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IN AGRICULTURE AND NATURAL RESOURCES

Executive Report

Examining the Human Dimensions of the
Best Management Practices Program

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For More Information

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Executive Summary

Examining the Human Dimensions of the Best Management Practices Program

February, 2018

Introduction

The Agricultural Best Management Practices (BMP) program is a partnership between the Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection, the five Florida Water Management Districts, and University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) Extension. The goal of the BMP program is to encourage agricultural producers' adoption of best management practices. Further, the program was designed to help increase the public's awareness of best management practices used by farmers and their trust that the Florida agriculture industry is taking appropriate measures to protect the natural environment and preserve resources.

Key Findings

The following results are key descriptive and comparative findings between the Florida public in 2015 and the Florida public in 2017:

- Overall, respondents in 2017 held less trust in farmers' water use and protection than respondents in 2015.
 - More respondents in 2015 (87%) agreed farmers will be concerned about water resources when making important decisions about farming than respondents in 2017 (70%).
 - The majority of respondents in 2015 (78%) agreed sound principles seem to guide farmers' behavior when it comes to water use, while only 54% of respondents agreed in 2017.
 - The majority of respondents in 2015 (66%) agreed farmers can be relied upon to keep their promises when it comes to water use. Only 45% of respondents in 2017 agreed with this statement.
 - The slight majority of respondents in both 2015 (54%) and 2017 (57%) agreed to some degree that it is important to watch farmers closely so they do not take advantage of water resources.
- In both 2015 and 2017, respondents agreed or strongly agreed farmers should conserve water, use less pesticides, and use less fertilizer.
- There were no significant differences observed between 2015 and 2017 respondents' overall positive perception of farming's relationship with the natural environment. However, significant differences were observed between 2015 and 2017 respondents for the individual items: "farmers conserve water" and "farm lands or privately owned agricultural lands allow water to return and recharge to ground water."
 - Only 45% of respondents in 2017 agreed to some degree farmers conserved water compared to 76% of respondents in 2015.
 - More respondents in 2015 (66%) than in 2017 (55%) agreed to some degree that farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources.
- Significant differences were observed between 2015 and 2017 respondents' average agreement with negatively framed statements pertaining to the relationship between farming and the natural environment.
 - Respondents in 2017 reported higher agreement with negatively worded statements about farming's relationship with the natural environment than respondents in 2015.
- There was no significance difference in 2015 respondents' and 2017 respondents' awareness of BMPs



- No significant difference was observed between 2015 and 2017 respondents' likelihood of buying products grown using BMPs.
- No significant difference was observed between 2015 and 2017 respondents' willingness to pay more for food grown using BMPs.

The following results include key descriptive and comparative findings between respondents in 2014 and 2017 from Florida counties where BMP educational programs have been implemented:

- The majority of respondents in both 2014 and 2017 prioritized buying local food and held positive attitudes toward local food.
- Fruits and vegetables were the types of food purchased locally by the largest number of respondents.
- The majority of respondents in both 2014 and 2017 agreed to some degree that farming is important to the economy, that farming is important to the environment, and that a loss of farmers would hurt the economy.
- Significant differences were observed between respondents in 2014 and 2017 regarding their perceptions of farmers who use BMPs:
 - More respondents in 2017 (84%) than 2014 (75%) agreed or agreed strongly that farmers practicing BMPs care about the environment than respondents.
 - More respondents in 2017 (76%) than 2014 (68%) agreed or agreed strongly that they would rather purchase products from farmer who uses BMPs than those who do not.
 - More respondents in 2017 (72%) than 2014 (64%) agreed or agreed strongly that they trust farmers practicing BMPs more than those who do not.
- Respondents in both 2014 and 2017 perceived farmers' engagement in BMPs was very important.
- Respondents in 2017 reported higher overall agreement that Florida farmers engage in nutrient/fertilizer BMPs than respondents in 2014.
- Respondents in 2017 reported higher overall agreement that they trust farmers who use BMPs than did respondents in 2014.
- Regarding information sources about farming, respondents in 2014 were more likely to seek information from newspapers or television. Respondents in 2017 were most likely to get information from the internet or television.
 - The internet sources used by the highest percentage of 2014 respondents was internet search engines. Respondents in 2017 used both internet search engines and social media.
 - TV news programs were the type of television source used by the highest number of respondents in both 2014 and 2017.

Background

The Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection, the five Florida Water Management Districts, and UF/IFAS Extension were interested in evaluating Florida residents' change in perception of agricultural best management practices and agricultural water use following the implementation of BMP education Extension programming in Florida counties.



The UF/IFAS Center for Public Issues Education in Agriculture and Natural Resources (PIE Center) worked with the FDACS Office of Ag Water Policy, the Florida Farm Bureau, and Florida Dairy Farmers in 2015 to collect data from Florida residents regarding their perceptions of agricultural water use. The PIE Center also worked with Florida Farm Bureau and Mosaic in 2014 to collect data from Florida residents in counties in which BMP education had been implemented to assess their perceptions of agriculture BMPs and water use. The purpose of this report is to compare data collected from Florida residents and Florida residents in counties where BMP education has been implemented to data from the 2015 Ag Water Use study and the 2014 CARES study, respectively.

Methods

This study used an online survey design to answer the research questions. The population of interest was Florida residents. A survey instrument was developed based on the 2015 Ag Water Use questionnaire and 2014 CARES questionnaire. An expert panel with expertise in water quality and quantity issues, agricultural water issues, and public opinion research reviewed the instrument for content, face validity, and survey design. Questions from both questionnaires were selected for inclusion in this survey instrument. The questionnaire was then reviewed for face and content validity by an expert panel that comprised the Interim Director of the University of Florida/Institute of Food and Agricultural Sciences' Center for Public Issues Education for Agriculture and Natural Resources (PIE Center) and two research coordinators with the PIE Center. Data was collected from Florida residents in 2017 using this survey instrument.

To reach Florida residents, a non-probability opt-in sample was obtained from a public opinion survey research company. Non-probability samples are often used in public opinion research to make population estimates (Baker, et al., 2013). While non-probability samples require adjustments for nonrandom selection and nonresponse, previous literature has shown that non-probability samples have yielded results that are as good as or even better than probability-based samples (Abate, 1998; Twyman, 2008; Vavreck & Rivers, 2008).

Two survey links were created. The public opinion survey research company sent the first link to the developed survey to Florida residents representative of the state population based on the 2010 Census data. In 2015, 524 responses were obtained. In 2017, 526 responses were obtained. To compensate for potential exclusion, selection, and non-participation biases that tend to be limitations of using a non-probability sample, weighting procedures were implemented (Baker et al., 2013). In this case, weighting was conducted using post-stratification methods (Kalton & Flores-Cervantes, 2003) to balance demographics ensuring the composition of the sample reflected the adult Florida population and to provide results intended to approximate the population of interest.

The second survey link was sent to Florida residents in counties in which BMP education Extension programs have been implemented. In 2014, 699 responses were obtained from Florida residents in selected counties. In 2017, 524 responses were obtained from Florida residents in these same counties. Quotas were set *a priori* to ensure the residence of respondents represented the targeted Florida counties. Descriptive statistics were used to determine frequencies of responses, means, and standard deviations. Chi-square analysis and independent *t*-tests were employed to determine if there were statistical differences between groups.



Comparisons between Floridians (General Public) in 2015 and 2017

The following sections include the results of comparisons between Florida respondents in 2015 and Florida respondents in 2017.

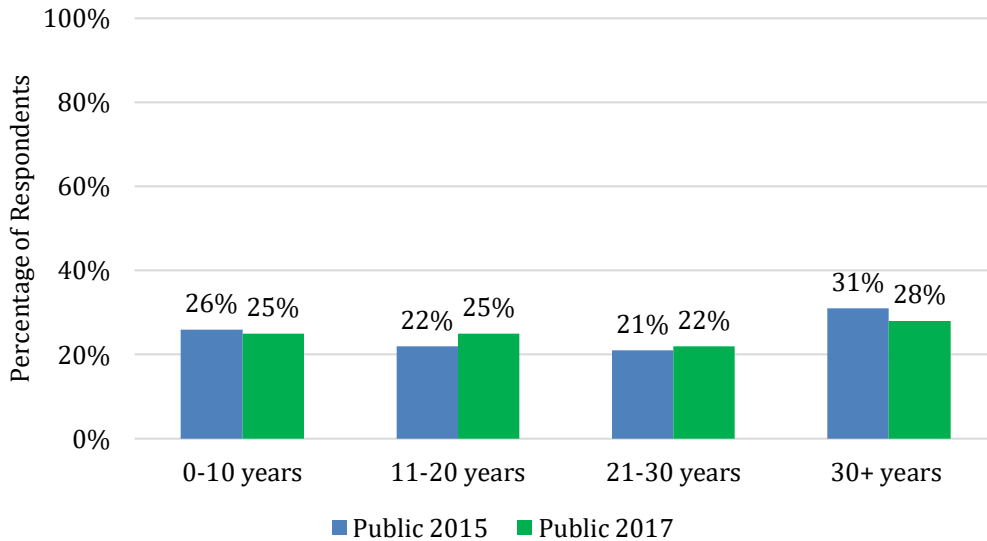
About the Respondents

Demographic questions were presented to respondents regarding their years lived in Florida, place of residence, gender, race, age, educational attainment, political affiliation and values, and involvement in agriculture.

Residence

Respondents were asked how long they have lived in Florida and the residential area in which they live. There was difference in the number of years lived in Florida among respondents 2015 and 2017 (Figure 1).

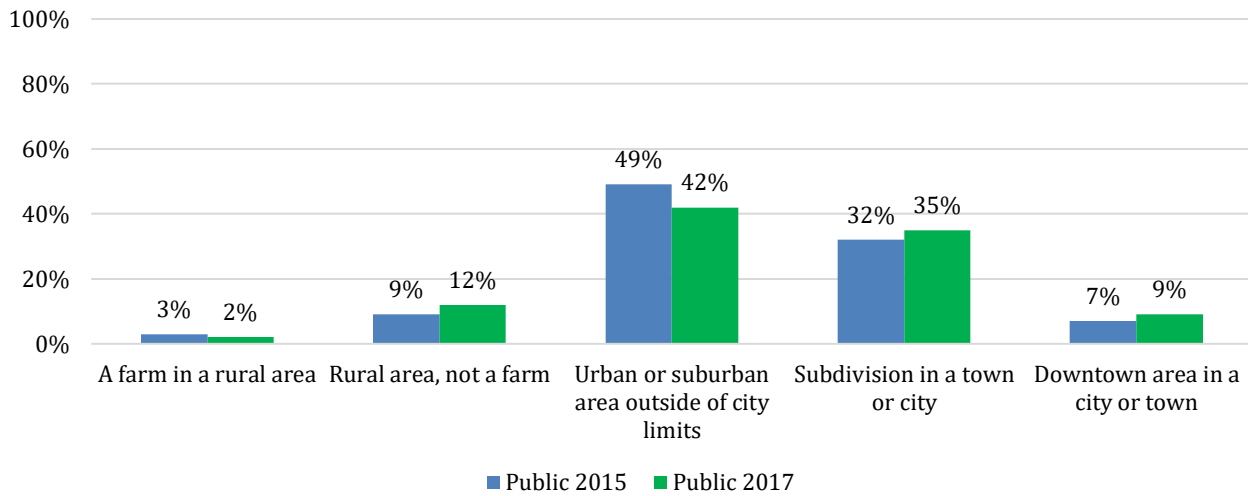
Figure 1: Years lived in Florida



In both 2015 and 2017, the largest number of respondents from the general public indicated they lived in an urban or suburban area outside of the city (Figure 2). Slightly less respondents from the general public lived in an urban or suburban area outside of city limits in 2017 (42%) than did respondents in 2017 (49%), and more respondents lived in a rural area, not a farm in 2017 (12%) than in 2015 (9%).



Figure 2: Residential area of Florida respondents



Demographics

The demographic characteristics of respondents are displayed in Table 1. In 2015, the general public was predominantly male (51.5%), White (76.9%), and living in a county in a metro area with a population of one million or more (63.1%). More respondents in 2015 were within the age range of 50 to 59 than any other age category. The same characteristics were true of the general public in 2017, with the exception of age range. Slightly more respondents were in the age category of 30-39 years old (19.2%) than any other age category.

Table 1: Demographic characteristics of Florida respondents

Demographic Category	Florida Respondents 2015	Florida Respondents 2017
Gender		
Male	51.5	51.7
Female	48.5	48.3
Race and Ethnicity		
Hispanic	22.5	21.1
American Indian or Alaska Native	0	.4
Asian or Pacific Islander	2.9	2.5
Black or African American	16.4	14.4
White	76.9	77.6
Multiracial	1.8	1.9
Other	2.0	3.2
Age		
18-19	2.1	2.9
20-29 years	19.3	15.6
30-39 years	17.4	19.2
40-49 years	15.5	15.0
50-59 years	20.4	16.5
60-69 years	18.1	18.1
70-79 years	5.9	11.4



Examining the Human Dimensions of the Best Management Practices Program

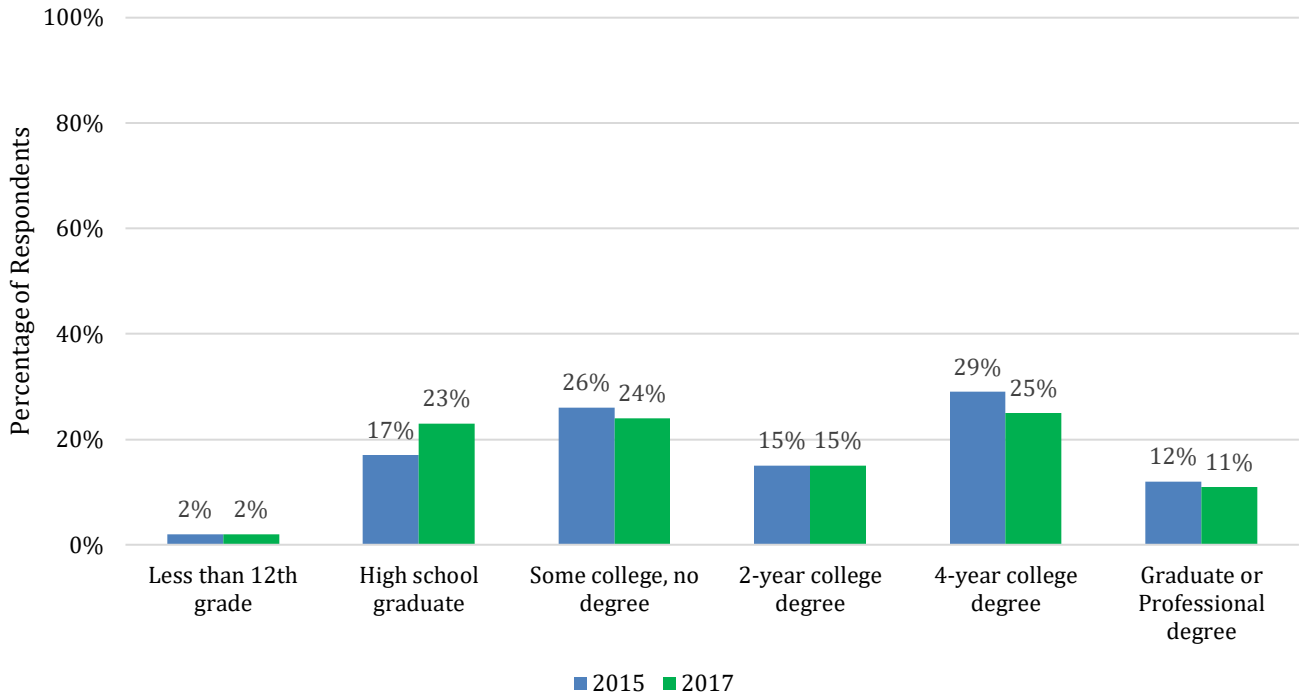
80 and older	1.3	1.3
Area of Residence		
Metro-Counties in metro areas 1 million population or more	63.1	63.1
Metro-Counties in metro areas of 250,000 to 1 million population	25.7	25.7
Metro- Counties in metro areas of fewer than 250,000 population	4.8	4.8
Nonmetro- Urban population of 20,000 or more, adjacent to a metro area	3.5	3.5
Nonmetro- Urban population of 2,500 to 19,999, adjacent to a metro area	2.9	2.6
Nonmetro- Completely rural or less than 2,500 urban population, adjacent to a metro area	0	.3

Educational Attainment

Educational attainment among respondents was similar in 2015 and 2017 (Figure 3). However, slightly more respondents held a four-year college degree in 2015 (29%) than respondents in 2017 (25%).



