Onion ipmPIPE Website:
Awareness, Usage, and Impacts

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Summary

This report: (1) evaluates economic and environmental impacts of the Onion ipmPIPE website, (2) identifies key factors that influence onion growers' decisions to visit and use the website, and (3) gathers grower opinions about the website.

Based on the results of surveys conducted in 2012 and 2013, visiting the Onion ipmPIPE website increased onion yields by 250 cwt/acre, increased per acre revenue by 79%, and reduced pesticide costs by $370/acre on average for our sample, other things constant. For growers in our seven-state sample who visited the website, it increased onion yields by 244 cwt/acre and per acre revenue by 133%. Extrapolating to all U.S. onion growers, using the sample average estimates, would result in a total increase of 35.85 million hundredweight and savings of $53 million if all growers used it. Although the benefits of the website are substantial per grower, only 5.1% of the respondents visited the site in 2011 and 6.9% in 2012. Therefore, factors influencing growers to visit the website were examined and opinions of growers compiled about what they would like to see in the site. Awareness was a key factor influencing visits to the website, and farmers would like to see pest management information in a form that can be readily applied on their farms. Because the probability of visiting the website depends on grower awareness of it, website management should consider advertising it more aggressively.

The Onion ipmPIPE website can be marketed more intensely not only to

growers, but to extension agents, crop consultants, trade groups, and other secondary sources of information for growers. Some website content may need to be repackaged so that growers can more readily see how the information could be applied to their farming situations.

1. Introduction

The Onion ipmPIPE website provides up-to-date, integrated information in support of onion grower decision making. Available information includes current pest locations, severity, and potential spread; real-time onion prices; and weather forecasting. With this information, onion growers and related stakeholders can improve their decisions with respect to disease and insect management, thus enhancing their overall welfare. Improved economic efficiency is realized through lower production costs and higher yields. These efficiency gains may be passed through the market to consumers, increasing total economic benefits. Pesticide exposure is also reduced for wildlife, humans, and the environment. Despite these potential benefits, current use of the Onion ipmPIPE website is relatively low. Many onion growers are unaware of it, and few have visited it.

The main objectives of this report are to:

- examine onion grower awareness and use of the Onion ipmPIPE website and identify key factors that determine visits to the website,
- evaluate the economic and environmental impacts resulting from visits to the website, and
- gather grower opinions about the website and offer suggestions on how to improve and promote it.

To achieve these objectives, two surveys of onion growers were conducted in

seven major onion-producing states (Colorado, Idaho, Michigan, New Mexico, New York, Utah, and Washington). Data from the surveys provided detailed information about whether growers visited the website, and for those who visited, how often, when, and why, as well as what information segments were accessed. Farm level data on onion output, inputs, sales, prices, and operator demographics were collected. Growers' ideas about potential website improvements and opinions about content they would like to see on the website were also gathered. The data allowed us to identify the relationship between onion growers' visitation of the website and their onion production, as well as between visitation and farmer demographics. Analysis of the data allowed us make recommendations for improving website content and marketing.

The rest of this report is organized as follows. Section 2 describes the surveys and responses. Section 3 presents statistics about the sample including demographics and production. In section 4, growers' awareness, visitation, and uses of the Onion ipmPIPE website are examined. Section 5 evaluates the economic and environmental impacts of visiting the website. Section 6 summarizes the respondents' opinions and suggestions on the website, and Section 7 concludes the report.

2. Survey Methods and Grower Responses

The first step in conducting the survey was to obtain a sample that is representative of the population. In our case, the population of interest was all

onion growers in the seven project states. The United States Department of Agriculture's National Agricultural Statistics Service (USDA-NASS) maintains the most comprehensive and representative list of onion growers in all states (NASS list), which includes 1214 onion growers in the seven states in our study.

The first onion ipmPIPE survey targeted all growers on the NASS list, and collected data on onion production and website use in project states during the 2011 growing season, as well as grower opinions about the website. The questionnaire had four parts. The first part gathered demographic information, the second part recorded the respondents' onion production in 2011, the third part asked detailed questions about the respondents' website use, and the fourth part collected opinions and suggestions on how to improve the website.

