The Journal of Extension

Volume 45 | Number 1 Article 9

2-1-2007

Collaborating with Wheat Producers in Demonstrating Areawide Integrated Pest Management

Sean P. Keenan
Oklahoma State University, sean.keenan@okstate.edu

Kristopher L. Giles
Oklahoma State University, kris.giles@okstate.edu

Paul A. Burgener
University of Nebraska, pburgene@unlnotes.unl.edu

David A. Christian
University of Nebraska, dchristian2@unlnotes.unl.edu

Recommended Citation

Keenan, S. P., Giles, K. L., Burgener, P. A., & Christian, D. A. (2007). Collaborating with Wheat Producers in Demonstrating Areawide Integrated Pest Management. *The Journal of Extension, 45*(1), Article 9.
https://tigerprints.clemson.edu/joe/vol45/iss1/9

This Feature Article is brought to you for free and open access by the Conferences at TigerPrints. It has been accepted for inclusion in The Journal of Extension by an authorized editor of TigerPrints. For more information, please contact kokeefe@clemson.edu.

February 2007 // Volume 45 // Number 1 // Feature Articles // 1FEA7

Collaborating with Wheat Producers in Demonstrating Areawide Integrated Pest Management

Abstract
Focus groups were used to initiate collaborative relationships with wheat producers while learning about their farming history and decision-making. Focus group transcripts illustrate that producers were less confident in evaluating insect management problems compared to weed management. Producers do rely on Cooperative Extension in managing insect problems. Extension educators continue to play an important role in increasing producer's knowledge of simplified field scouting and insect identification technology.

Sean P. Keenan
Postdoctoral Fellow
Oklahoma State University
Stillwater, Oklahoma
sean.keenan@okstate.edu

Kristopher L. Giles
Assistant Professor
Oklahoma State University
Stillwater, Oklahoma
kris.giles@okstate.edu

Paul A. Burgener
Agricultural Economist
University of Nebraska
Panhandle Research and Extension Center
Scottsbluff, Nebraska
pburgene@unlnotes.unl.edu

David A. Christian
Technologist
University of Nebraska
Panhandle Research and Extension Center
Scottsbluff, Nebraska
dchristian2@unlnotes.unl.edu

Norman Elliott
Research Biologist
Wheat, Peanut, and Other Field Crops Research Unit
USDA Agricultural Research Service
Stillwater, Oklahoma
norman.elliott@ars.usda.gov

Introduction

In the fall of 2001 the USDA Agricultural Research Service (USDA-ARS) initiated a 5-year areawide demonstration program for suppression of two significant pests of winter wheat, the Russian wheat aphid and greenbug. A cooperative research team was assembled from five universities--the University of Nebraska, Colorado State University, Kansas State University, Oklahoma State University, and Texas A & M University. The research team worked with USDA-ARS to establish cooperative relationships with wheat producers and field demonstration sites.

Focus groups were a way to initiate relationships with producers while learning about their farming history and decision-making (Keenan et al., 2007). Using software for textual analysis, this article explores focus group discussion regarding wheat pests and management. The analysis illustrates that producers were relatively less confident in evaluating insect management problems compared to weed management.

A simplified method of field scouting has been recently modified to incorporate natural enemy identification (Elliott et al., 2004, Royer, Giles, & Elliott, 2005 a & b). Adoption of this system can improve producer's knowledge and confidence in Integrated Pest Management (IPM).

Methods

Participant Selection

County Extension educators helped in scheduling and hosting focus groups between January and March, 2003. In addition to producers who farmed 23 demonstration sites for the Areawide program, seven - nine additional wheat producers were recruited from as broad of a geographical area as feasible.

The research team sought producers who were traditional users of Cooperative Extension Services (CES) and who were similar in their farming practices to each of the demonstration producers. Possible participants were identified in consultation with CES county educators, farm Co-Ops, and producer organizations in each state. The project team understood that these producers would be a non-random sample of wheat producers. As the program developed, the Areawide project would broaden its outreach efforts to reach non-traditional CES audiences (see Kelsey & Mariger, 2004).

To compensate producers for time and travel and to provide an incentive for their continued participation over a 4-year period, the Areawide program offered each producer an honorarium of $250 for their participation in the focus group and $100 for the cost-of-production interview.

Participant Characteristics

A total of 138 producers participated in one of twenty focus groups between January and March, 2003. An additional 7 individuals participated in cost-of-production interviews for a total of 145 participating producers after the first year of the program. Producer characteristics are summarized in Table 1 by state/region.