Figure 3: Educational attainment of Florida respondents

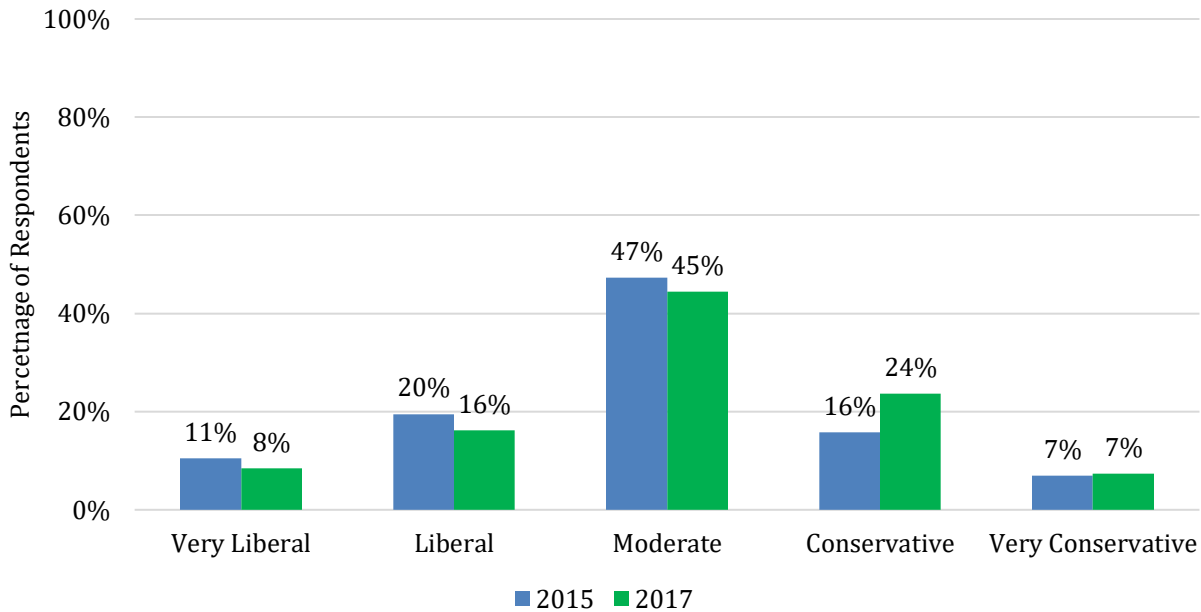


Political Affiliation and Values

Respondents in both 2015 (47%) and 2017 (45%) were more likely to hold moderate political beliefs than any other political belief. The fewest number of respondents in 2015 and 2017 reported being very liberal or very conservative (Figure 4).

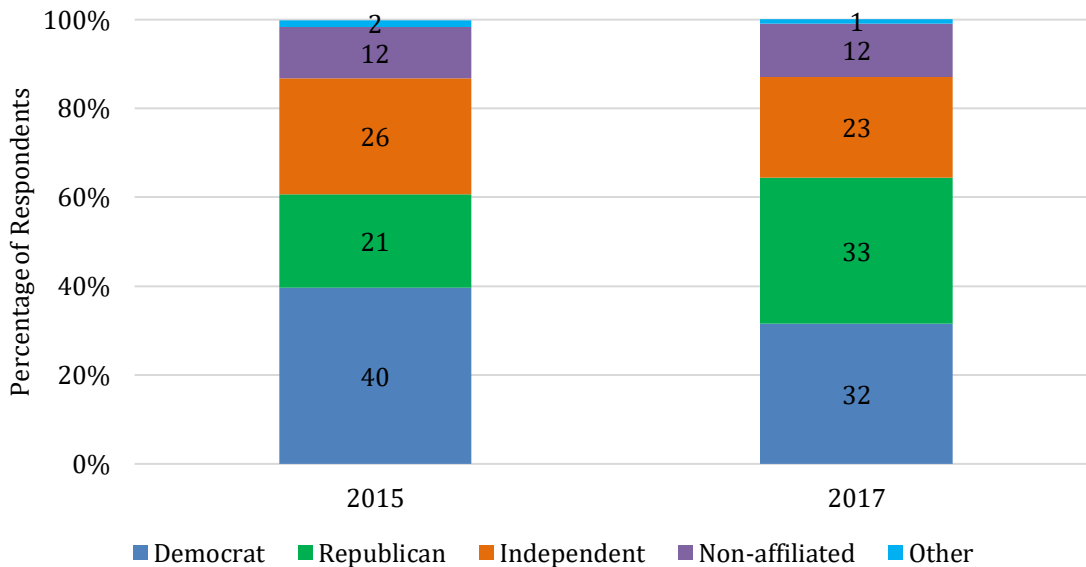


Figure 4: Political values of Florida respondents



Florida respondents were more likely to be affiliated with the Democratic party in 2015 (40%) than in 2017 (32%). There were more Republican respondents in 2017 (33%) than in 2015 (21%). Results can be seen in Figure 5.

Figure 5: Political affiliation of Florida respondents

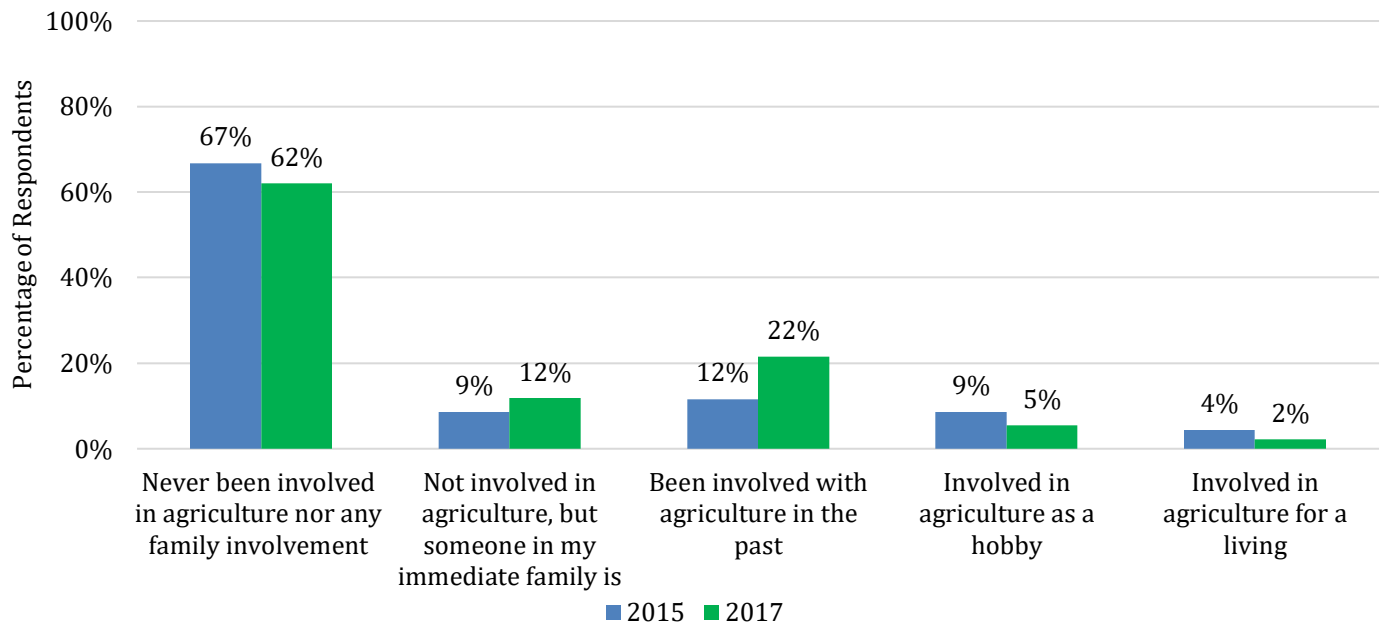


Involvement in Agriculture

Respondents were asked to indicate their level of involvement in agriculture (Figure 6). The majority of respondents in both 2015 (67%) and 2017 (62%) had never been involved in agriculture nor had family members involved in agriculture.



Figure 6: Florida respondents' involvement in agriculture



Attitude toward Farmers and Farming Practices

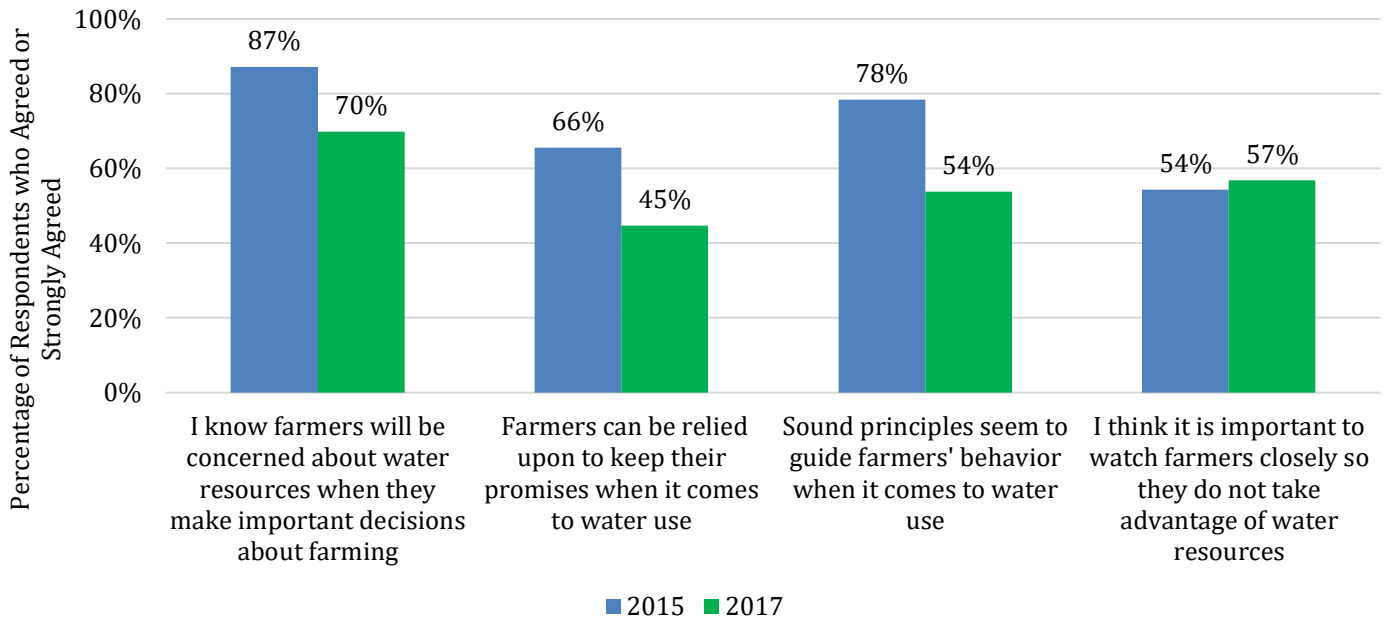
Respondents were asked to indicate their level of agreement to a variety of questions about farmers and their farming practices. Key concepts examined included: trust in farmers' water use and protection, farmers' use of resources, and agriculture's relationship with the natural environment. All questions were asked using a 5-point Likert-type agreement scale with 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, 5 = *Strongly Agree*. In Figures 7-11 the agree and strongly agree categories were combined to visually display differences in general agreement among respondents in 2015 and 2017.

Trust in Water Use and Protection

Respondents were asked about their trust in farmers' practices (see Figure 7). Overall, respondents in 2015 were more likely to agree or strongly agree that farmers (a) are concerned about water resources when making decisions, (b) can be relied upon to keep their promises about water use, and (c) are guided by sound principles when it comes to water use. Less than half (45%) of respondents in 2017 agreed to some degree that farmers can be relied upon to keep their promises when it comes to water use. Additionally, while 78% of respondents in 2015 agreed that sound principles seem to guide farmers' behavior when it comes to water use, only 54% of respondents in 2017 agreed. A little over half of the respondents in 2015 (54%) and 2017 (57%) agreed to some degree that it is important to watch farmers closely so they do not take advantage of water resources. All items were statistically significant at the .01 level when a Chi-square test was conducted to assess differences between the respondents in 2015 and 2017.