The second onion survey targeted all the growers on the list maintained by NASS and on a second list of onion growers that was constructed so that we could test the effect on website use of sending email notices to encourage use of the website. We could not use the NASS list for that purpose because NASS does not share individual grower names with researchers. This second survey reflected website use during the 2012 growing season. The questionnaire had three sections. Section 1 asked growers about their production of red, yellow and white onions in 2012, with questions on acreage, soil quality, water source, farming system, total production, price, pesticide costs, fertilizer costs, and labor, among others. Section 2 asked demographic questions, and Section 3 asked about the use of the website, and whether the respondent had received the newsletter.

Both surveys were undertaken by the USDA-NASS Colorado field office. Questionnaires were mailed to every onion grower on the lists in March, and two weeks later a postcard was mailed to each of the growers who had not returned their questionnaires, reminding them to complete the survey. Finally in May, enumerators called those growers who had not returned their questionnaires, and completed as many questionnaires as possible by telephone interview.

The main difference between the two surveys is that the second survey included a subset of 137 onion growers who were candidates to be encouraged through email notification to access the Onion ipmPIPE website. A total of 59 growers were randomly assigned to the group that received newsletters via email, and the rest of the subset were assigned to a comparison group that was not contacted by email. During the 2012 growing season (June to August, 2012), one welcome email and four newsletters were sent out. The newsletters included news from the field, weather headlines, temperature specifics, reports of onion thrips, and reports of *Iris yellow spot virus*. At the end of each newsletter section, there was a link to the Onion ipmPIPE website where more information could be obtained. The first grower survey was conducted between March and June, 2012, and the second between March and May, 2013.

A total of 686 usable questionnaires were obtained, 354 from the first survey and 332 from the second survey. The two surveys were conducted independently, so the respondents could not be matched in the two surveys, but the two samples were from almost the same population.

Most of the responses were obtained via the follow-up telephone interviews. The overall response rate for the first survey was 29.2%, and that for the second was 27.4%, assuming the growers added by Virginia Tech to the NASS-identified list of growers were already on the NASS list. By state, Colorado had 55 and 34 valid responses to the two surveys, Idaho had 27 and 25, Michigan had 80 and 61, New Mexico had 27 and 23, New York had 109 and 122, Utah had 6 and 10, and Washington had 50 and 57.

3. Sample Description: Demographics and Production

Summary statistics of grower demographics and farm characteristics from the surveys are shown in Tables 1 and 2[1]. In the first survey, 77.6% of the respondents were male, with an average age of 55.0 years and an average education of 14.9 years. The average grower had 101 acres of onions and produced 46,163 hundredweight of bulb onions with an unweighted average yield of 305 hundredweight per acre. The average grower received $475,290 from onion sales, and spent $169,835 on pesticides. Growers responding to the survey planted a total of 9,907 acres of onions, harvested 4,523,954 hundredweight of onions, and received $35,171,480 in revenue. Our sample roughly represents 17.2% of total acreage, 14.3% of total output, and 7.5% of total revenue of bulb onion production in the seven project states.

In the second survey, 86.7% of the respondents were male, with an average

[1] Because national average yield of bulb onion in 2009 was 500 cwt/acre, we deleted outliers with yields less than 50 cwt/acre or greater than 800 cwt/acre when calculating Table 2.

age of 55.4 years and an average education of 14.8 years. The average grower had 92 acres of onions and produced 39,658 hundredweight of bulb onions with an unweighted average yield of 309 hundredweight per acre. The average grower received $911,796 in sales of these onions, and spent $75,342 on pesticides. Growers responding to this survey planted a total of 8,377 acres of onions, harvested 3,608,922 hundredweight of onions, and received $73,855,473 in revenue. Our sample roughly represents 14.6% of total acreage, 11.4% of total output, and 15.8% of total revenue of bulb onion production in the seven project states.

Grower demographics from the two surveys were similar, and farm characteristics from the two were also similar in terms of farm size, output and yield. Compared with the population in project states and in the United States, the typical farm in our samples was larger in harvested area, but smaller in yield.