Table 1.
Producer Characteristics by State/Region

Selected Characteristics	Wyoming / Nebraska	Colorado	Texas	Kansas / Oklahoma	Project Total
Number of farms	28	37	25	55	145
Average dryland acres	1,936.5	4,100.1	1,585.5	1,804.9	2,367.4
Average irrigated acres	425.9	928.3	1,614.4	296.1	868.7
Average range/pasture acres	2,301.8	2,164.9	2,234.9	923.0	1,620.2
Average age of operator	51.5	48.1	47.9	49.1	49.1
Note: Wheat producers from Wyoming and from Kansas were grouped with adjacent states due to small numbers of focus group participants recruited from those two states.					

While participants were not randomly selected, differences by state in terms of the acreage figures were consistent with trends for counties included in the program. For example, producers from Colorado sites had the highest average dryland acres per farm, and Texas producers (recruited from the Texas Panhandle region) had the highest average irrigated acres per farm. The project team had observed similar characteristics from county agricultural census data.

However, the average age of participants, 49.1, was relatively younger than expected. In part, this was due to participation by the younger members of family-farming partnerships (often a son or younger brother). Not indicated in the table, two of the focus group participants were female farm operators.

Focus Group Methods

Focus groups involve natural discussion rather than directed interviewing with preconceived answer categories. The focus group moderator facilitates discussion by helping the group to get acquainted and by directing their discussion from general topics to a specific issue of interest (Krueger & Casey, 2000). In this case, we directed the discussion from general farm management decisions to more specific decisions about pest management.

Focus group discussions were audio recorded. Discussion transcripts provided the opportunity to search for common threads of discussion across focus groups. The database of 20 focus group transcripts contained a total of 6,068 transcribed segments of discussion. Using textual analysis software (Cartwright, 2001), transcript segments were coded true/false for word groups.

Word groups are useful for selecting subsets of focus group text, exploring variation in topics of discussion, and finding relationships between topics. The present analysis includes only segments of transcripts involving discussion of pest management topics. This included a total of 1,215 segments out of the 6,068 transcribed.

Focus Group Findings

The analysis begins with the most commonly discussed weeds, diseases, and insects for winter wheat. Percentage tables illustrate differences by state/region. Three pest management topics relevant to winter wheat are explored next, using percentages of discussion along with some examples of producer's comments from the focus group transcripts.

Weeds in Winter Wheat

Table 2 summarizes the three most commonly discussed weeds. Percentages reported are the percent of discussion segments that were coded true for each weed category within each state/region and from all focus groups.

Table 2.
Three Most Commonly Discussed Weeds by State/Region

Discussion Topics	Percent of Discussion by State/Region				All Regions (percent)	Chi-Square	Mean Square Contingency
	Wyoming / Nebraska	Colorado	Texas	Kansas / Oklahoma			
Winter annual grass weeds	24.0	12.8	10.4	19.8	17.5	19.63*	0.02
Broadleaf weeds	10.0	3.4	15.2	5.6	7.2	27.26*	0.02
Field bindweed	0.8	5.3	7.9	2.5	3.6	18.78*	0.02
* p <= 0.001 (df = 3).							

Winter annual grasses were the most commonly discussed weeds for wheat (these included forms of cheat grass, ryegrass, and jointed goat grass); producers mentioned one or more of these in 17.5% of all discussion segments involving pest management. Wyoming/Nebraska producers spoke the most about winter annual grasses, mentioning one or more of these in 24% of all segments involving pest management topics.

State/region contrasts also illustrate that Texas producers spoke more frequently about broadleaf weeds (15.2% of segments) than they did about winter annual grasses (10.4%). A possible reason for this contrast was that many of the Texas producers had irrigated crop rotations as a significant part of their farm enterprises, because regular crop rotation would help reduce the occurrence of these weeds.

The mean square contingency coefficient is a chi-square measure of association. This statistic ranges from 0, indicating no variation, to 1.0, indicating the maximum possible variation by category. Similar to Pearson's R-squared, it can be interpreted as the proportion of variation in topics that is attributable to differences by state/region. The relatively small values for the mean square contingency (rounded to 0.02 for all three weed topics) illustrates that the contrasts in the discussion of weeds by state/region were quite small.

Focus group discussions suggested that producers in all locations appeared to be fairly comfortable in their understanding of weed problems in winter wheat.

Wheat Diseases

In Table 3, the wheat diseases most commonly discussed were rust, wheat streak mosaic, and barley yellow dwarf. However, wheat diseases were not extensively discussed in any focus group (less than 8% of discussion for any disease by state/region), and variation by state/region was minimal (mean square contingency statistics were all 0.01 or less).

