with agricultural programs had a higher knowledge score than students in schools without a program. The students' knowledge score also had a weak positive correlation with a positive perception towards agriculture (Wright, Stewart, and Birkenholz, 1994). Another study analyzing Illinois 12th grade students found more agricultural knowledge among students living in rural areas (vs. urban) and among students enrolled in agriculture programs (vs. non). However, overall the researchers found the general population to be agriculturally illiterate (Pense, Beebe, Leising, Wakefield, and Steffen, 2006).

Stereotypes concerning farming begin at a young age and continue to grow. Iowa middle school students, in both rural and urban areas, imagined farmers as old men, wearing bib overalls and chewing on straw. They reported that the farmers they knew did not subscribe to this stereotype, but that "other farmers" did (Holz-Clause and Jost, 1995). In a study done at Cornell University, a representative sample of tenth graders across New York State were surveyed. They ranked low in agreement with the statement that "agriculture is a place for college graduates to work." These same students had a slightly higher degree of agreement with the statement, "agriculture is a place for high school graduates to work" (Newsom-Stewart and Sutphin, 1994). However, these students recognized that agriculture was important to society, the economy, and to the future (Newsom-Stewart and Sutphin). One specific objective of this current study is to compare the students' agricultural perceptions in the communities surrounding Cornell University with the results

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gathered in Newson-Stewart and Sutphin's statewide study.

Theoretical Framework

The environment in which a child is raised plays a crucial role in their learning process. Urie Bronfenbrenner's ecological interactions theory (1979) proposed five different systems exist that influence a child's learning and development: the microsystem (what directly influences the child, i.e. family, classroom), the mesosystem (two microsystems interacting), the exosystem (environments that have an indirect influence), the macrosystem (larger socio-cultural context) and the chronosystem (the evolution of the external systems over time). According to Bronfenbrenner, the classroom environment and the community atmosphere are two variables that influence a child's learning. The presence of agriculture within the community, agricultural organizations and programs within the schools, and agriculturally literate teachers has the power to shape what a student learns.

The social learning theories of Albert Bandura (1964) and Lev Vygotsky (1962) support social interactions as the basis of learning. Thoughts, perceptions, and stereotypes are fostered through the social exchanges observed and participated in. The environments of urban and rural communities are dissimilar as a result of differences in the residents ethnicity, average income, average education level attained, employment opportunities, etc. A student will therefore encounter slightly different interactions in each setting. An agriculturally aware community can foster positive agricultural perceptions within a student, while an agriculturally illiterate community can cause the proliferation of stereotypes. The body language used, the tone in which a message is conveyed, and the actual words used, all hold meaning. The social interactions within the community and within the classroom influence the development of agricultural perceptions and stereotypes.

In the landmark publication, entitled, Understanding Agriculture: New Directions for Education (1988), the National Research Council stated that agriculturally literate persons should understand the "food and fiber system includ[ing] its history and current economic, social, and environmental significance to all Americans" (p. 1). This definition encompassed knowledge of "food and fiber production, processing, and domestic and international marketing" (p. 1). Since, Frick, Kahler, and Miller (1991) updated the definition of agricultural literacy as, "possessing knowledge and understanding of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic agricultural information includes: the production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing of agricultural products, the processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products" (p. 52).

Purpose and Objectives

The purpose of this survey was to analyze the perceptions of agricultural literacy of the student populations of three schools in New York. The specific objectives were: (1) To determine the differences in perception of New York agriculture by high school students from three different school settings (i.e.: rural, urban); (2) To determine the differences in knowledge of New York farming by high school students from three different school settings; and (3) To identify how school settings and agricultural education courses affect the results.

Methods and Procedures

Three school populations were chosen for participation in this survey due to their community and educational culture. Rural Ag High is in a rural setting and has a two-teacher agricultural science program. During the time of this survey, Rural Ag High enrolled 318 students in grades 9-12 (New York State Education Department (NYSED), 2006). Urban High is an urban school with no agricultural science program. According to the 2000 census, the town population was 63,396. The school enrolled 1,564 students in grades 9-12 (NYSED). Rural Non-Ag High is in a rural setting, but again, has no agricultural science program. Rural Non-Ag High enrolled 267 students in grades 9-12 at the time this survey was conducted (NYSED). The town population was 5,430 during the 2000 census.