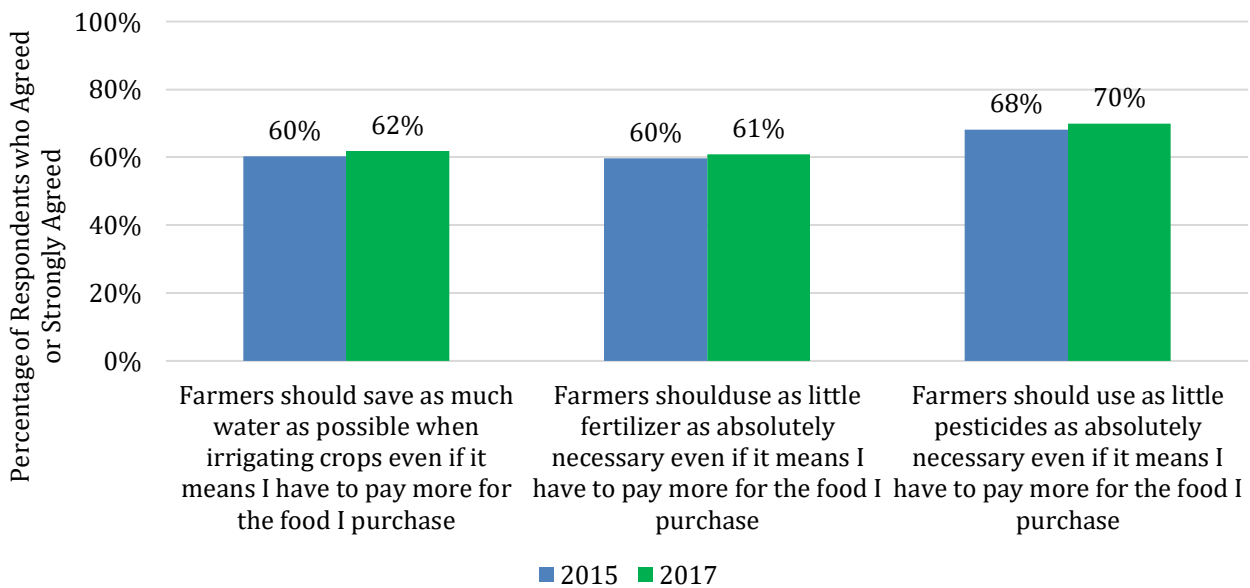
Figure 7: Florida respondents' trust in water use and protection



Use of Resources

Respondents in 2015 and respondents in 2017 answered similarly to questions about farmers' use of resources (Figure 8). The majority of respondents in both 2015 and 2017 groups agreed or strongly agreed farmers should use as little pesticides, fertilizer, and water as possible when producing their crops or products even if it means they have to pay more for the food they purchase. The item "farmers should save as much water as possible when irrigating crops even if it means I have to pay more for the food I purchase" was the only item statistically significant at the .01 level when a Chi-square test was conducted to assess differences between respondents in 2015 and 2017.

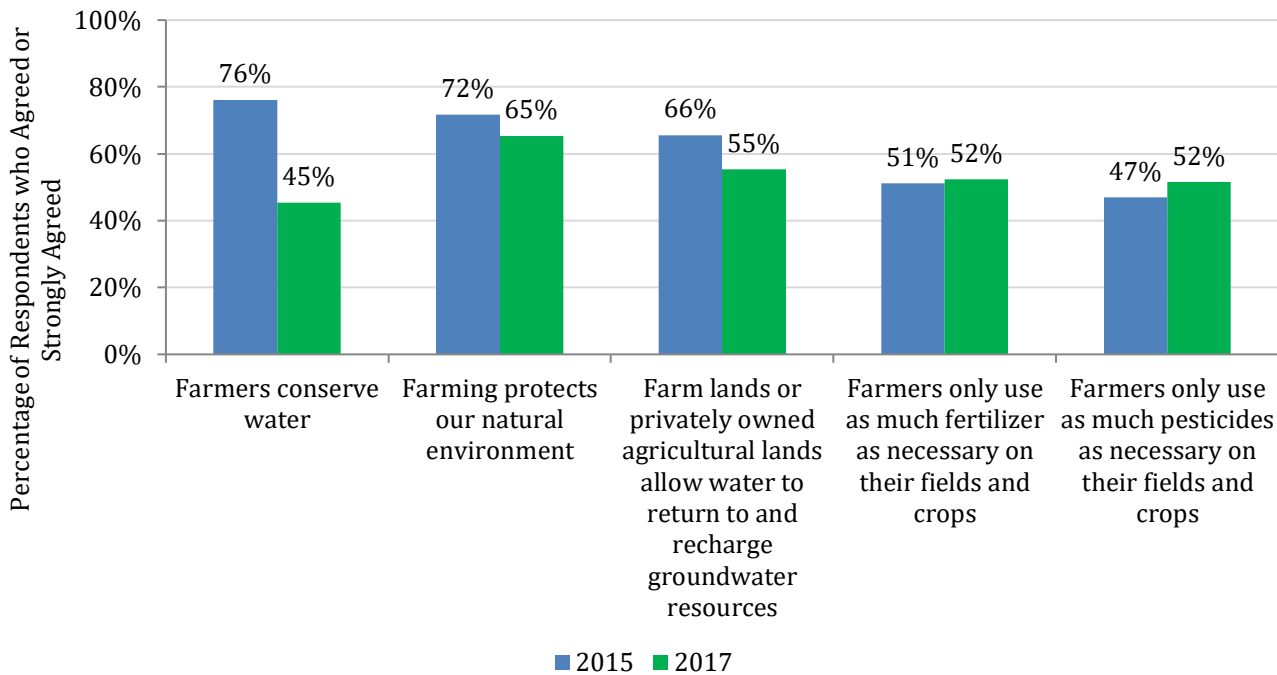
Figure 8: Florida respondents' beliefs about farmers' use of resources



Relationship with the Natural Environment

Respondents were asked about their perceptions regarding agriculture’s relationship with the natural environment from a positive perspective (Figure 9). Chi-square analysis was conducted to assess differences between the respondents in 2015 and 2017. Two items were statistically significant at the .01 level, including “farmers conserve water” and “farm lands or privately owned agricultural lands allow water to return to and recharge ground water. Only 45% of respondents in 2017 agreed or strongly agreed that farmers conserve water compared to 76% in 2015. Fewer respondents in 2017 (55%) agreed to some degree that farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources than did respondents in 2015 (66%).

Figure 9: Florida respondents’ perception of farming’s relationship with the natural environment – positive frame



Respondents were also asked a series of negatively framed questions about agriculture’s relationship with the natural environment (Figure 10). Chi-square analysis was conducted to assess differences between the respondents in 2015 and 2017, and all items were statistically significant at the .01 level. Fewer respondents in 2017 agreed or strongly agreed with each negatively framed statement than respondents in 2015.



Figure 10: Florida respondents' perception of farming's relationship with the natural environment – negative frame

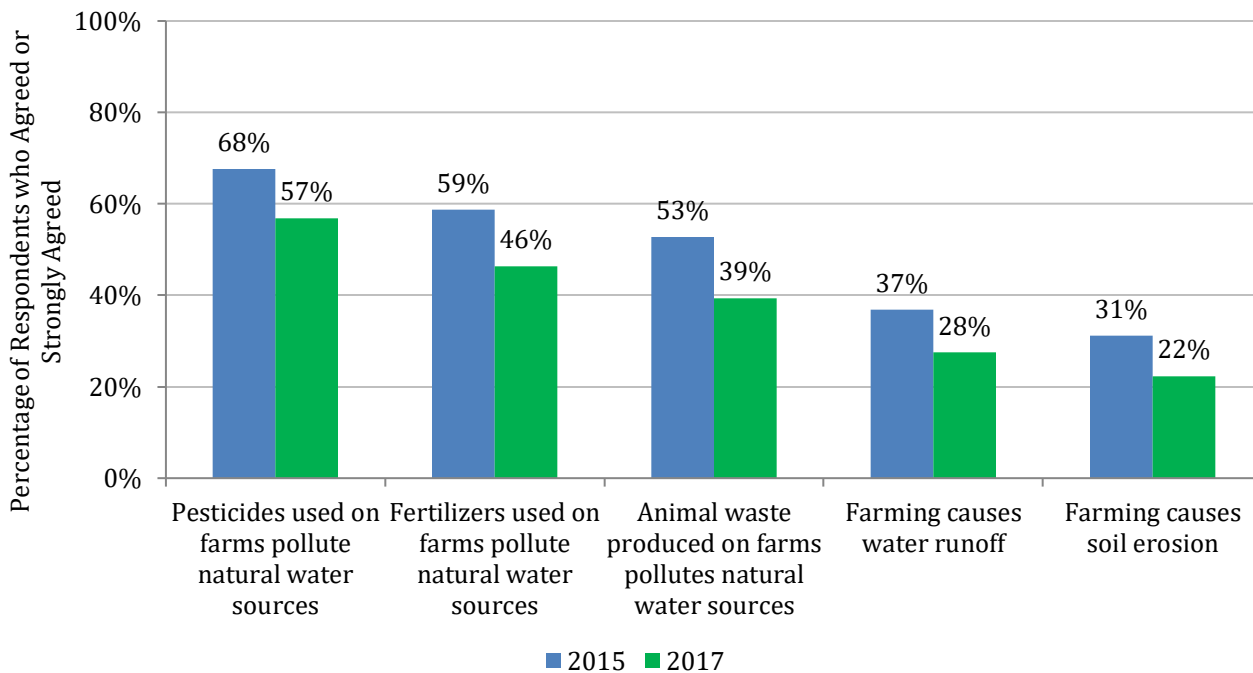


Table 2 displays the overall average response to each of the items presented in Figures 7-10. The items were split into five different conceptual areas and summed and averaged into five constructs. Responses were collected on a five-point Likert scale of agreement (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*). Real limits were set to interpret responses (1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*). The five constructs are shown in bold. All scales demonstrated acceptable internal reliability consistency of $\alpha = .61$ or higher (Table 2). Construct means were compared among respondents in 2015 and 2017 using an independent samples *t*-test. Statistically significant differences in groups were observed at the $p < .01$ level for respondents' average agreement with their trust in farmers' water use and protection and their agreement with negatively worded items pertaining to farming's relationship with the natural environment.

Regarding *trust in water use and protection*, respondents in both 2015 and 2017 held an overall position of agreement with statements pertaining to their trust in farmers' water use and protection. However, respondents in 2015 ($M = 3.95$; $SD = .58$) reported slightly higher agreement than did respondents in 2017 ($M = 3.73$; $SD = .63$); $t(1022) = 5.75$, $p = .000$. Regarding farmers' *use of resources*, respondents in both 2015 ($M = 3.90$; $SD = .96$) and 2017 ($M = 3.92$; $SD = .85$) held an overall position of agree pertaining to how farmers should use resources. Regarding farming's *positive relationship with the natural environment*, respondents in 2015 had an average of 3.98 and respondents in 2017 had an average score of 3.92. For the overall average of items pertaining to the *relationship with the natural environment using negative frame questions*, respondents in 2015 ($M = 3.50$; $SD = .84$) reported slightly higher agreement with negatively worded statements about farming's relationship with the environment than did respondents in 2017 ($M = 3.24$; $SD = .85$); $t(1023) = 4.93$, $p = .000$ (Table 2).



Table 2: Index results and comparisons between 2015 and 2017 Florida respondents' perceptions of farmers' water use and protection, farmers' use of resources, and farming's relationship with the natural environment

	2015 <i>M</i>	2015 <i>SD</i>	2017 <i>M</i>	2017 <i>SD</i>
Trust in Water Use and Protection** ($\alpha = .61$)	3.95	.58	3.73	.63
I know farmers will be concerned about water resources when they make important decisions about farming	4.32	.80	3.99	.87
Farmers can be relied upon to keep their promises when it comes to water use	3.87	.89	3.52	.94
Sound principles seem to guide farmers' behavior when it comes to water use	4.06	.84	3.68	.94
I think it is important to watch farmers closely so they do not take advantage of water resources (RC)	3.54	1.12	3.67	.99
Use of Resources ($\alpha = .83$)	3.90	.96	3.92	.85
Farmers should save as much water as possible when irrigating crops even if it means I have to pay more for the food I purchase	3.75	1.06	3.77	.90
Farmers should use as little fertilizer as absolutely necessary even if it means I have to pay more for the food I purchase	3.73	1.04	3.78	.93
Farmers should use as little pesticides as absolutely necessary even if it means I have to pay more for the food I purchase	3.98	1.03	3.94	.95
Relationship with the Natural Environment - Positive Frame ($\alpha = .83$)	3.98	.79	3.92	.84
Farmers conserve water	4.06	.82	3.52	.96
Farming protects our natural environment	3.98	.88	3.82	.94
Farm lands or privately owned agricultural lands allow water to return to and recharge groundwater resources (such as aquifers where we get our drinking water)	3.97	.83	3.74	.89
Farmers only use as much fertilizer as necessary on their fields and crops	3.57	.98	3.69	.90
Farmers only use as much pesticides as necessary on their fields and crops	3.49	.10	3.67	.95
Relationship with the Natural Environment – Negative Frame** ($\alpha = .85$)	3.50	.84	3.24	.85
Farming causes soil erosion	3.04	1.05	2.82	1.05
Farming causes water runoff	3.19	1.07	2.96	1.03
Fertilizers used on farms pollute natural water sources	3.74	.98	3.46	1.03
Pesticides used on farms pollute natural water sources	3.94	.91	3.69	1.01
Animal waste produced on farms pollutes natural water sources	3.58	1.05	3.26	1.13

Note. (RC) = item recoded for use in the overall index. Real limits: 1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*.

** $p < .01$



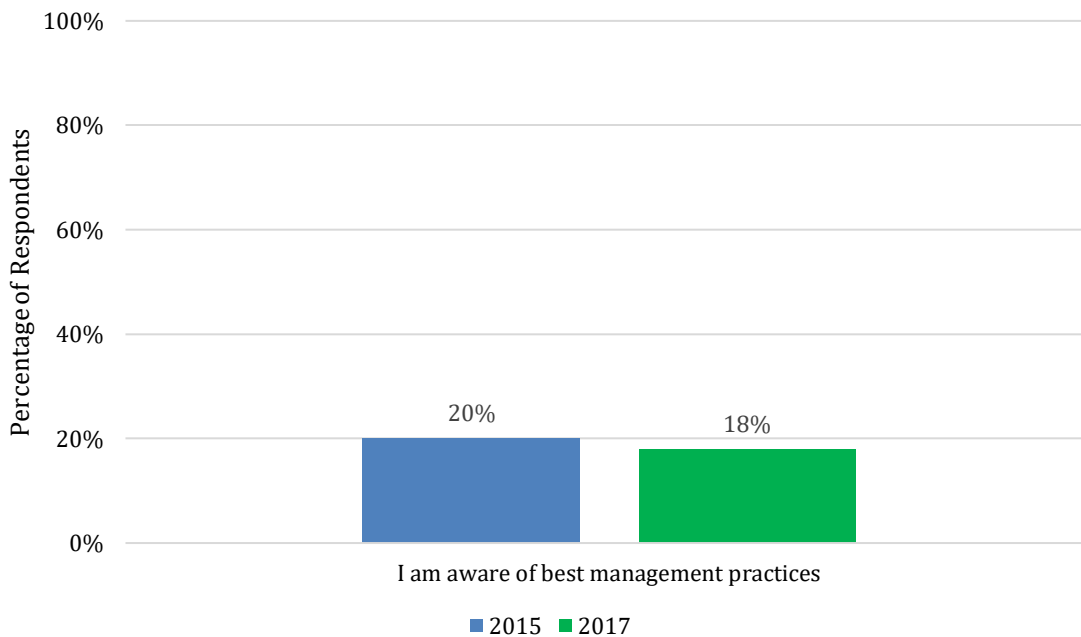
Best Management Practices

Respondents were asked a series of questions regarding best management practices (BMPs).