Table 3.
Three Most Commonly Discussed Wheat Diseases by State/Region

Discussion Topics	Percent of Discussion by State/Region				All Regions (percent)	Chi-Square	Mean Square Contingency
	Wyoming / Nebraska	Colorado	Texas	Kansas / Oklahoma			
Rust (unspecific)	3.2	2.2	7.3	3.7	3.7	8.25	0.01
Wheat streak mosaic	5.2	0.6	4.3	2.9	3.0	11.41	0.01
Barley yellow dwarf	0.8	0.9	1.8	1.2	1.2	1.10	0.00
* p <= 0.001 (df = 3).							

Producers spoke about wheat diseases mostly in the context of variety selection and cultural methods that prevent diseases, including crop rotation. Producers were broadly familiar with the role of mites and aphids in transmitting some diseases.

Producers who practiced crop rotations tended to believe that rotation helped prevent diseases. Others commented about improved wheat varieties, planting date, or other cultural methods for controlling wheat diseases, particularly rust.

In short, while producers acknowledged that wheat diseases could create significant crop losses, they also tended to believe that control measures were generally effective when implemented properly.

Insects

Evident in Table 4, the Russian wheat aphid was most extensively discussed among producers in Wyoming/Nebraska and Colorado focus groups, while the greenbug was most frequently discussed in Texas, and Kansas/Oklahoma. These trends are consistent with the host ranges of these pests.

Table 4.
Three Most Commonly Discussed Insect Pests by State/Region

Discussion Topics	Percent of Discussion by State/Region				All Regions (percent)	Chi-Square	Mean Square Contingency
	Wyoming / Nebraska	Colorado	Texas	Kansas / Oklahoma			
Russian wheat aphid	12.0	19.7	3.0	--	8.1	111.27*	0.09
Greenbug	0.4	2.2	15.9	11.6	7.4	60.25*	0.05
Armyworm or cutworm (unspecific)	4.0	5.0	3.0	8.3	5.8	9.63	0.01
* p <= 0.001 (df = 3).							

A few producers in all states spoke about problems with armyworms or cutworms in wheat fields; some recent experience with crop losses prompted more discussion of these pests among Kansas and Oklahoma producers.

Overall, producers in Wyoming/Nebraska and Colorado focus groups acknowledged that Russian wheat aphids have caused extensive crop losses in the past. Many indicated direct experience with these losses. To a lesser extent, Texas producers also indicated past experiences with Russian wheat aphid. Producers in Texas and Kansas/Oklahoma also acknowledged sporadic problems with greenbugs. The next section explores producer's experiences with managing these aphid pests for

winter wheat.

Integrated Pest Management (IPM)

In Table 5, the most frequently discussed management practices were herbicide applications, mentioned in 12.3% of segments, and crop rotation, 11.5%. These topics are interrelated. For example, producers tended to agree that crop rotation was important for controlling winter annual grasses and diseases. Some also speculated that crop rotation helped reduce pest insect problems.

Table 5.
Discussion of Pest Management Practices by State/Region

Discussion Topics	Percent of Pest Management Discussion by State/Region				All Regions (percent)	Chi-Square	Mean Square Contingency
	Wyoming / Nebraska	Colorado	Texas	Kansas / Oklahoma			
Herbicide applications	15.2	11.9	3.7	13.9	12.3	14.58	0.01
Crop rotation	14.0	12.5	7.9	10.8	11.5	4.12	0.00
Field scouting	2.4	1.3	6.1	5.8	4.0	14.16	0.01
Biological control	3.6	1.3	4.9	0.6	2.0	15.95	0.01
Insect-resistant wheat varieties	--	6.3	3.7	0.4	2.3	36.98*	0.03
* p <= 0.001 (df = 3).							

Overall there was very little discussion about management topics specific to insects, displayed in Table 5--field scouting, biological control, and insect-resistant varieties (less than 7% of discussion by state/region for any of these). This was particularly noticeable in contrast to discussion about weeds and weed management topics.

Some examples of producer's comments by state will illustrate some of their thoughts about insect management decisions.

Insect-Resistant Wheat

Indicated in Table 5, Colorado producers spoke most about insect-resistant wheat. This may be because researchers from Colorado State University and the USDA-ARS have worked for a number of years on resistant cultivars. Varieties resistant to greenbug and Russian wheat aphid have been available since the late 1990's (Porter et al., 1997; Lazar et al., 1998; Peairs, 1998; Brewer & Elliott, 2004). Nonetheless, variety selection remains a difficult decision, as a Texas producer noted: "The TAM 110 variety has greenbug resistance, but Jagger doesn't. Jagger has leaf rust resistance, but the TAM variety is susceptible--we don't have the perfect wheat yet."