This study was a convenience sample of the population of high school students enrolled in these three high schools in New York (N = 2,149). A convenience sample survey is appropriate when one attempts to ascertain characteristics of a small and defined population (Dillman, 2000; Salant and Dillman, 1994). The researcher-developed questionnaire consisted of questions related to the agricultural literacy objectives. In order to establish face and content validity, the questionnaire was reviewed by a panel of experts consisting of an agricultural science teacher, a graduate student in developmental sociology in the college of agriculture, and seven high school students not in the target population. Data were analyzed using SPSS version 13.0. Descriptive statistics were used in the analysis.

Data were collected from January 2006 through May 2006. The study was administered via a modified survey design of teacher-administered questionnaires as outlined by Dillman (2000). The questionnaire consisted of 21 questions targeted at gaining demographic data, student perceptions, and student knowledge. The questionnaire contained statements

in which the subjects circled a number on a likert-type scale to represent their agreement with the statement. Administrative approval was received in each school, and the study was conducted anonymously. Approval was also received from the Cornell University Committee on Human Subjects. Each school received a cover letter explaining the questionnaire, its intents, and instructions for distribution. Questionnaires were administered through a teacher in each school who saw all students in the school or grade level. Thus, the social studies department was used in Rural Ag High to survey all 10th grade students. In Urban High and Rural Non-Ag High, the English department was used for dissemination of the questionnaire and secured the response of all students in the school. The duration for administration of the questionnaires lasted between one and two weeks. All students in attendance at the school during the administration of the survey were included in the study.

Results and Findings

Over half (52%) of the participants were female (see Table 1). Most participants did not live on a farm. Those who did live on a farm comprised 10.8% of the population. A small portion (26.9%) of the participants had relatives who were employed on a farm. The majority of the participants were not involved in any agricultural groups/organizations; only 10.9% of the population was. Table 1 shows the demographic information of the entire population compared to the individual school populations.

A noticeably larger percentage of participants from Rural Ag High lived on a farm, had relatives that worked on a farm, and/or participated in an agriculturally related group. Urban High students had the lowest agreement with the aforementioned statements; although it was not far below Rural Non-Ag High. Of special interest in this survey is the comparison of the three different school cultures and the differences in perceptions between farm and non-farm students.

Objective 1: Perceptions about Agriculture

Students in Urban High generally disagreed that farmers make a lot of money (see Table 2). A large number of students from Rural Ag High (41.7%) disagreed with the statement "Most farms in New York are small family farms." On average, students at Rural Ag High disagreed that most farms are small family farms while more students in Urban High (31.0%) and Rural Non-Ag High (43.7%) agreed with the statement. Urban High had the highest rate of agreement (78.7%) with the statement "Farming is very difficult." Urban High students' agreement was 10.5% higher than the average agreement of the survey population. Rural Ag High was in highest agreement with the notion that you can tell a farmer just by looking at them; 34.2% of the population agreed with this statement. Of particular note is that the majority of students at Urban High disagreed that you could tell a farmer just by looking at him/her.

The data were also divided into two categories: the population that lived on a farm and those students living off of farms (see Table 3). The majority (55.4%) of

Table 1. Demographic information about participants (N=768)

		Total Population	Rural Ag	Urban	Rural Non-Ag
Number of Participants		768	243	312	213
Sex: Female (%)		52.0	51.0	54.8	48.8
Male (%)		48.0	49.0	45.2	51.2
Students living on a farm	*n*	83	49	14	20
	%	10.8	20.2	4.5	9.4
Students with a relative who works on a farm	*n*	206	104	51	51
	%	26.9	43.0	16.3	23.9
Students participating in an agricultural group	*n*	84	48	20	16
	%	10.9	19.7	6.4	7.6

Table 2. Rural and urban students' perceptions about New York agriculture. (SD=strongly disagree, D=disagree, DK=don't know, A=agree, SA=strongly agree; Overall population (N = 768), Rural Ag High (n = 243), Urban High (n = 312), Rural Non-Ag High (n = 213))

Statement	Population	SD / D (%)	Unsure (%)	A / SA (%)	mean
Farming is very difficult.	Overall	10.0	21.8	68.2	3.8
	Rural Ag High	14.1	27.0	58.9	3.6
	Urban High	5.5	15.8	78.7	4.0
	Rural Non-Ag High	11.8	24.9	63.3	3.7
Most farms in New York are small family farms.	Overall	28.3	38.4	33.4	3.0
	Rural Ag High	41.7	31.3	27.1	2.8
	Urban High	23.1	45.8	31.0	3.1
	Rural Non-Ag High	20.6	35.7	43.7	3.2
Most farmers are men.	Overall	33.7	29.3	37.0	3.0
	Rural Ag High	31.7	24.2	44.2	3.1
	Urban High	32.5	33.1	34.4	3.0
	Rural Non-Ag High	37.6	29.6	32.9	2.9
Farmers in New York make a lot of money.	Overall	35.3	51.6	13.1	2.7
	Rural Ag High	31.0	45.5	23.6	2.9
	Urban High	43.0	52.2	4.8	2.6
	Rural Non-Ag High	29.1	57.7	13.2	2.8
You can tell a farmer by their appearance.	Overall	53.3	21.0	25.6	2.6
	Rural Ag High	45.6	20.2	34.2	2.9
	Urban High	62.4	16.7	20.9	2.4
	Rural Non-Ag High	48.8	28.2	23.0	2.6