Awareness of Best Management Practices

Respondents were asked whether they were aware of any BMPs farmers in Florida implement to protect water. Twenty percent of respondents in 2015 reported “yes”, and 18% of respondents in 2017 reported “yes” (Figure 11). Chi-square analysis revealed no significant change at the $p < .01$ level between 2015 and 2017 respondents’ awareness of BMPs.

Figure 11: Florida respondents’ awareness of BMPs

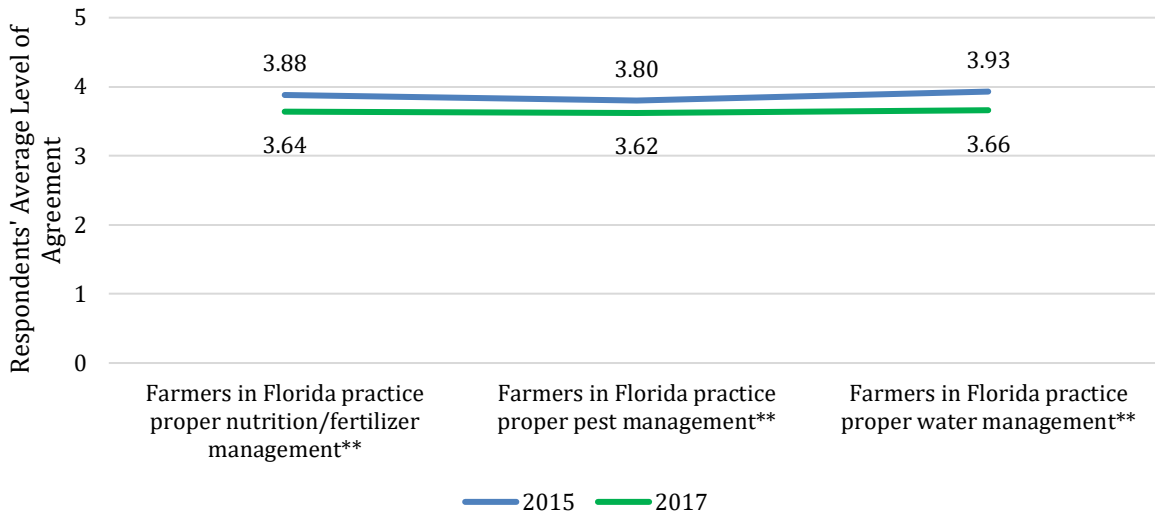


Best Management Practices Use

Next, respondents were asked to indicate their level of agreement with statements pertaining to Florida farmers’ use of specific BMP practices. Responses were collected using a five-point Likert scale of agreement with 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*. While respondents in both 2015 and 2017 held the position of “agree” for all statements, respondents in 2015 reported slightly higher agreement for each statement than did respondents in 2017 (Figure 12). The differences between the two groups were statistically significant at the $p < .01$ level for all three statements.



Figure 12: Florida respondents' perceptions of farmers' use of BMPs



Note: Real limits: 1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*.

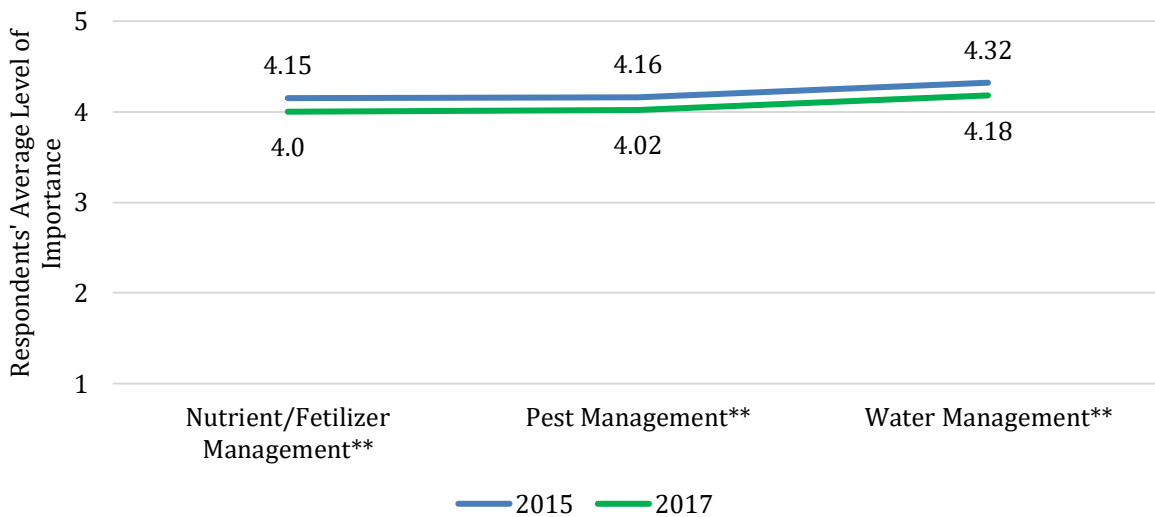
** $p < .01$

Importance of Best Management Practices

Respondents were asked how important it is for farmers to practice three specific BMPs, including nutrient/fertilizer management, pest management, and water management. Responses were collected on a five-point Likert-type scale with 1 = *not important*, 2 = *slightly important*, 3 = *important*, 4 = *very important*, and 5 = *extremely important*.

Respondents in 2015 and 2017 responded similarly, with an average within the limits of “very important” for all three items (Figure 13). The slight differences between groups were statistically significant at the $p < .01$ level for all three items.

Figure 13: Florida respondents' perceived importance of BMPs



Note. Real limits: 1.00 to 1.50 = *not important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*. ** $p < .01$

Individual means as well as the overall construct means for BMP use and importance of BMPs are displayed in Table 3. Responses regarding respondents' agreement with farmers' use of BMPs were collected using a five-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*). Real limits were set to interpret results (1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*). Independent t-test revealed significant differences at the $p < .01$ level between 2015 and 2017 respondents' agreement with individual statements, as well as the overall average. While both groups fell within the real limits of "agree", respondents in 2015 reported slightly higher agreement that farmers should use BMP practices than respondents in 2017.

Regarding respondents' perceived importance that farmers practice BMPs, responses were collected using a five-point Likert-type scale of importance (1 = *not important*, 2 = *slightly important*, 3 = *important*, 4 = *very important*, 5 = *extremely important*). Real limits were set to interpret results (1.00 to 1.50 = *not important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*). Statistically significant differences at the $p < .01$ level were observed between 2015 and 2017 respondents for individual items and the overall average. Both groups perceived BMPs as "very important" overall, however, respondents in 2015 had slightly higher averages than respondents in 2017.

Table 3: Index results and comparisons between 2015 and 2017 Florida respondents' perceptions of farmers' use of BMPs and importance of BMPs

	2015 <i>M</i>	2015 <i>SD</i>	2017 <i>M</i>	2017 <i>SD</i>	<i>t</i>	<i>p</i>
Agreement that Farmers Practice Proper BMPs**	3.86	.76	3.64	.74	4.61	.000
Proper Nutrition/Fertilizer Management**	3.88	.80	3.64	.78	4.64	.000
Proper Pest Management**	3.80	.83	3.62	.80	3.37	.001
Proper Water Management**	3.93	.81	3.66	.81	5.11	.000
Importance that Farmers Practice BMPs**	4.21	.72	4.07	.80	3.07	.002
Nutrient/Fertilizer Management**	4.15	.83	4.00	.87	2.80	.005
Pest Management**	4.16	.84	4.02	.86	2.76	.006
Water Management**	4.16	.84	4.02	.86	2.69	.007

Note: Real limits of agreement scale: 1.00 to 1.50 = *not important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*. Real limits of importance scale: 1.00 to 1.50 = *not important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*.

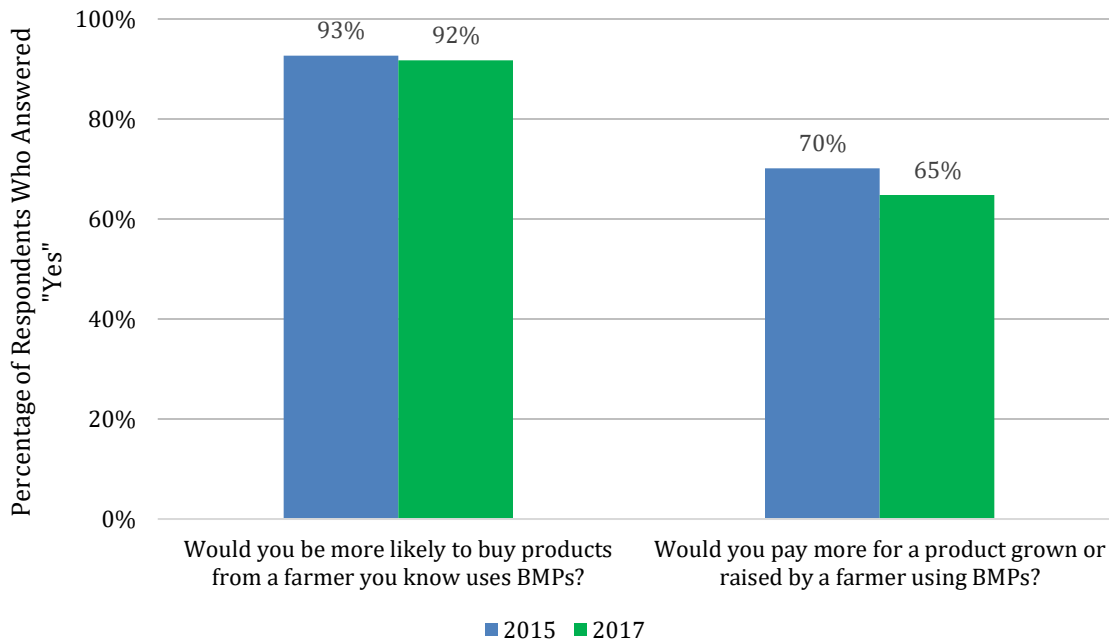
** $p < .01$

Willingness to buy or pay more for BMP products

Respondents were asked about their willingness to buy or pay more for products grown by farmers who use BMPs. There were no statistically significant differences observed between 2015 and 2017 respondents' likeliness of buying or willingness to pay more for food grown using BMPs. Results are displayed in Figure 14.



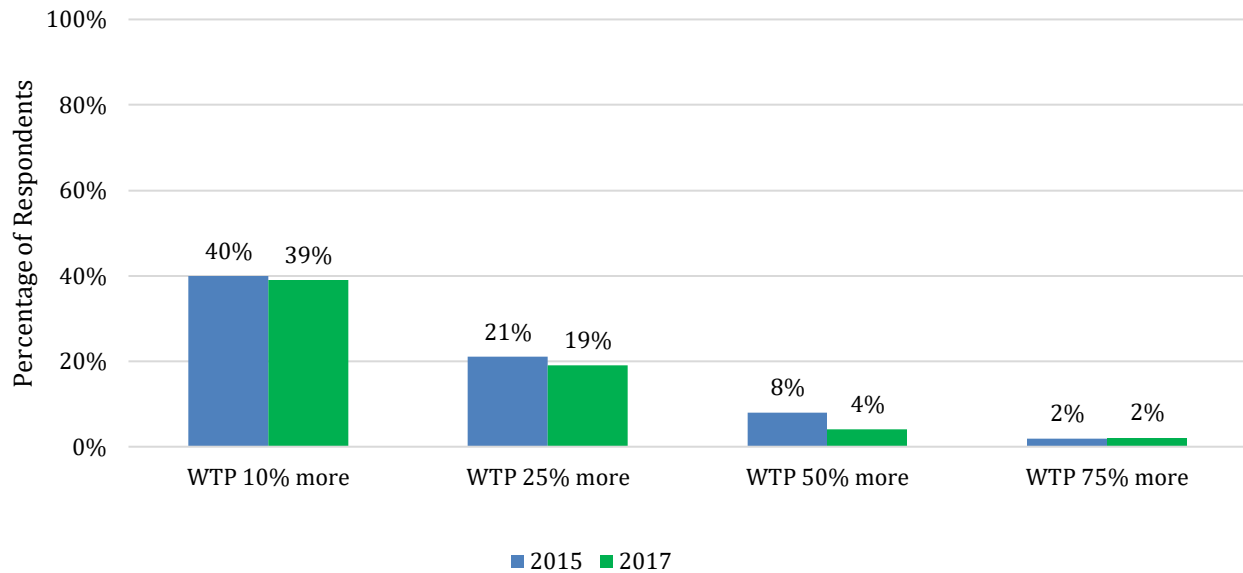
Figure 14: Florida respondents' willingness to buy or pay more for food grown using BMPs



Respondents who indicated they would be willing to pay more for a product produced using BMPs (2015, $n = 368$; 2017, $n = 341$) were then asked how much more they would be willing to pay (Figure 15). The question specifically asked how much more respondents would be willing to pay for fruit grown using BMPs compared to fruit not produced using BMPs. Response options included (a) 10% or \$2.75 instead of \$2.50 for a small container, (b) 25% or \$3.13 instead of \$2.50 for a small container, (c) 50% or \$3.75 instead of \$2.50 for a small container, and (d) 75% or \$4.38 instead of \$2.50 for a small container. Differences between 2015 and 2017 respondents' amount willing to pay more for BMP products was not statistically significant at the $p < .01$ level.