Some producers in Colorado focus groups indicated that resistant varieties have helped prevent Russian wheat aphid damage, as with the following comments. "I think our biggest pest problem was Russian wheat aphids until we got the resistant varieties." "We have a piece of ground where we had Russian wheat aphids every year until we planted aphid resistant wheat. I quit looking for aphids after that. I don't even think about planting any other kind of wheat."

Evident in the second comment, some producers may be overly reliant on resistant cultivars as a method of preventing damage to the exclusion of other IPM methods. Researchers suggest that it is important to manage aphids using a combination of management tactics to reduce the incidence of new biotypes and to avoid crop damage when they do occur (Peairs, Haley, & Johnson, 2003).

Field Scouting

While wheat producers indicated that they did not expect economically significant crop losses from aphids most of the time, and they also acknowledged a tendency to ignore or overlook an insect problem when it does occur.

Producers indicated that they tend to rely on expertise from crop consultants, extension educators, or other crop advisors for scouting. Primarily, however, producers used consultants for higher valued (often irrigated) crops like alfalfa, corn, and cotton, rather than dryland winter wheat. An

Oklahoma producer noted that, while consultants are helpful, producers need to become more knowledgeable about insect identification and field scouting: "[Our consultants] can't scout the whole country. . . . As farmers, we don't know where and when we've got a problem until it is really visible and then we call the crop consultant."

Some producers mentioned that they were familiar with older methods for sampling fields for aphids, based on counting aphids per foot-row; none specifically mentioned that they were familiar with a simplified presence/absence sampling procedure (Glance N' Go) that allows for significantly reduced sampling time and incorporation of biological control (Royer et al., 2005 a & b). One Oklahoma producer noted:

> It seems like we have some control measures on weeds--you can see them, or easily scout them out--whereas for insects, they are hard to find sometimes or you might not do a good job of scouting and they creep up on you.

In individual interviews, only six out of 145 producers indicated that they regularly scouted wheat for insects, and 45 indicated that they never scouted. Some producers felt like they did not have time to scout, though a Kansas producer was an exception:

> I [live] so far from anywhere, I scout for relaxation (laughing). I guess I like to be ahead of the problem and I try not to attack it after problems happen. It's a lot cheaper, and easier, and I guess I have fun doing it.

More typical were comments like this from an Oklahoma producer:

> I get busy with other things and I put it off. You know, I'm always going to do that tomorrow. With the [crop] rotation, there are not too many weeks out of the year that I'm not doing something other than scouting fields like I need to.

Biological Control

Producers were broadly familiar with beneficial insects typically present in wheat fields, but few were comfortable in their ability to determine the effectiveness of biological control. One Nebraska producer commented:

> We did [release] ladybugs one year, couldn't tell if they made a difference or not--the aphids were growing faster than the ladybugs is basically what it looked like to me . . . and then we didn't want to spray because we didn't want to kill the ladybugs, so where do you go from there . . .

Some focus group participants in Texas felt that biological control was effective, but these comments were based on casual observations rather than systematic scouting. "Especially on dryland, we have relied on biological control and had a good wheat crop. When we have the wasp and the ladybug--once I see one mummy [parasitized aphid], I don't spray. . . ." "[I]n areas with more irrigated crops, farmers use more chemicals than we do here . . . and my theory is, we're keeping a beneficial [insect] population. . . . "

While beneficial insects might be preserved in an implicit "no treatment" decision, producers may find that they have overlooked a severe insect problem. An Oklahoma producer noted:

> So much of the time that we get in trouble with pest problems is that we try to save a dollar . . . I know we got in trouble last year with greenbugs. We went just about five days too long that we didn't spray.

A focus group question asked producers whom they like to consult when they encounter pest and other crop management problems. The three most frequently cited categories were neighbors, Cooperative Extension personnel, and crop consultants. The analysis of transcripts illustrated that producers made more frequent references to neighbors in the context of speaking about wheat production, crop rotation, and weed management. Producers made more frequent references to Cooperative Extension and crop consultants when speaking about insect management.

Conclusion

Focus groups revealed that producers were broadly familiar with aphid species, diseases transmitted by aphids, and natural enemies of aphids. However, only a few producers seemed comfortable with scouting for insects and determining the effectiveness of natural enemies. This was particularly noticeable in contrast to their familiarity and comfort level in managing weeds and diseases in winter wheat.

Recommendations for Practice

Wheat producers do rely on Cooperative Extension to manage insect problems. CES educators play an important role in increasing producers' knowledge of field scouting and insect identification technology. Several recommendations follow for CES educators.