Table 3. On-farm students' perceptions compared to those of students living off of farms (On-farm (n = 83), Off-farm (n = 685))

	Group	SD / D (%)	Unsure (%)	A / SA (%)	mean
Farming is very difficult.	On-farm	21.7	9.6	68.7	3.7
	Off-farm	8.6	23.3	68.1	3.8
Most farmers are men.	On-farm	41.0	21.7	37.3	2.9
	Off-farm	32.8	30.3	36.9	3.0
Most farms in New York are small family farms.	On-farm	42.7	19.5	37.8	2.8
	Off-farm	26.5	40.8	32.7	3.1
Farmers in New York make a lot of money.	On-farm	55.4	26.5	18.1	2.5
	Off-farm	32.9	54.8	12.2	2.7
You can tell a farmer is a farmer just by looking at them.	On-farm	67.5	14.5	18.1	2.2
	Off-farm	51.6	21.8	26.6	2.7

Table 4. Rural and urban high school students' knowledge about NY agriculture (Overall population [N = 768], Rural Ag High [n = 243], Urban High [n = 312], Rural Non-Ag High [n = 213])

Commodity	Population	Not Important (%)	Unsure (%)	Important / Very Important (%)	Mean
Dairy	Overall	1.4	6.3	92.3	3.5
	Rural Ag High	2.9	6.2	90.9	3.5
	Urban High	0.6	6.8	92.7	3.5
	Rural Non-Ag High	0.9	5.6	93.4	3.5
Beef	Overall	6.5	15.9	77.5	3.1
	Rural Ag High	3.3	13.6	83.0	3.3
	Urban High	10.3	20.3	69.6	3.0
	Rural Non-Ag High	4.7	12.3	83.0	3.2
Corn	Overall	4.1	14.0	81.9	3.1
	Rural Ag High	4.1	12.4	83.4	3.3
	Urban High	3.9	16.5	79.7	3.1
	Rural Non-Ag High	4.2	12.2	83.5	3.1
Apples	Overall	4.2	13.2	82.7	3.1
	Rural Ag High	7.0	17.8	75.2	3.0
	Urban High	2.3	8.7	89.1	3.3
	Rural Non-Ag High	3.8	14.6	81.6	3.1
Chicken	Overall	5.9	17.6	76.5	3.0
	Rural Ag High	5.0	18.2	76.9	3.1
	Urban High	7.1	23.2	69.8	3.0
	Rural Non-Ag High	5.2	8.9	85.9	3.2
Pork	Overall	13.2	22.4	64.4	2.8
	Rural Ag High	6.6	21.1	72.3	3.0
	Urban High	17.7	28.3	54.0	2.6
	Rural Non-Ag High	14.2	15.1	70.7	2.9
Hay	Overall	6.8	31.1	62.1	2.8
	Rural Ag High	5.0	25.6	69.4	2.9
	Urban High	9.6	34.1	56.3	2.7
	Rural Non-Ag High	4.7	33.0	62.3	2.8
Grapes	Overall	11.1	25.3	63.6	2.7
	Rural Ag High	10.3	29.3	60.3	2.7
	Urban High	11.6	21.5	66.9	2.8
	Rural Non-Ag High	11.2	26.3	62.5	2.7

on-farm students (n = 83) disagree with the statement that farmers make a lot of money. A large number (42.7%) of on-farm students disagreed with the idea that most farms in New York are small family farms. Only 37.8% of on-farm students agreed with this statement. In reality, the average New York farm is 206 acres (USDA, 2002). The rest of the population, off-farm students, showed a disagreement of 26.5% and an agreement of 32.9%. In response to the statement "you can tell a farmer just by looking at them," 18.1% of on-farm students agreed and 26.6% of off-farm students agreed.

The survey included an open ended question which asked about the first image the individual has of a farmer. The most common responses involved a man wearing overalls, a straw hat and a plaid shirt, with hay sticking out of his mouth and a pitchfork in his hand. Tractors and big red barns were also mentioned. The words redneck, hick, and hillbilly were used in many cases as well. Only one person specifically responded that they imagined a woman in their description. The two most outlandish responses were from Rural Ag High. Both students answered that farmers get a "free ride" from the government through checks. One of the students went on to say that they get rich off this money and sit on their "lazy asses" all day.