Figure 15: Amount Florida respondents were willing to pay more for BMP products

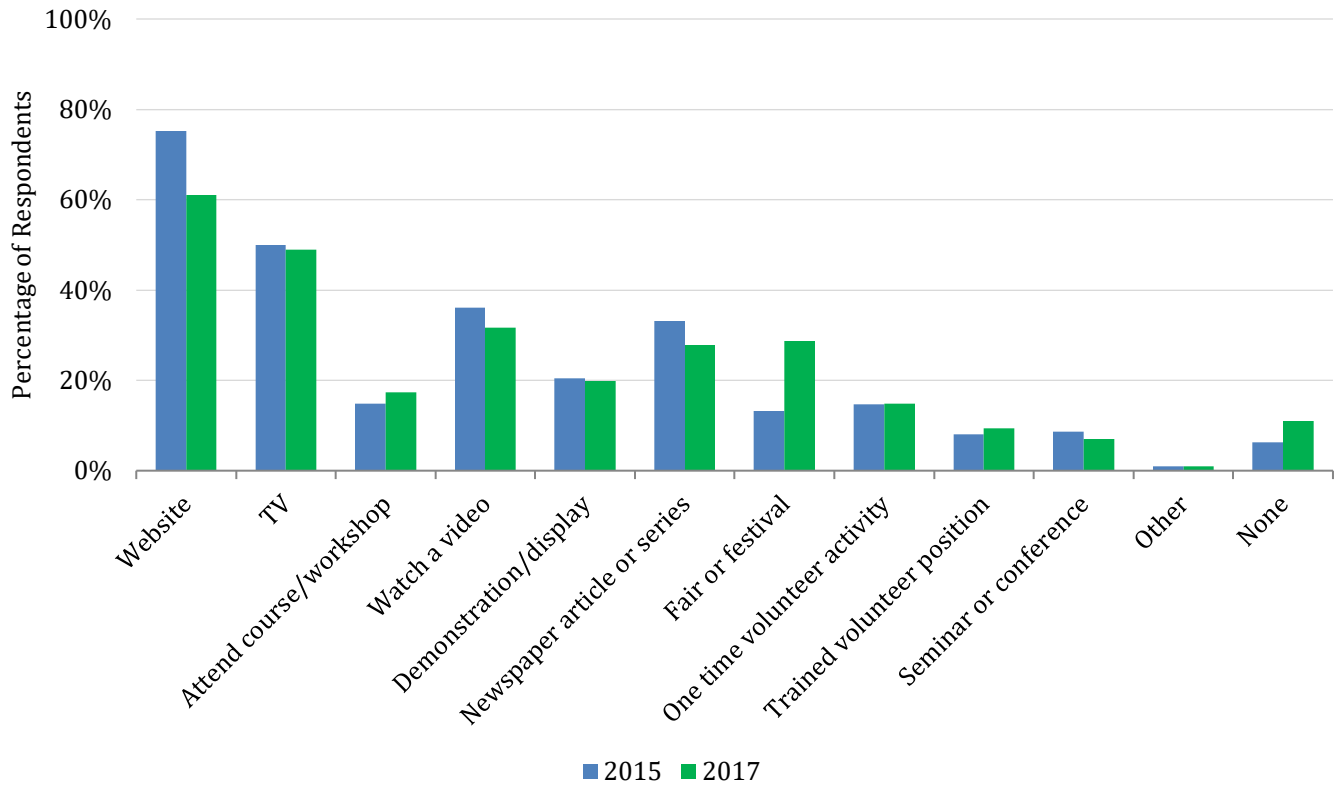


Opportunities to Learn About Water

Lastly, respondents were asked to indicate which types of learning opportunities they would use to learn more about water topics. They were presented with a list and allowed to select all that applied. The types of learning opportunities or sources preferred by a larger number of respondents in both 2015 and 2017 included website, television programming, and watching a video (Figure 16).



Figure 16: Sources used by Florida respondents to gather information about farmers' use of water



Comparison of Respondents in Counties Where BMP Educational Programs were Implemented

The following sections include comparisons between respondents in 2014 living in Florida counties where BMP educational programs have been implemented and respondents in 2017 living in those same counties.

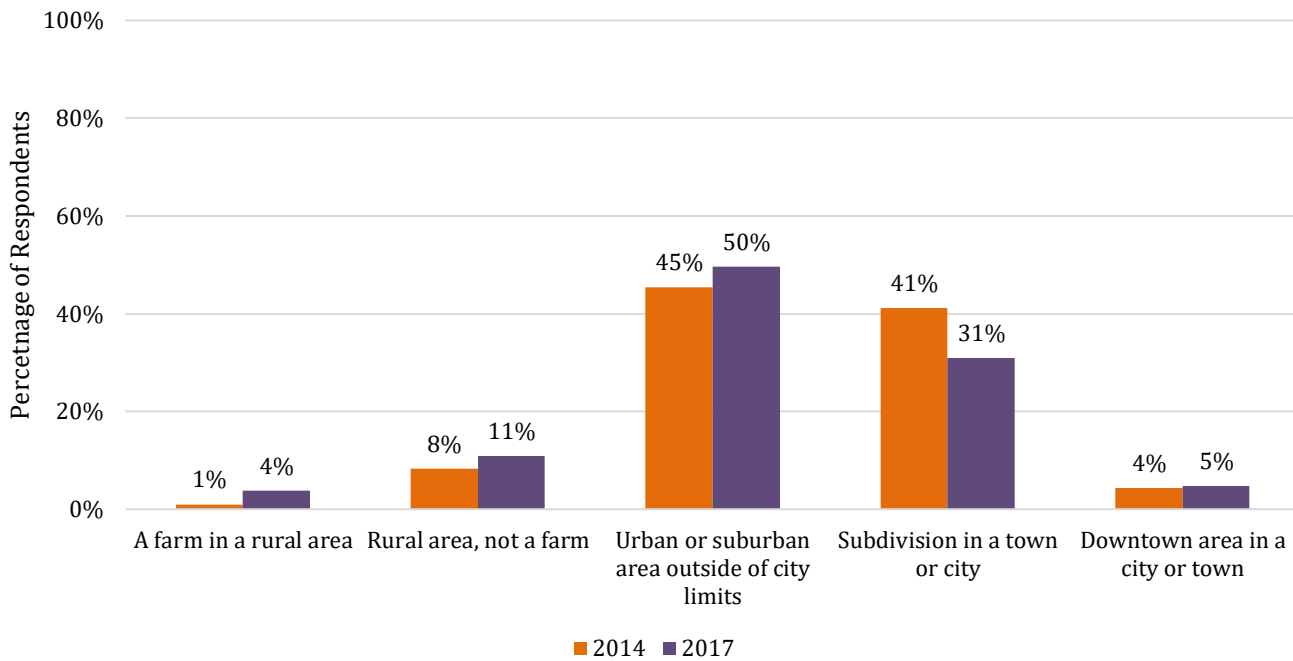
About the Respondents

Demographic questions were presented to respondents regarding their area and county of residence, gender, race, age, educational attainment, political affiliation and values, and involvement in agriculture.

Residence

In both 2015 and 2017, the largest number of respondents lived in an urban or suburban area outside of the city limits or in a subdivision in a town or city (Figure 17).

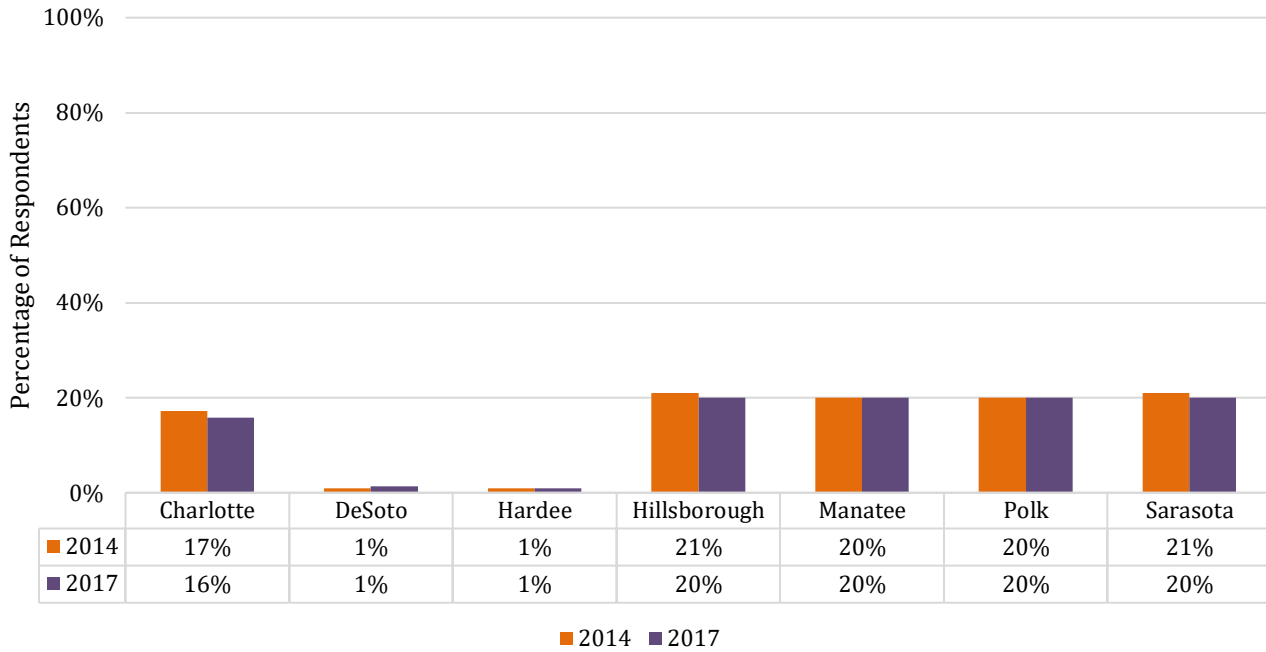
Figure 17: Area of residence



Respondents were also asked to indicate in which of the seven counties with BMP educational programming they lived. The results are displayed in Figure 18.



Figure 18: County of residence



Demographics of BMP County Respondents

The demographic characteristics of respondents in 2014 and 2017 are displayed in Table 4. In 2014, respondents were more likely to be female (58.8%), White (93.8%), and in the age range of 60-69 years (27%). The same characteristics were true of respondents in 2017.

Table 4: Demographic characteristics of BMP county respondents

Demographic Category	BMP County Respondents	
	2014	2017
Gender		
Male	41.2	49.8
Female	58.8	50.2
Race and Ethnicity		
Hispanic	3.9	11.3
American Indian or Alaska Native	1.0	1.1
Asian or Pacific Islander	.90	2.7
Black or African American	2.7	5.9
White	93.8	86.8
Multiracial	.10	1.3
Other	1.4	2.1
Age		
18-19	.60	3.4
20-29 years	6.3	25.4
30-39 years	12.3	17.2
40-49 years	15.0	8.6

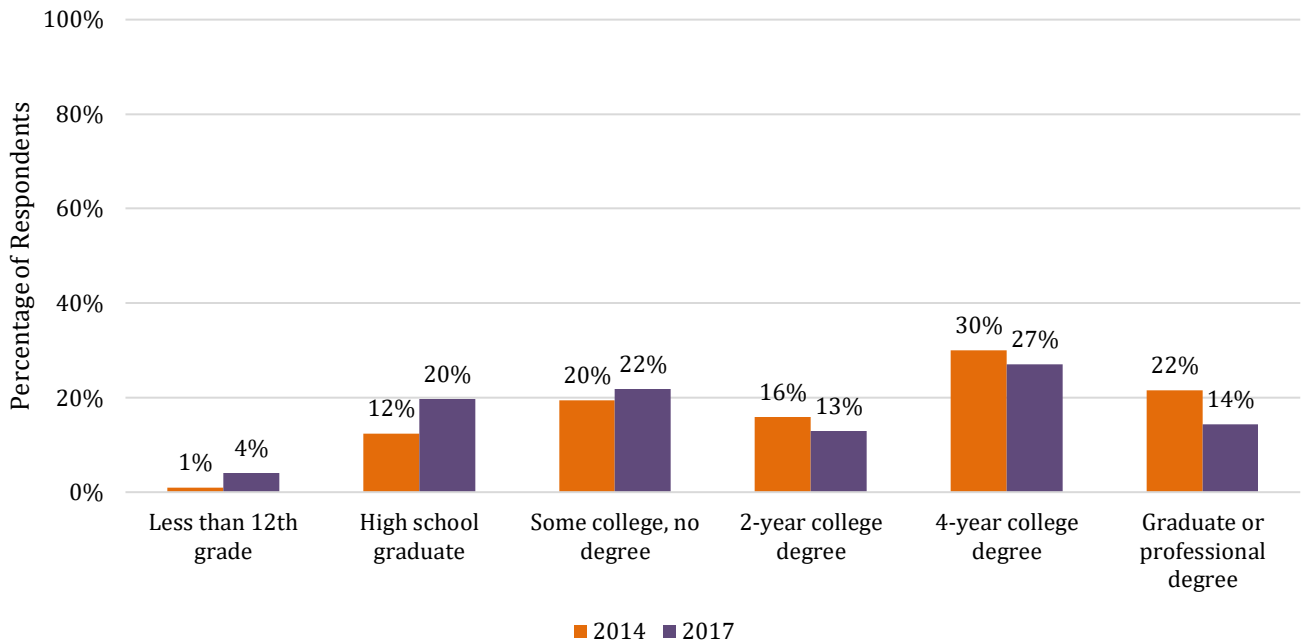


50-59 years	19.3	11.1
60-69 years	27.0	18.1
70-79 years	17.0	14.9
80 and older	2.4	1.3

Educational Attainment

Educational attainment among respondents was similar in 2014 and 2017 (Figure 19). However, slightly more respondents in 2017 (20%) than 2014 (12%) held a high school diploma as their highest degree of education, and slightly fewer respondents in 2017 (14%) than 2014 (22%) had attained a graduate or professional degree.

Figure 19: Educational attainment of BMP county respondents

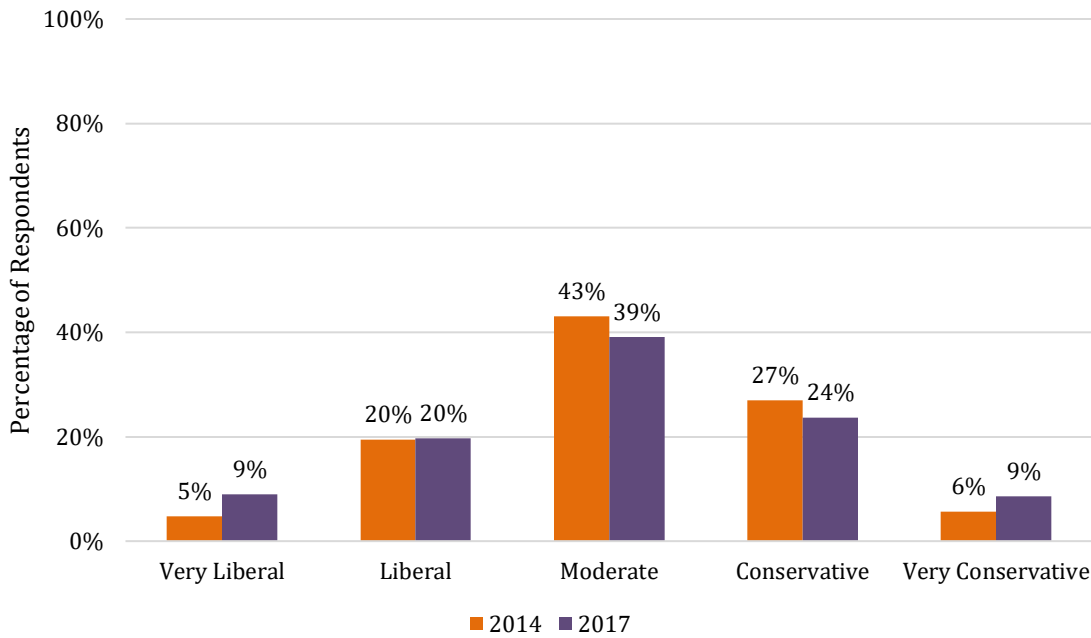


Political Values

Respondents in both 2014 (43%) and 2017 (39%) were more likely to hold moderate political beliefs than any other political belief. The fewest respondents in 2014 and 2017 reported being very liberal or very conservative (Figure 20).