4. Awareness, Visitation and Use of Onion ipmPIPE Website

Onion ipmPIPE website awareness, visitation, and use were relatively low. During the 2011 growing season, only 13.8% of all respondents (49 respondents) were aware of the Onion ipmPIPE website, and 5.1% (18 respondents) visited the website. Of the 18 visitors, 10 visited occasionally (1-5 times), 5 visited moderately (6-15 times), and 3 did not answer the question. On a scale of one-to-five (five being the highest) growers were asked to score their confidence in the information presented on the website. Visitors were generally confident

that the information from the Onion ipmPIPE website was helpful during the growing season, with an average confidence score of 3.2. Only 2 out of 18 growers said that their management decisions were changed by information they received from the website. The most common time to visit the website during the season was from bulbing through harvest, and the most common reason cited to visit the website was because they wanted general pest information/diagnostics and pest risk models. Growers said they became aware of the Onion ipmPIPE website through two main sources: meetings and extension. Approximately 26% and 31% of respondents cited these sources, respectively, which coincide with the current avenues of marketing by the Onion ipmPIPE.

During the 2012 growing season, only 6.9% of all respondents (23 respondents) visited the website. Of the 23 visitors, 20 visited occasionally (1-5 times), 1 visited moderately (6-15 times), 1 visited very often (more than 15 times), and 1 did not answer the question. Visitors were confident that the information from the Onion ipmPIPE website was helpful during the growing season, with an average confidence score of 4.3. The most common time to visit the website during the season was from pre-planting to planting.

Growers who were aware of or had visited the website were more likely to be male and slightly more educated. The average grower that was aware of the Onion ipmPIPE website had a larger farm than the average grower in terms of acres, production, and sales. The average grower that had visited the website had a larger farm than the average grower in terms of acreage and production, but a

smaller farm in terms of total sales. The average yields for growers that were aware of or visited the website were higher than the yield of the overall average grower (Table 3).

Results from several logit regressions verify that acreage and website awareness were two determinants of onion grower visits to the website (tables 4 and 5). Table 6 suggests that the growers that received newsletter alerts were more likely to visit the website than the growers that did not receive the alerts, which implies that more aggressively advertising the website works.

5. Impacts of Website Visits on Production

Information presented on the Onion ipmPIPE website changed the behavior of some growers. Therefore, we could assess what producers would have done with respect to pest management with and without the Onion ipmPIPE website.

5.1 Methods

The most critical component of any impact evaluation is to identify the counterfactual – what would have happened to the beneficiaries if the shock (change, information) had not existed (Khandker, Koolwal and Samad, 2010[2]). The problem faced in most evaluations is that the counterfactual is not observed. In our case, we would like to compare the yield, revenue, and pesticide applications on the same onion farm with and without using the Onion ipmPIPE

[2] Khandker, Shahidur R, Gayatri B Koolwal, and Hussain A Samad. 2010. *Handbook on Impact Evaluation: Quantitative Methods and Practices*. *Learning*. doi:10.1596/978-0-8213-8028-4.

website. However, at any given point in time an onion farm is not both a user and a non-user of the website, and therefore this comparison is not feasible. The next best alternative is to compare outcomes for farms that did receive the information (treated group) with outcomes for a comparison (untreated) group that did not receive it. However, one cannot guarantee that the comparison group is similar enough to the treated group that those who received the information (treatment) would have had outcomes similar to those in the comparison group in absence of treatment. As a result, the possibility of "selection bias" is introduced into the evaluation.

Successful impact evaluations hinge on getting rid of or accounting for selection bias. Three methods have been proposed in the literature to do so. The first method is to run a randomized controlled trial (RCT) in which the treatment is randomly assigned to the population (Duflo, Glennerster and Kremer, 2008[3]). Selection bias disappears if we can guarantee that the chance of being treated is independent of the outcomes that they experience. In our project, complete randomization was not feasible for several reasons. First, the project did not want to restrict potential users from viewing the website because that might have deterred website use in the future. Second, a comprehensive list of onion growers was not available to the researchers since NASS does not share grower names. Third, some growers might had already viewed the website and used the

[3] Duflo, Esther, Rachel Glennerster, and Michael Kremer. 2008. "Using Randomization in Development Economics Research: A Toolkit." *Handbook of Development Economics* 4: 3895–3962. doi:10.1016/S1573-4471(07)04061-2.

information. Therefore, a modified approach was used in which newsletters with new information on the Onion ipmPIPE website were periodically emailed to a randomly assigned group of onion growers. These newsletters encouraged them to utilize the website information for their onion production decisions. After the growing season, data were collected from those who received the newsletters and from a comparison group that did not, and the effect of receiving the information was assessed However, estimation of the effect was constrained because the number of observations was too small to enable reliable statistic inference (Table 7).