- In focus groups, producers illustrated curiosity about insect identification that went beyond

simple concern about economic crop losses. Producers would like to know how to scout fields and identify insects (pest and beneficial), but they need to be shown how to do it correctly.

- Using simplified field scouting technology (Elliott et al., 2004; Royer et al., 2005 a & b), CES educators can show producers how to overcome common errors in field scouting and insect identification.

- Producers have benefited from aphid-resistant wheat varieties; however, they do need to be reminded not to rely on this technology to the exclusion of other IPM methods.

To help reach nontraditional users of Cooperative Extension, the Areawide program initiated a press release effort in the fifth year of the program. An effort is also underway to develop a video training program for wider distribution. Additional information is available on the program Web site, http://www.ars.usda.gov/Business/docs.htm?docid=6555.

Acknowledgements

The authors express gratitude to Dr. Christine Johnson, Director of the Bureau for Social Research at Oklahoma State University, for assistance in research design and focus group transcription.

This work was approved for publication by the Director of the Oklahoma Agricultural Experiment Station, and supported in part under project OKL02334 and the USDA-ARS Areawide Pest Management Program. Mention of trade names or commercial products in this article is solely for the purpose of providing specific information and does not imply recommendation of endorsement by the U.S. Department of Agriculture.

References

Brewer, M. J., & Elliott, N. C. (2004). Biological control of cereal aphids in North America and mediating effects of host plant and habitat manipulations. *Annual Review of Entomology*, 49, 219-242.

Cartwright, A. (2001). Code-A-Text integrated system for the analysis of interviews and dialogues (C-I-SAID) [Computer Program] Version 31st July 2001 Build 3.5.5. Available at: http://www.code-a-text.co.uk/index.htm

Elliott, N. C., Royer, T. A., Giles, K. L., Kindler, S. D., Porter, D. R., Elliott, D. T., & Waits, D. A. (2004). A web-based decision support system for managing greenbugs in wheat. *Crop Management* [On-line] doi:10.1094/CM-2004-1006-01-MG.

Keenan, S. P., Giles, K. L., Elliott, N. C., Royer, T. A., Porter, D. R., Burgener, P. A., & Christian, D. A. (2007). Grower perspectives on areawide wheat integrated pest management in the southern U.S. Great Plains. In Koul, O. and Cuperus, G. W. (Eds.), *Ecologically-Based Integrated Pest Management* (pp. 289-314). Cambridge, MA: CAB International.

Kelsey, K. D., & Mariger, S. C. (2004). A comparison of farmers who do and do not use cooperative extension services. *Journal of Extension* [On-line], 42(2). Available at: http://www.joe.org/joe/2004april/a8.shtml

Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for Applied Research* (3rd Ed.). Thousand Oaks, CA: Sage.

Lazar, M. D., Worrall, W. D., Peterson, G. L., Porter, K. B., Rooney, L. W., Tuleen, N. A., Marshall, D. S., McDaniel, M. E., & Nelson, L. R.. (1998). Registration of TAM 110 wheat. *Crop Science*, 37, 1978-1979.

Peairs, F. B. (1998). Cultural control tactics for management of the Russian wheat aphid (Homoptera: Aphididae), In S.S. Quisenberry and F.B. Peairs (Eds.), *Response model for an introduced pest, the Russian wheat aphid* (pp. 288-296). Lanham, Maryland: Thomas Say Publications in Entomology, Entomological Society of America.

Peairs, F. B., Haley, S., & Johnson, J. (2003). Russian wheat aphid infestations in Prairie Red. Wheat Breeding and Genetics Program, Soil and Crop Sciences Department, Colorado State University. [On-line] Accessed: 24 June 2004. Available at: http://wheat.colostate.edu/links.html

Porter, D. R., Burd, J. D., Shufran, K. A., Webster, J. A., & Teetes, G. L. (1997). Greenbug (Homoptera: Aphididae) biotypes: selected by resistant cultivars or preadapted opportunists? *Journal of Economic Entomology*, 90, 1055-1065.

Royer, T. A., Giles, K. L., & Elliott, N. C. (2005a). Glance 'n go sampling for greenbugs in winter wheat: Spring edition. Oklahoma Cooperative Extension Service, Oklahoma State University Extension Facts, L-306, Stillwater.

Royer, T. A., Giles, K. L., & Elliott, N. C. (2005b). Glance 'n go sampling for greenbugs in winter wheat: Fall edition. Oklahoma Cooperative Extension Service, Oklahoma State University Extension Facts, L-307, Stillwater.