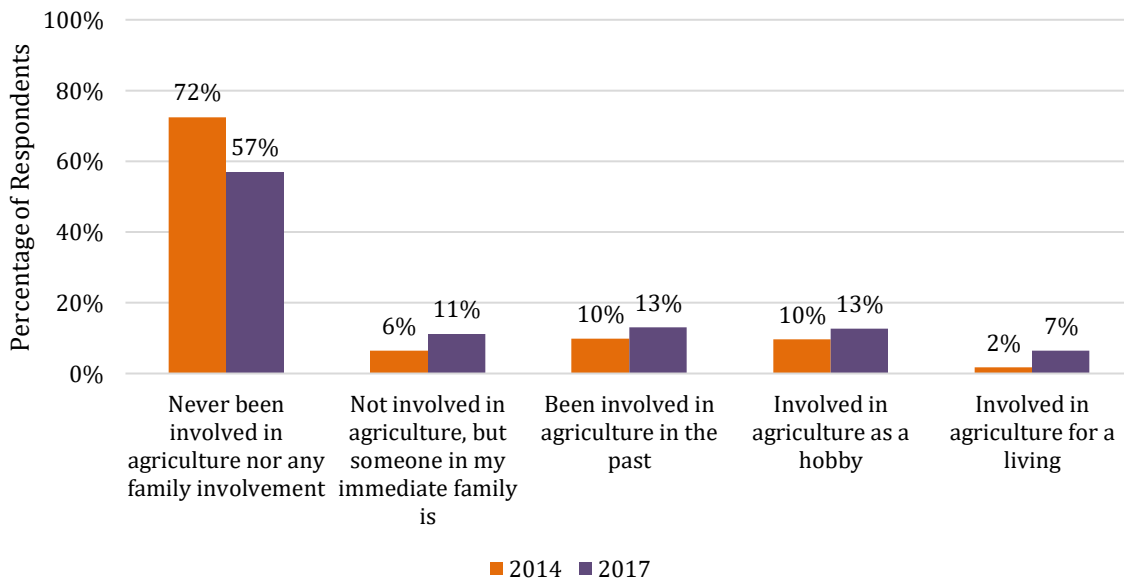
Figure 20: Political values of BMP county respondents



Involvement in Agriculture

Respondents were also asked to indicate their level of involvement in agriculture (Figure 21). The majority of respondents in 2014 (72%) and 2017 (57%) had never been involved in agriculture, nor did they have an immediate family member involved in agriculture. Overall, there was a slightly higher involvement in agriculture among respondents in 2017 than among respondents in 2014.

Figure 21: BMP county respondents' involvement in agriculture



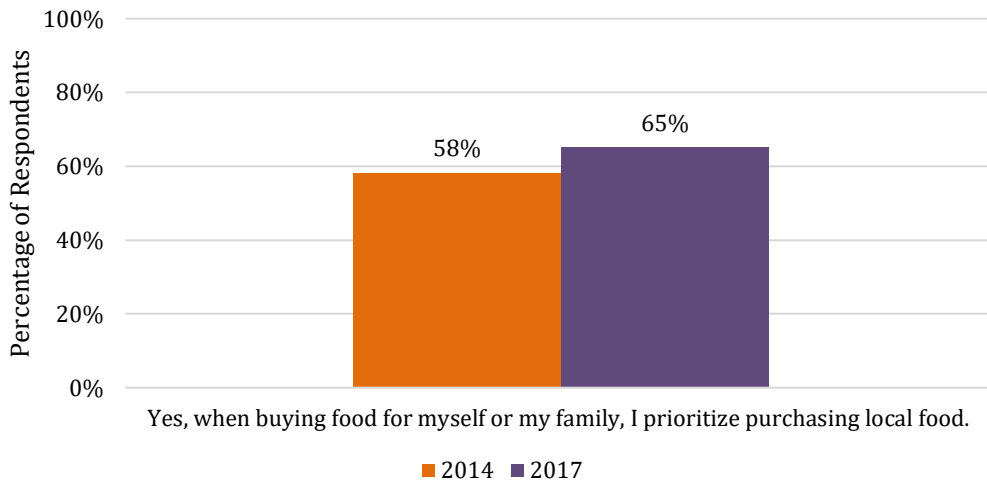
Local Food

Respondents were asked questions pertaining to their perceived priority of local food, their attitudes toward local food, and the type of local food they purchase.

Priority of Local Food

Respondents were asked if they prioritize purchasing local food when buying food for themselves or their families. The majority of respondents in both 2014 (58%) and 2017 (65%) reported that they prioritize buying local food (Figure 22). The difference observed between 2014 and 2017 respondents was statistically significant at the $p < .01$ level.

Figure 22: BMP county respondents' priority of purchasing local food

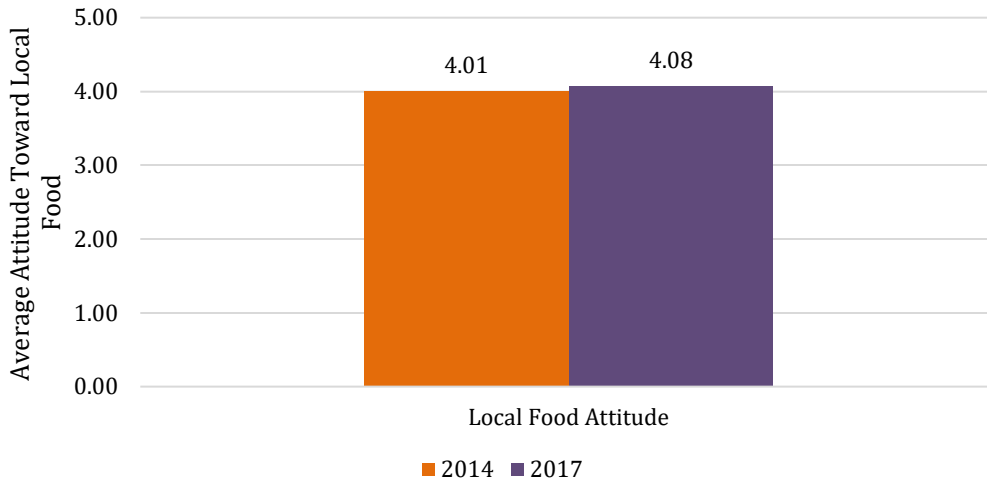


Local Food Attitudes

Respondents were asked a series of questions using semantic differential scale ranging from one to five points, with five representing the most positive attitude. Individual items were averaged to create an overall score to represent respondents' attitude toward Florida food. There was no statistically significant difference at the $p < .01$ level between 2014 and 2017 respondents' attitude. Respondents in both 2014 ($M = 4.01$; $SD = .58$) and 2017 ($M = 4.08$; $SD = .61$) held positive overall attitudes toward Florida food (Figure 23).



Figure 23: BMP county respondents' attitudes toward local food

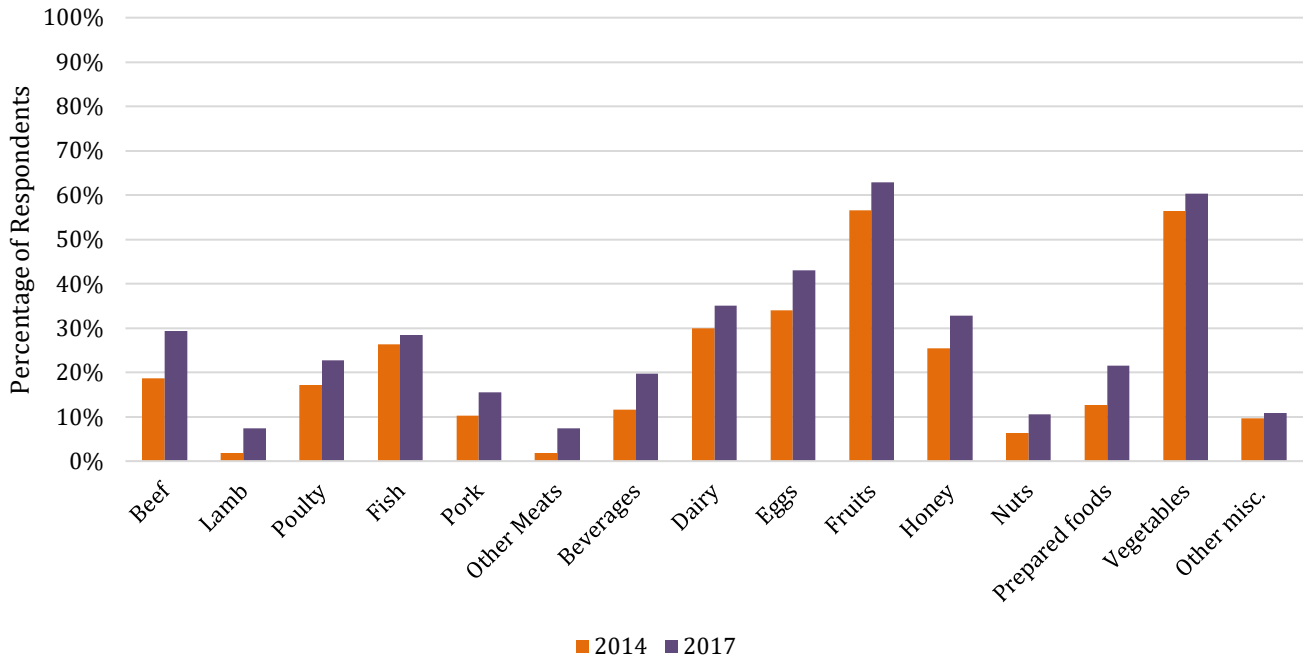


Type of Local Food Purchased

Respondents were asked to indicate, by selecting all that apply, the types of food they purchase locally. Overall, fruits and vegetables were the types of foods purchased locally by the highest number of respondents in both 2014 and 2017 (Figure 24). More respondents in 2017 reported having purchased all types of foods locally than respondents in 2014.



Figure 24: Type of local food purchased by BMP county respondents

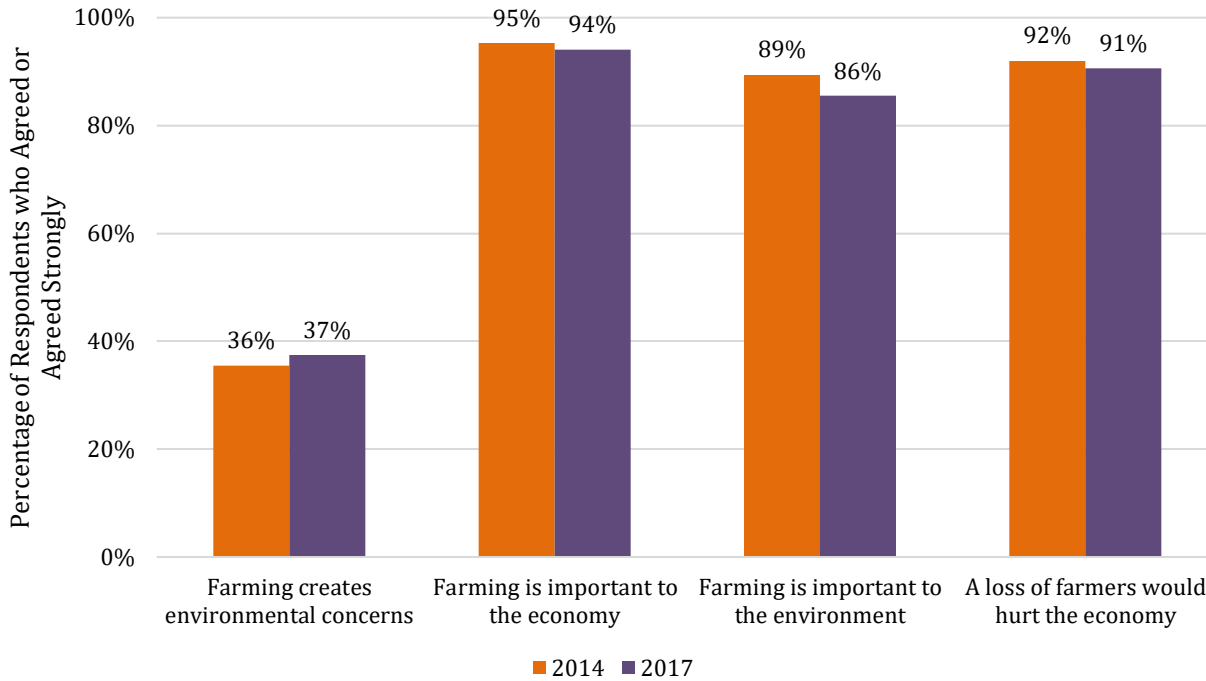


Impact of Farming and Farming Practices

Respondents were asked to indicate their level of agreement with questions pertaining to the impact of farming and farming practices. Responses were collected using a five-point Likert scale of agreement with 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, and 5 = *strongly agree*. Figure 24 displays the percentages of respondents who agreed or strongly agreed with each statement. The majority of respondents in both 2014 and 2015 agreed or strongly agreed that farming is important to the economy, farming is important to the environment, and a loss of farmers would hurt the economy (Figure 25). Statistically significant differences at the $p < .01$ level were observed for the item “farming creates environmental concerns.”