A second method called an instrumental variables (IV) approach can also be used to correct for selection bias. Selection bias is removed by finding a variable(s) (or instrument(s)) that is correlated with participation (treatment) but not correlated with unobserved characteristics that might affect the outcome. These variables can be used to predict participation. The difficulty with the approach is to find appropriate instruments. We intended to use grower demographic variables as instruments for website visiting, but could not obtain statistically reliable estimates for the treatment variable.

Therefore a third method, propensity score matching (Rosenbaum and Rubin, 1983[4]), was used to control for selection bias. Propensity score matching constructs a statistically valid comparison group based on the probability of

[4] Rosenbaum, Paul R, and Donald B Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70: 41–55. doi:10.1093/biomet/70.1.41. http://biomet.oxfordjournals.org/content/70/1/41.abstract.

participating in the treatment, using observed characteristics. Participants are then matched on the basis of this probability, or propensity score, to nonparticipants. The effect of the program is then calculated as the mean difference in outcomes across these two groups. The validity of PSM depends on two conditions: (a) conditional independence (namely, that unobserved factors do not affect participation) and (b) sizable common support or overlap in propensity scores across the participant and nonparticipant samples. These two conditions appear to hold for our study. Onion growers self-select to visit the website, and their participation is largely dependent on their own characteristics.

5.2 Impact Evaluation

The results of the estimation using PSM are shown on table 8[5]. We found that visiting the Onion ipmPIPE website had significant effects on growers' yield, revenue, and pesticide costs. For our sample, the average effect on yield was an increase of 243.70 cwt/acre (101.99%) for those who used the website, and an increase of 250.11 cwt/acre (113.68%) for the whole sample. If those who did not use it had used it, they would have increased their yield by an estimated 250.48 cwt/acre (114.38%). The average effect on per acre revenue was an increase of 133.08% for those who used the website and 79.36% for the whole sample. The average effect on pesticide costs for an average grower in the sample was a decrease of $369.73/acre. Nonusers could have decreased them by

[5] We deleted outliers with yields less than 50 cwt/acre or greater than 800 cwt/acre in the estimation.

$375.43/acre had they used it.

6. Grower Perception and Suggestions

The first survey (2012) provided information on growers' perceptions on and suggestions for the website. The most commonly cited production information sources for onion growers were extension outlets (agents, websites, etc.); trade sources, such as pesticide dealers, seed dealers, packers, catalogs, or input suppliers; and informational meetings (see Table 9). Only seven respondents (approximately 2% of all respondents) cited the Onion ipmPIPE website as a source of production information. These results changed slightly when grower responses were weighted by the acres of the respondent farms. When weighted by acreage, the most important information sources became trade sources, extension outlets, and crop consultants. The Onion ipmPIPE website increased in importance from 2% to 3% when responses were weighted by acreage.

From these survey responses, one could conclude that most growers do not seek out raw information or data to inform their decisions, but prefer it in a form that is readily usable or is already a recommendation, such as that found in a secondary source.

The survey asked respondents about content desired on the Onion ipmPIPE website. Respondents who *had not visited* were asked what they would like to see on a website about onion production and pests. Because these respondents did not have the Onion ipmPIPE website as a point of reference, we asked them about

a generic website. They responded that they would like to see onion integrated pest management (IPM) information (23% of respondents), onion pest information (23%), onion production information (21%), and general onion pest management information (20%) (Table 10).

Growers that *had visited* the website answered two questions about content on the website: (1) what were the most important or relevant sections and (2) how could the website be improved? The most commonly selected responses of the most important or relevant sections were educational resources, followed by weather information and risk models for thrips. To improve the website most, growers responded that they would like to see a message board that would allow interactions with other growers, more localized production and pest information, and more pest management practices information (Table 11).

7. Conclusions and Recommendations

The Onion ipmPIPE website was helpful in boosting the productivity of onion farmers who used it. For the subsample of growers who visited the website, visiting the Onion ipmPIPE website increased their yield by 243.70 cwt/acre (or 101.99%) and their per acre revenue by 133.08%. For the subsample of growers who did not visit the website, visiting the Onion ipmPIPE website could have increased their yield by 250.48 cwt/acre (or 114.38%) and their per acre revenue by 76.76%. It would have reduced their pesticide costs by $375.43/acre.