Objective 2: Knowledge about Agriculture

The population surveyed was unaware of the importance of certain New York agriculture products (see Table 4). The students of each school had an importance rating of over 50% for each product listed; their responses lacked noticeable variation from product to product. The majority of students' importance ratings of NY agricultural products differed from their actual values determined by the rates of production in New York. Grapes were perceived as the second most unimportant, with 21.3% agreement with this status. Apples were valued significantly higher by students in Urban High than Rural Ag High and Rural Non-Ag High students. The population did agree that dairy production is the most important for New York agriculture.

When comparing on-farm and off-farm students' knowledge about the importance of agricultural commodities to New York, on-farm students identified dairy (71.1%), beef (55.4%) and hay (53.0%) as

Table 5. On- and off-farm high school students' knowledge about New York agriculture (On-farm (n = 83), Off-farm (n = 685))

Commodity	Group	Not Important (%)	Unsure (%)	Important / Very Important (%)	Mean
Dairy	On-farm	2.4	1.2	96.4	3.7
	Off-farm	1.3	6.9	91.7	3.5
Beef	On-farm	4.8	9.6	85.6	3.4
	Off-farm	6.8	16.7	76.5	3.1
Hay	On-farm	2.4	9.6	87.9	3.4
	Off-farm	7.3	33.8	58.8	2.0
Corn	On-farm	4.9	7.3	87.8	3.3
	Off-farm	4.0	14.8	81.2	3.1
Chicken	On-farm	8.4	18.1	73.5	3.0
	Off-farm	5.6	17.6	76.8	3.1
Pork	On-farm	8.5	15.9	75.6	3.0
	Off-farm	13.8	23.2	63.8	2.8
Apples	On-farm	6.0	14.5	79.5	3.0
	Off-farm	4.0	13.1	82.9	3.2
Grapes	On-farm	18.1	21.7	60.3	2.6
	Off-farm	10.2	25.7	64.0	2.8

Table 6. Rural, urban, on- and off-farm students' knowledge of a farmer's lifestyle (Overall population (N = 768), Rural Ag High (n = 243), Urban High (n = 312), Rural Non-Ag High (n = 213), On-farm (n = 83), Off-farm (n = 685))

	Most farmers work only on their farm.		Farmers must go to college to be successful.	
Population	Agree (%)	Disagree (%)	Agree (%)	Disagree (%)
Overall Population	39.6	60.4	27.2	72.8
Rural Ag High	49.6	50.4	26.7	73.3
Urban High	40.1	59.9	32.9	67.1
Rural Non-Ag High	28.0	72.0	19.6	80.4
On-farm	34.2	65.8	32.1	67.9
Off-farm	40.2	59.8	26.6	73.4

the top three commodities of importance to the state (see Table 5). Off-farm students identified dairy (58.9%), beef (39.8%), and chicken (39.3%) as the top three commodities of importance to the state. Overall, fewer off-farm students identified the commodities as very important. In spite of the growing viticulture industry in the area, grapes were ranked lowest in importance by both groups of students.

Nearly half (49.6%) of Rural Ag High students agreed with the statement that most farmers work only on their farm (see Table 6). In New York, farming is the primary occupation of 60.8% of the principal operators (USDA, 2002). Rural Non-Ag High students had the highest disagreement with this statement at 72%. Overall, the population did not believe that farmers had to go to college to be successful. The most interesting result from this statement concerning farmers' education was seen in on-farm students. The majority of on-farm students (67.9%) believed that farmers did not need college to be successful in agriculture.

Conclusions / Implications / Recommendations

The agriculturally related demographic data from each school is what was expected. A noticeably larger percentage of participants from Rural Ag High live on a farm, have relatives that work on a farm, and/or participate in an agriculturally related group. Urban High had the lowest agreement with the aforementioned statements; although the level of agreement was only slightly below that of the Rural Non-Ag High students. Of special interest in this survey was the comparison of the three different school cultures and the differences in perceptions between farm and non-farm students.

Overall, students in these three schools were not agriculturally literate, even with a major land-grant university in the community and with one school having an agricultural science program. Students in these schools still held on to several misconceptions about agriculture, including the idea that farming is hard work, farmers are poor, and the importance of various agricultural commodities in the state. Further, many students thought that farmers only worked on their own farms and that they did not have to attend college to be successful.