Figure 25: BMP county respondents' perceptions of the impact of farming and farming practices



Best Management Practices

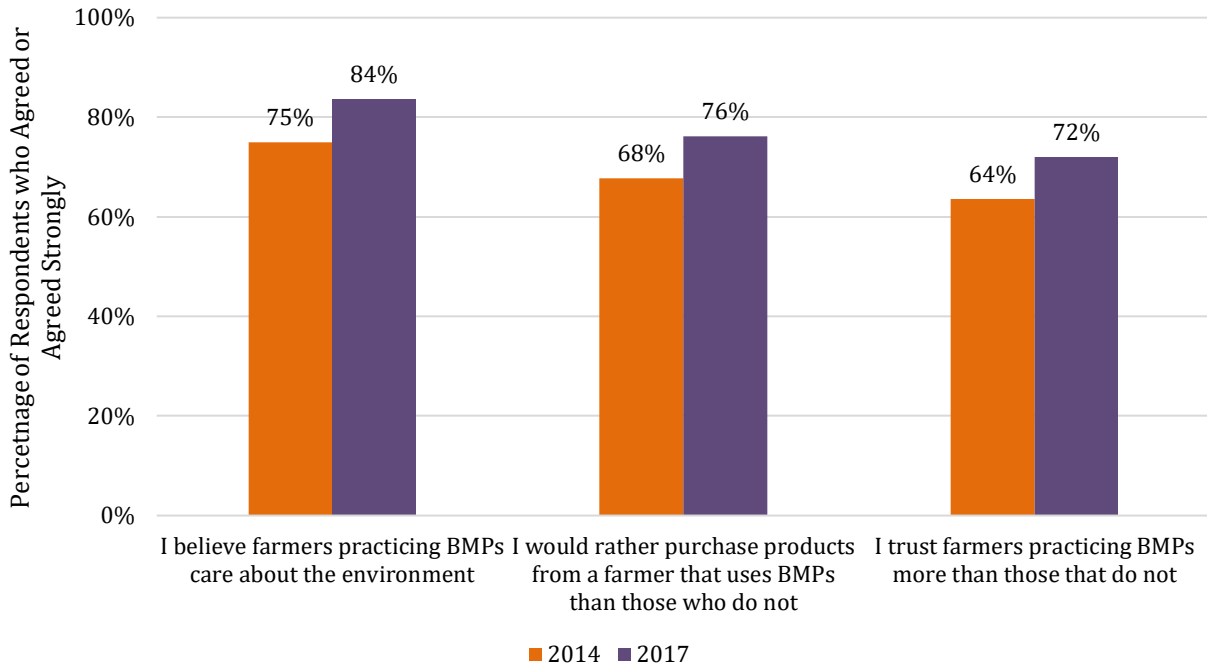
Respondents were asked a series of questions pertaining to their perceptions of BMPs and nutrient stewardship, including their beliefs about farmers who use BMPs, the importance of farmers' engagement in BMPs, their beliefs about whether Florida farmers are engaging in BMPs, and their trust in farmers who use BMPs.

Farmers Who Use BMPs

Respondents indicated their level of agreement with three statements pertaining to farmers who use BMPs (Figure 26). A larger percentage of respondents in 2017 (84%) agreed to some degree that farmers practicing BMPs care about the environment than did respondents in 2014 (75%). Similarly, 76% of respondents in 2017 agreed or strongly agreed that they would rather purchase products from a farmer who uses BMPs than those who do not. Only 68% of respondents in 2014 agreed or agreed strongly to that same statement. Finally, 72% of respondents in 2017 agreed or agreed strongly that they trust farmers practicing BMPs more than those who do not, compared to 64% of respondents in 2014. Differences between respondents in 2014 and respondents in 2017 were statistically significant at the $p < .01$ level for all three items.



Figure 26: BMP county respondents' beliefs about farmers who use BMPs



Importance of Farmers' Engagement in BMPs

Respondents were also asked to indicate the level of importance they associate with Florida farmers' engagement in BMPs specific to 4R nutrient stewardship (Figure 27). Responses were collected using a five-point Likert-type importance scale with 1 = *not at all important*, 2 = *slightly important*, 3 = *important*, 4 = *very important*, and 5 = *extremely important*. Real limits were set to interpret responses (1.00 to 1.50 = *not important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*). Respondents in both 2014 and 2017 perceived farmers' engagement in proper fertilizer management and proper pest management as very important. Significant differences at the $p < .01$ level were observed for water management. Respondents in 2014 perceived farmers' engagement in proper water management as "extremely important", while respondents in 2017 perceived farmers' engagement in proper water management as "very important".



Figure 27: BMP county respondents' perceived importance of farmer engagement in BMPs



Note. Real limits; 1.00 to 1.50 = not important, 1.49 to 2.50 = slightly important, 2.51 to 3.50 = important, 3.51 to 4.50 = very important, 4.51 to 5.00 = extremely important

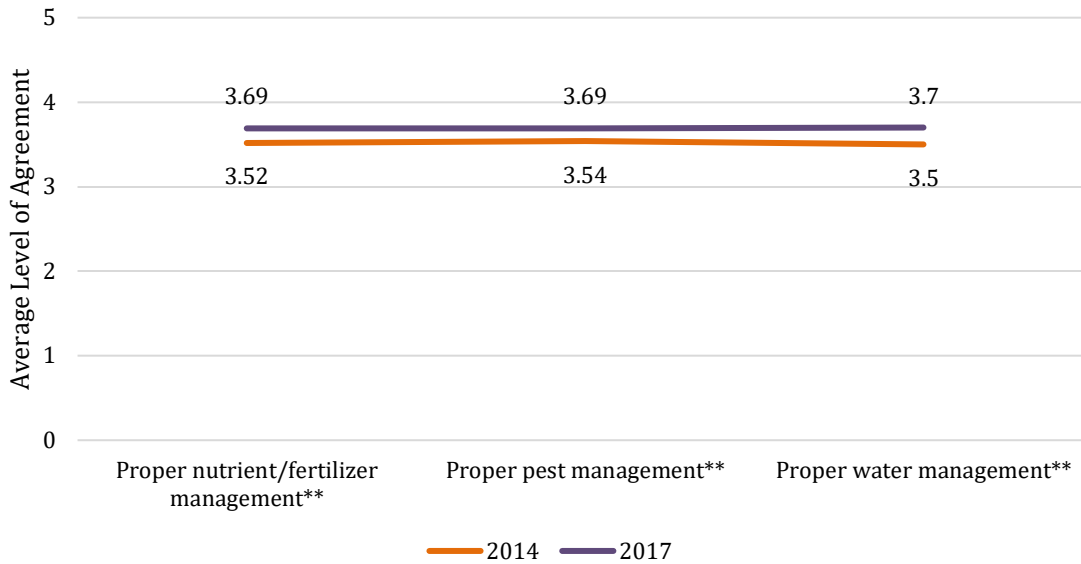
** $p < .01$

Florida Farmers' Engagement in BMPs

Next, respondents were asked to indicate their level of agreement with statements pertaining to Florida farmers' engagement in specific BMP practices. Responses were collected using a five-point Likert scale of agreement with 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. Real limits were used to interpret responses (Figure 28). While respondents in both 2014 and 2017 held the position of "agree" for all three statements, respondents in 2017 reported higher agreement than respondents in 2014 for all statements. (Figure 28). The differences observed between the two groups were statistically significant at the $p < .01$ level for all three statements.



Figure 28: BMP county respondents' agreement that Florida farmers are engaged in BMPs



Note. Real limits: 1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*.

** $p < .01$

Trust in Farmers Who Use BMPs

Respondents were asked to indicate their agreement with five statements regarding their trust in farmers who use specific best management practices. All questions were asked using a 5-point Likert-type agreement scale with 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*. Table 29 displays the percentage of respondents who agreed or agreed strongly.

The majority of respondents in both 2014 and 2017 agreed or strongly agreed with all five statements. The item “I trust farmers who practice 4R stewardship” was the only item statistically significant at the $p < .01$ level when a Chi-square test was conducted to assess differences between respondents in 2014 and 2017. Eighty-three percent of respondents in 2014 agreed or strongly agreed they trust farmers who practice 4R stewardship, whereas only 77% of respondents in 2017 agreed or strongly agreed.



Figure 29: BMP county respondents' trust in farmers who use BMPs

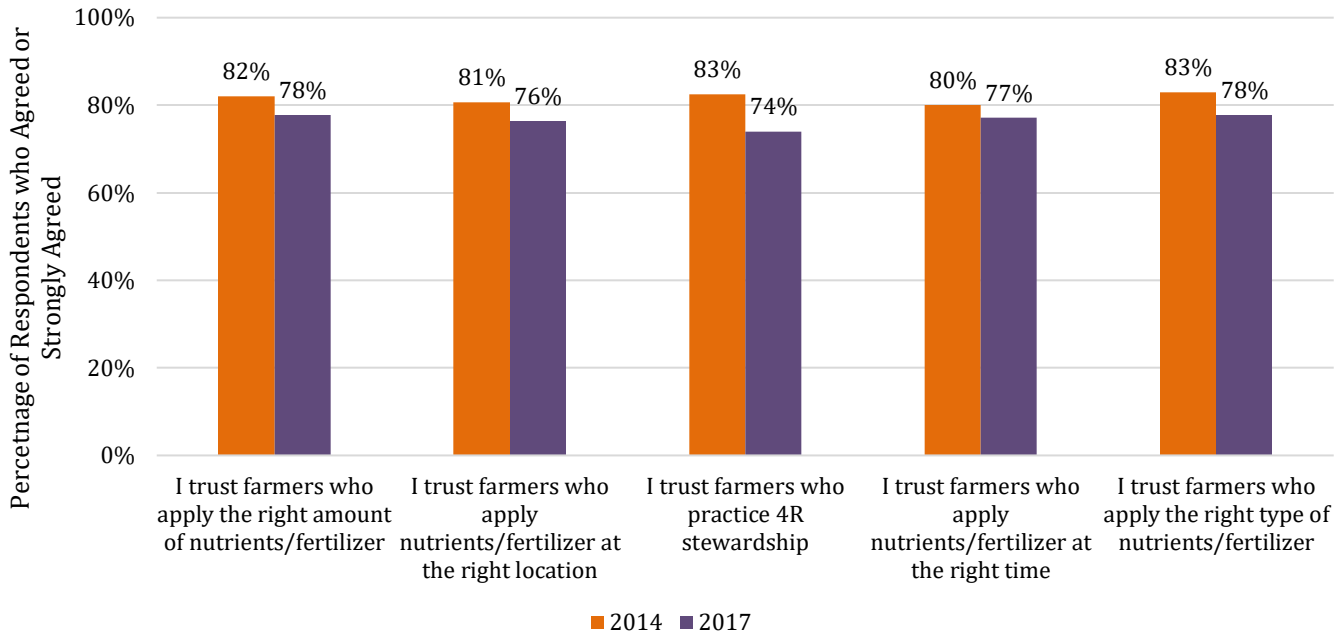


Table 5 displays the overall average response to each of the items presented in Figures 27-29. The three constructs are shown in bold, and the means of individual items are provided. Responses regarding farmers' engagement in BMPs were collected on a five-point Likert-type scale of importance (1 = *not at all important*, 2 = *slightly important*, 3 = *important*, 4 = *very important*, and 5 = *extremely important*). Real limits were set to interpret responses (1.00 to 1.50 = *not at all important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*). Responses regarding farmers' engagement in BMPs and trust in farmers who use BMPs were collected on a five-point Likert scale of agreement (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*). Real limits were set to interpret responses (1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*). All scales demonstrated exemplary internal reliability consistency of $\alpha = .95$ or higher. Construct means were compared among respondents in 2015 and 2017 using an independent samples *t*-test. Two construct averages had statistically significant differences between the two groups at the $p < .01$ level, including agreement with Florida farmers' engagement in BMPs and trust in farmers who use BMPs.

Regarding *importance of farmer engagement in BMPs*, respondents in both 2014 and 2017 perceived farmers' engagement in BMPs as "very important". Regarding *Florida farmers' engagement in BMPs*, respondents in 2017 ($M = 3.75$; $SD = .70$) reported slightly higher agreement that farmers are engaged in BMPs than did respondents in 2014 ($M = 3.61$; $SD = .74$); $t(1554) = -3.31, p = .001$. As for *trust in farmers who use BMPs*, respondents in 2017 ($M = 4.09$; $SD = .66$) reported higher agreement that they trust farmers who use BMPs than did respondents in 2014 ($M = 3.98$; $SD = .70$); $t(1221) = -2.85, p = .004$ (Table 5). These findings indicated 2017 respondents were more likely to believe that Florida farmers engage in BMPs and more likely to trust farmers who engage in BMPs than 2014 respondents.



Table 5: Index results and comparisons between 2014 and 2017 BMP county respondents' perceptions of the importance of farmer BMP engagement, agreement with farmer engagement in BMPs, and trust in farmers who use BMPs

	2014 <i>M</i>	2014 <i>SD</i>	2017 <i>M</i>	2017 <i>SD</i>
Importance of Farmer Engagement in BMPs ($\alpha = .95$)	4.09	.75	4.04	.80
The right amount of nutrient/fertilizer should be applied	4.12	.80	4.06	.86
Nutrients/fertilizer should be applied at the right location	4.08	.81	3.99	.86
4R nutrient stewardship should be practiced by farmers	4.08	.92	4.08	.91
Nutrients/fertilizer should be applied at the right time	4.09	.82	4.01	.87
The right type of nutrient/fertilizer should be applied	4.08	.79	4.06	.85
Agreement with Florida Farmers' Engagement in BMPs** ($\alpha = .96$)	3.61	.74	3.75	.70
Farmers in Florida apply the right amount of nutrient/fertilizer	3.58	.77	3.72	.76
Farmers in Florida apply nutrient/fertilizer at the right location	3.63	.76	3.75	.74
Farmers in Florida apply nutrient/fertilizer at the right time	3.64	.77	3.75	.74
Farmers in Florida apply the right type of nutrient/fertilizer	3.61	.76	3.78	.76
Agreement with Trust in Farmers Who Use BMPs** ($\alpha = .97$)	3.98	.70	4.09	.66
I trust farmers who apply the right amounts of nutrients/fertilizer	3.99	.73	4.09	.72
I trust farmers who practice 4R nutrient stewardship	3.96	.76	4.13	.73
I trust farmers who apply nutrients/fertilizer at the right time	3.98	.71	4.06	.72
I trust farmers who apply the right type of nutrients/fertilizer	3.98	.72	4.10	.74

Note. Real limits for importance scale: 1.00 to 1.50 = *not at all important*, 1.49 to 2.50 = *slightly important*, 2.51 to 3.50 = *important*, 3.51 to 4.50 = *very important*, 4.51 to 5.00 = *extremely important*. Real limits for agreement scales: 1.00 to 1.50 = *strongly disagree*, 1.49 to 2.50 = *disagree*, 2.51 to 3.50 = *neither agree nor disagree*, 3.51 to 4.50 = *agree*, 4.51 to 5.00 = *strongly agree*.