Extrapolating sample average estimates to USDA-ERS onion statistics for

2000-2012 reveals that the U.S. onion growers and industry could have increased total output by 35.85 million hundredweight and saved pesticide costs of $53.00 million if they used the website. There is great potential for the Onion ipmPIPE website if (1) increased advertising could be directed at extension and grower meetings to foster website awareness and visitation and (2) the website could be tweaked so the information provided can more directly be applied to individual farming situations. Website visitors cited extension and grower meetings as the top two ways they became aware of the website, and onion growers indicated that they wanted more local onion production, more local pest information, and more pest management information. Growers also would like to see a message board function to interact with other growers directly about pests and pest management practices.

In summary, we suggest that the Onion ipmPIPE website take the following actions to improve the visitation of the website:

(1) Market the website more to growers -- The Onion ipmPIPE website should be marketed more to growers and, more importantly, to extension agents, crop consultants, and trade sources.

(2) Advertise the website more to traders, and crop consultants who serve the growers -- Crop consultants, extension agents, and trade sources can integrate information provided by the Onion ipmPIPE website (both refined and raw) into their recommendations to onion growers.

(3) Re-work the current content to make it more appealing to growers who

want a primary source of onion production and pest information -- The Onion ipmPIPE website has copious amounts of pest management information, but growers feel the presentation of it needs improvement, and they would like to see a message board.

8. Appendix: Tables

Table 1: Onion Grower Demographics

	2011			2012		
Variable	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Male	352	.7755682	.4178015	332	.8674699	.339578
Age (years)	344	54.98837	12.49536	329	55.44073	11.80883
Education (years)	348	14.8908	2.598964	328	14.76524	2.768833

Table 2: Farm Characteristics

	2011			**2012**			**Project States[1], 2009**		**US, 2009**	
Variable	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	N	Mean
Acreage (acres)	98	101.09	223.81	91	92.06	223.86	1162	49.48[2]	4249	35.55[2]
Output (cwt)	98	46,162.79	1.12e+07	91	39,658.48	1.09e+07	1162	27,154.04[2]	4249	17,784.42[2]
Yield (cwt/acre)	98	304.99	205.96	91	309.43	196.91	1162	548.75[2]	4249	500.24[2]
Sales Value ($1000)	74	475.29	1,535.77	81	911.80	2,560.57	1162	401.39[2]	4249	248.01[2]
Pesticide Costs ($1000)	71	169.83	721.90	71	75.34	311.21	1162	NA	4249	NA
Total Acreage (acres)	98	9,906.79		91	8,377.27		1162	57,500	4249	151,060
Total Output (1000 cwt)	98	4,523.95		91	3,608.92		1162	31,553	4249	75,566
Sales Value ($1000)	74	35,171.48		81	73,855.47		1162	466,417	4249	1,053,812

1. Utah state is not included as the data is not available.
2. These are weighted arithmetic means.

Table 3: Grower Awareness and Visitor Average Coverage in 2011

Farm characteristic	Aware Grower	% of Average	Visiting Grower	% of Average
Acreage (acre)	120	178%	116	172%
Production (cwt)	39,298	162%	24,318	256%
Sales value ($)	302,208	110%	$275,081	99%

Table 4: Determinants of Growers' Visitation of Website: Full Sample

webvisit	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
age	.1539546	.1286446	1.20	0.231	[-.0981841, .4060934]
age*age	-.0015791	.0012385	-1.28	0.202	[-.0040064, .0008482]
education	.0271773	.0701055	0.39	0.698	[-.1102269, .1645815]
male	.9164901	.7573653	1.21	0.226	[-.5679186, 2.400899]
acreage	.0012922**	.000524	2.47	0.014	[.0002652, .0023192]
constant	-7.582284	3.60314	-2.10	0.035	[-14.64431, -.5202589]

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

Table 5: Determinants of Growers' Visitation of Website: VT List[1]

webvisit	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
age	-.230325	.3013795	-0.76	0.445	[-.821018, .360368]
age*age	.0023878	.0027544	0.87	0.386	[-.0030107, .0077862]
education	-.1680464	.27588	-0.61	0.542	[-.7087612, .3726684]
organic	.8342099	2.000959	0.42	0.677	[-3.087597, 4.756017]
irrigation	.5047724	1.416019	0.36	0.721	[-2.270574, 3.280119]
acreage	.0008145	.0015388	0.53	0.597	[-.0022014, .0038305]
alerts	3.396575**	1.342426	2.53	0.011	[.765468, 6.027682]
constant	4.532268	8.268677	0.55	0.584	[-11.67404, 20.73858]

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

1. The VT list refers to a sample from the 137 growers who were candidates to be encouraged through email notification to access the ipmPIPE website.