With the exception of thinking that most farmers were men and that you could identify a farmer by looking at him/her, students at Rural High School appeared to be slightly more agriculturally literate. Their general perceptions of agriculture and their knowledge about agricultural commodities were more attuned with the actual state of agriculture in New York.

On-farm students from all three schools were more positive about farming, with more students agreeing that farming is lucrative, that most farms are smaller family farms, and disregarding the stereotype of a farmer's appearance. Further, these students identified dairy as the most important commodity by a wide margin, yet they gave more credence to corn and beef than is the case in the state's agricultural economy.

On average, on-farm students were a little more knowledgeable about some products, but not others. There was no noticeable correlation between the on-farm students and the participants' knowledge of

New York State agriculture. Of interest in this data, are the results concerning beef, pork, and hay. On-farm students viewed these products as more important than off-farm students. Combined with some other crops, hay accounts for 3.8% of the total value of agriculture products sold in New York; beef accounts for 8.0% and pork for .5% (USDA, 2002). On-farm students rated hay as 31.9% more "very important" than off-farm students. Pork was rated as important by 75.6% of on-farm students and 63.1% by off-farm students. Pork is not very important to New York. The participants who lived on farms, on-farm students were less accurate in this case.

Students did not know much about production agriculture in New York and which commodities are important to the state's economy. Dairy makes up for a little over 50% of New York agriculture and is produced statewide (USDA, 2002). New York is the leading producer of dairy products nationally (New York Department of Agriculture and Markets [NYDAM], 2005). Most students in all schools and from farms understood the importance of dairy to the state's agriculture economy. However, students living off-farm were markedly less in agreement as to dairy's importance. Apple production in New York is ranked 2nd nationally (NYDAM). Nearly one-third of all students in all demographic categories understood the importance of apples. New York grape production is ranked third highest in the nation (NYDAM). All students perceived grapes and associated industries as being of little importance to agriculture in the state.

Among other commodities, students generally knew little of their importance to the state. Students believed that hay, corn, beef, chicken, and pork were more important than is actually the case. Perhaps the lack of knowledge stems from students' general perceptions about agriculture. Students in all demographic categories also believed that a college education was not necessary for success in agriculture. This is particularly interesting and disturbing with one of the Nation's elite colleges of agriculture in the community. Evidently, students do not realize the importance of a college education to successful agricultural careers.

The implications of agricultural illiteracy in our schools and communities have direct impacts on agricultural policy and economics. Students who lack an understanding of the importance of agriculture or who hold various misconceptions and stereotypes about agriculture will become adults who make poor, misinformed decisions about political candidates, agricultural policy, and food and fiber decisions in their own homes. Agricultural illiteracy in youth translates into agricultural illiteracy in adults, yet these adults may have significant impacts on various aspects of food and fiber. For agricultural educators, this research provides one more piece of evidence relating to the agricultural illiteracy of our youth.

Further, in these three schools, Rural Ag High, Urban High, and Rural Non-Ag High, students were not markedly different in their agricultural illiteracy. Even though the community surrounding Rural Ag High is one of the most productive agricultural areas in the state, and even though Rural Ag High supports a two-teacher agricultural science program, these students were not more agriculturally literate than their counterparts at Urban High or Rural Non-Ag High. In fact, Rural Ag High students subscribed to the gender, appearance, and working condition stereotypes common to popular presentations of farmers. Further, students at Urban High believed more accurately that a college education contributed to success in agriculture, than did students at either of the other two rural high schools.

Several recommendations arise out of this research. Agriculture science teachers and county extension faculty should promote more accurate representations of agriculture than traditional farming stereotypes. The faculty and outreach coordinators in the college of agriculture at Cornell University should engage the local communities in authentic education about the importance and current state of agriculture in New York. Further, local FFA chapters may engage and educate civic organizations about the breadth and diversity of agriculture through the use of the Agricultural Issues Forum and Agricultural Communications Career Development Events.

Future research should engage local students in discussions about their perceptions of agriculture. Where do students find evidence to support their perceptions about agriculture? How do these perceptions influence their choices of future careers? When presented with information that more accurately portrays agriculture, how do these students respond?

As participants in the broad field of agriculture, agriculture educators must continue to educate as many people as possible about agriculture. Agriculture educators and agricultural science education must represent current agriculture practices, align with those individuals and entities outside of traditional production, and educate youth about the abundant and diverse career opportunities available in the broad field of agriculture. Educators must aim to produce future generations supplied with a basal level of agricultural literacy, such as is described in the National Research Council's report (1988); future generations capable of making informed agriculturally-related voting decisions, making educated consumer choices, and creating an environment of respect for agriculture in which their offspring may be raised.

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