** $p > .01$

Information Sources and Events

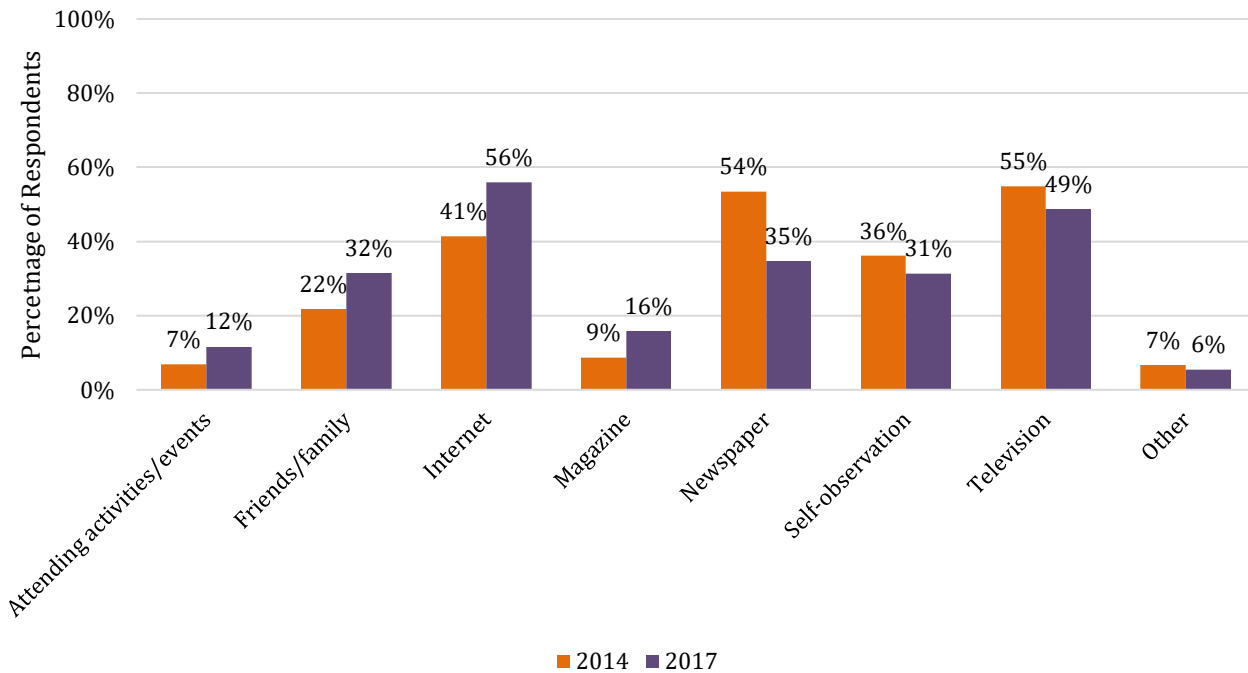
Lastly, respondents were asked to indicate, by checking all that apply, the sources they use to acquire information about farming and the types of public events they attend.

Information Sources

Respondents in 2014 were more likely to get information about farming from newspapers (54%) or television (55%) than any other sources. Respondents in 2017, however, were most likely to get information about farming from the internet (56%) or television (49%; Figure 30).



Figure 30: Sources used by BMP county respondents to gather information about farming

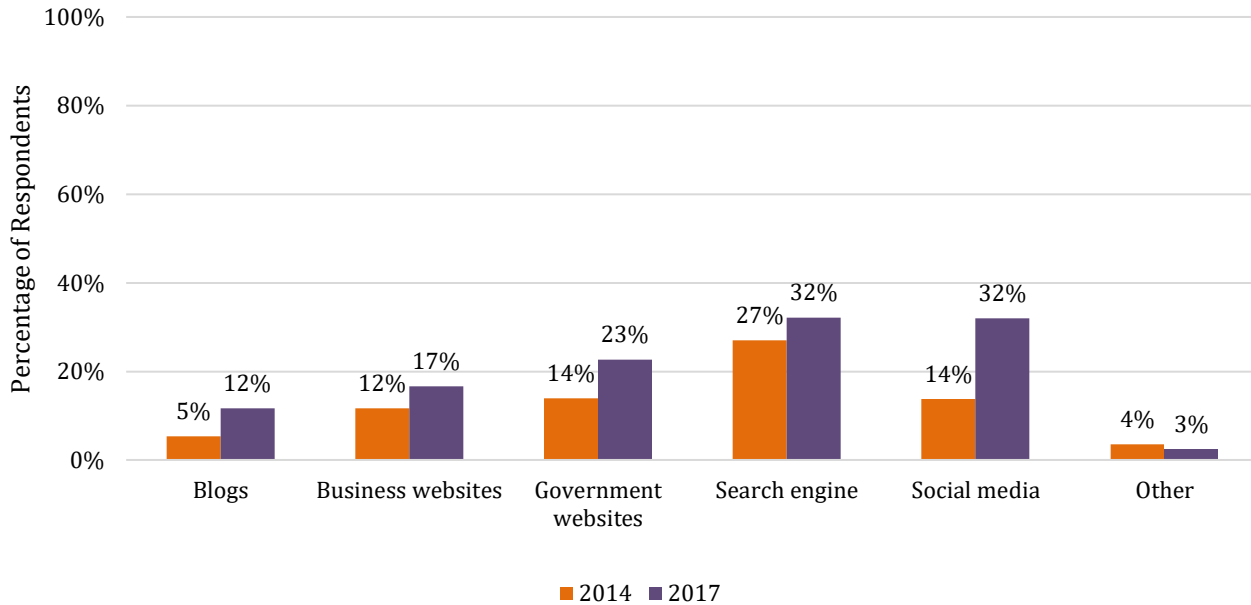


Internet sources

Respondents who indicated they use the internet to obtain information about farming were then ask to indicate which specific internet sources they utilized. More respondents in 2014 used internet search engines (27%) than any other internet source. Respondents in 2017 used internet search engines (32%) and social media (32%) more than any other internet sources (Figure 31).



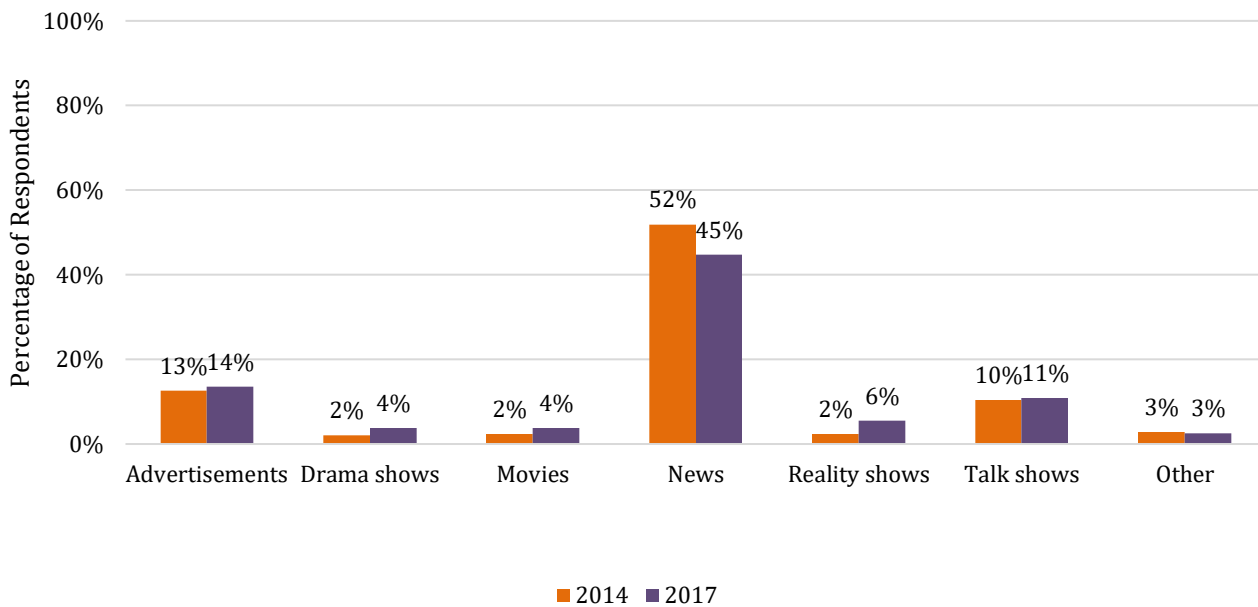
Figure 31: Internet sources used by BMP county respondents to gather information about farming



Television Sources

Respondents who indicated they use the television to obtain information about farming were then asked to indicate which specific television sources they utilized. Respondents in both 2014 (52%) and 2017 (45%) were more likely to utilize news channels for information about farming than any other television sources (Figure 32).

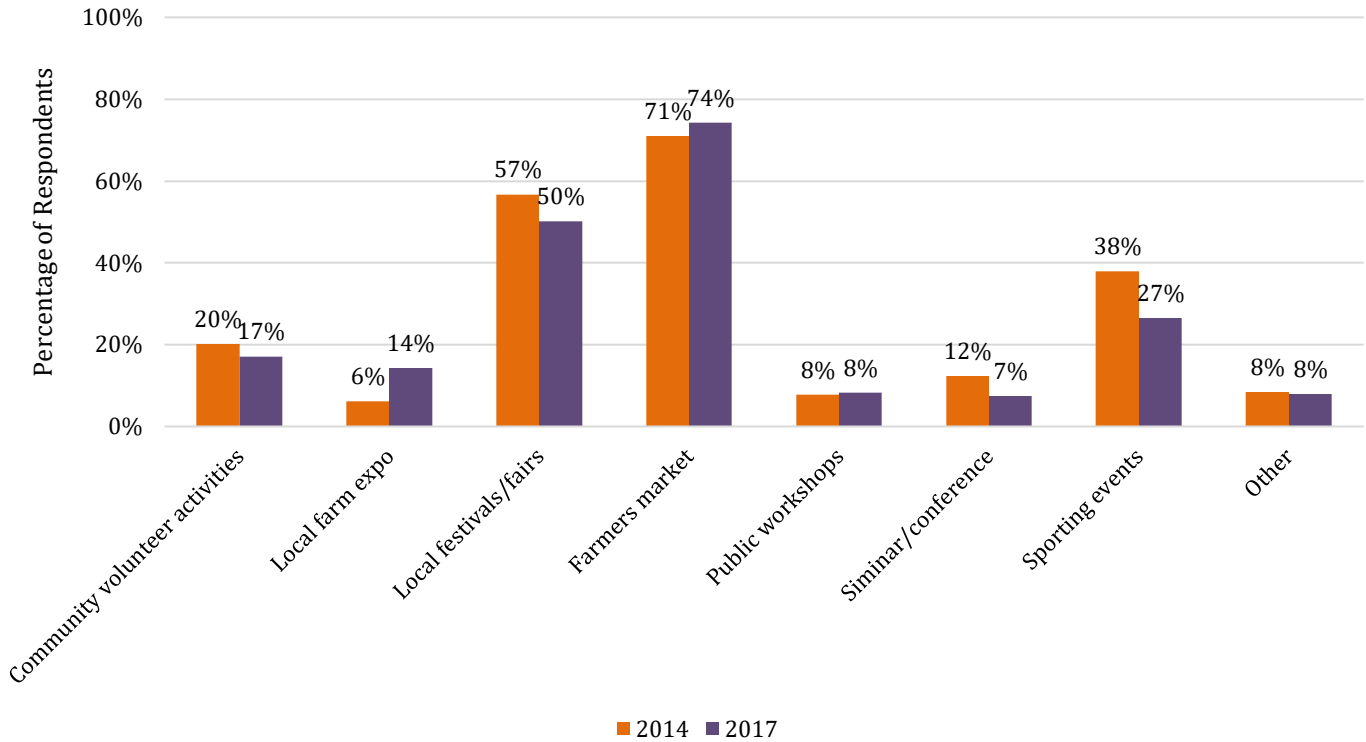
Figure 32: Television sources used by BMP county residents to gather information about farming



Public Events

Finally, respondents were asked to indicate the types of public events they attend. The majority of respondents in 2014 reported they attend the farmers’ market (71%) and local festivals/fairs (57%). The majority of respondents in 2017 also reported having attending the farmers’ market (74%) and local festivals/fairs (50%; Figure 33).

Figure 33: Public events attended by BMP county residents



Recommendations

The following are key recommendations for creating messages, communicating with, and educating Florida residents about agriculture and natural resources, farming/farmers, and best management practices.

- Respondents from the general public in 2014 held more positive perceptions of agriculture and farming than respondents from the general public in 2017. This was particularly for topics related to farmers’ use of water such as whether farmers (a) are concerned about water resources when making important decisions, (b) are guided by sound principles when it comes to water use, (c) can be relied upon to keep their promises when it comes to water use, and (d) need to be watched closely so they don’t take advantage of water resources. As such, information regarding farmers’ use of best management practices and nutrient stewardship should be disseminated to the public. Further, this information should emphasize the impact of BMPs on water resources.
 - As respondents in both 2015 and 2017 also agreed farmers should use less pesticides and fertilizer, the information distributed should also highlight how best management practices allow Florida farmers to use less pesticides and fertilizers.
- Respondents in BMP counties demonstrated more positive perceptions of BMPs and farmers who use BMPs in 2017 than they did in 2014. This demonstrates that **BMP educational programming is working**. BMP



educational programs should be expanded across the state and should seek to incorporate positive messages about agriculture and farming.

- The overall lack of awareness of BMPs reported by general public respondents in 2015 and 2017 provides further support for expanding the reach of BMP educational programs and continuing efforts to increase BMP awareness among Florida residents.
- Internet, social media, and television media should be used to communicate BMP information to Florida residents. Specifically, this should include web information that appears on internet search engines, social media content, and television news programming. Moreover, informational messages communicated to residents in BMP counties should (a) describe BMPs and why they are important, (b) highlight how Florida farmers' are current engaged in BMPs, and (c) identify local food brands produced by farmers who use BMPs.
- Information about BMPs should also be communicated to BMP county residents at local farmers' markets. The majority of BMP county residents in both 2014 and 2017 reported having attended their local farmers' market, as well as indicated they prioritized buying local food and had positive perceptions of local food. Additionally, these respondents agreed or agreed strongly that they would rather purchase products from farmers who use BMPs. As such, it could be beneficial for farmers selling at local markets to advertise their BMP engagement. This could benefit farmers already engaged in BMPs as well as provide an incentive for farmers selling at market who are not yet engaged in BMPs.
- Findings regarding positive public perceptions of farmers who use BMPs and public interest in purchasing BMP products should be shared with Florida farmers to increase adoption of best practices.
 - The majority of BMP county respondents in 2017 agreed farmers practicing BMPs care about the environment, agreed they would rather purchase products from a farmer who uses BMPs than those who do not, and agreed they trust farmers practicing BMPs more than those who do not. Effort should be made to convey to Florida farmers findings such as these.

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