Table 6: Determinants of Growers' Visitation of Website in 2011: NASS List

webvisit	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
age	.1111226	.2529873	0.44	0.660	[-.3847235, .6069686]
age*age	-.0013045	.0025065	-0.52	0.603	[-.0062171, . .0036081]
education	.0448733	. .1336949	0.34	0.737	[-.217164, .3069106]
male	-.136522	.9452119	-0.14	0.885	[-1.989103, 1.716059]
acreage	-.0001073	.0015079	-0.07	0.943	[-.0030628, .0028482]
aware	4.798971***	1.070796	4.48	0.000	[2.70025, 6.897692]
constant	-8.113253	7.373561	-1.10	0.271	[-22.56517, 6.338661]

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

Table 7: Treatment Status by Assignment: VT List

		Alerts		Total
		0	**1**	
Visit	**0**	12	2	14
	1	8	5	13
Total		20	7	27

Table 8: Estimation of Average Treatment Effects Using PSM

	SATE[1]	SATT[2]	SATC[3]
Log of yield[4]	.759***[4]	.703***[4]	.763***[4]
Yield (cwt/acre)	250.11***[4]	243.70***[4]	250.48***[4]
Log of revenue per acre	.584***[4]	.846***[4]	.570***[4]
Revenue per acre ($/acre)	1105.04	4476.24	916.44
Log of pesticides per acre	-.424	.167	-.465
Pesticides per acre ($/acre)	-369.73***[4]	-297.32	-375.43***[4]

1. SATE = Sample average treatment effect, which refers to the average effects of visiting the Onion ipmPIPE website on different outcome measures (listed in the first column) in our full sample.

2. SATT = Sample average treatment effect on the treated, which refers to the average effects of visiting the Onion ipmPIPE website on different outcome measures for those who used the website in our sample.

3. SATC = Sample average treatment effect on the control, which refers to the average effects of visiting the Onion ipmPIPE website on different outcome measures if those in our sample did not use the website had used it.

4. *, **, and *** denote significance level of 10%, 5%, and 1%, respectively.

Table 9: Onion Production Information Sources in 2011

Information Source	No. of Responses	% of Respondents	Acres	% of Total Acres
No Response	29	**8%**	263	**1%**
Relative	17	**5%**	1,175	**6%**
Friend	54	**15%**	2,541	**12%**
Meetings	71	**19%**	7,640	**36%**
Extension	139	**38%**	10,456	**50%**
State onion associations	18	**5%**	2,526	**12%**
Crop consultant	43	**12%**	8,536	**40%**
Pesticide dealer, seed dealer, catalog, packer, or input supplier	120	**33%**	10,556	**50%**
Onion ipmPIPE website	7	**2%**	678	**3%**
Other	20	**5%**	8	**0%**
Other farmers	17	**5%**	150	**1%**
Past experience	51	**14%**	3,806	**18%**
Internet and electronic source	14	**4%**	57	**0%**
Print	9	**2%**	8	**0%**

Table 10: Website Desires and Suggestions, First Survey

Website Desires and Suggestions	Total	% of Respondents	Aware Growers	% of Aware Growers
No response	111	30%	8	16%
Onion production information	81	21%	7	14%
Onion pest information	96	23%	20	39%
Weather forecasts	37	10%	5	10%
Pest risk assessment models	33	9%	3	6%
Onion price forecasts	69	18%	4	8%
Current onion price information	62	17%	6	12%
Onion IPM information	86	23%	11	22%
Genral onion pest management information	78	20%	10	20%
Alerts	46	12%	6	12%
Newsletters	30	8%	4	8%
Message board	40	11%	5	10%
None	56	10%	7	6%
Other	24	7%	4	8%
Organic information	14	4%	0	0%

Table 11: Visitor Website Suggestions, First Survey

Visitor website suggestions	No. of Visitors
No response	27
More frequent website updating	2
More weather information	3
More localized production & pest information	5
More educational resources	1
More current price information	2
More price forecasting	1
More pest management practices	4
More accurate risk models	3
More onion production & pest information forecasts	2
Alerts	3
Newsletters	1
Message board	6
None	7