

Ecologically based weed management: A manual and training program for farm advisors

Final Report for ENE06-099

Project Type: Professional Development Program

Funds awarded in 2006: \$129,670.00

Projected End Date: 12/31/2009

Region: Northeast

State: New York

Project Leader:

[Dr. Charles Mohler](#)

Cornell University

Project Information

Summary:

The project developed the draft of a manual on ecological weed management titled "Manage weeds on your farm: a guide to ecological strategies", which will ultimately be published by SARE Outreach. An Advisory/Training Team of ultimately nine extension staff, agricultural professionals and exemplary organic farmers reviewed the manual. They also helped organize and present seven workshops on ecologically based weed management for extension personnel and other agricultural professionals at sites throughout the Northeast. These workshops were attended by 243 people, 135 of whom were extension educators and other agricultural professionals such as NRCS personnel and Certified Crop Advisors. Drafts of the manual were distributed at the workshops which included problem solving exercises using the manual.

Workshop participants expressed a high degree of knowledge acquisition at the time of the workshop, with 79% indicating that it substantially increased their understanding of weed management. Ninety two percent indicated that they expected to use the manual in their extension and outreach work. A follow-up e-mail and telephone survey of 107 educator and agricultural advisor participants 12 to 18 months after workshop attendance reached 48% of attendees. This survey found that 59% of participants felt that the workshop and manual had improved their weed management skills either "moderately" or "a lot" and 51% had used the manual in their work more than five times in the previous year. Respondents indicated that they had provided information on ecological weed management to over 1,900 people through talks and personal contacts and had positively influenced the weed management practices of over 275 farmers and gardeners.

One of the goals of the project was to raise the level of expertise of members of the Advisory/Training team so that they could support extension of ecological weed management information in their states. In addition to assisting with the workshops for extension staff and agricultural professionals supported directly by the project, advisors led 4 half to full day short courses on ecological weed management with

157 attendees plus 108 other presentations containing substantial ecological weed management content with a total audience of over 4,400. They produced 22 print and internet publications on ecologically based weed management, and advised over 640 growers individually through telephone or e-mail contacts. Some of this activity might have taken place without the project, but advisors indicated that they were using knowledge and skills gained through the project extensively in their work. Several who had not previously given presentations on ecological weed management have done so since the initiation of the project. Most, including the farmers on the team, have repeatedly advised Cooperative Extension staff on questions regarding ecological weed management, indicating that they are now recognized as local sources of expertise.

Performance Target:

Target 1. Of the 10 members of the project Advisory/Training Team, all will gain sufficient understanding of the ecological approach to weed management to convey the essential paradigm shift to growers. At least 8 will co-present workshops to extension personnel. All will use knowledge gained in the project in extension activities reaching a minimum total of 300 growers, and improve weed management on 30 farms during the lifetime of the project.

Target 2. Of 210 extension professionals who take the weed management workshops, 170 will answer an evaluation questionnaire, and of these 150 will perceive improved skill in ecologically based weed management. Ninety of these will have used that knowledge in extension activities.

Verification and assessment

Members of the project Advisory/Training Team will keep records of their use of the knowledge gained from the project in their work with farmers (e.g., newsletter articles, one-on-one advice etc.) from the time they first receive the draft manuscript. They will also note any related changes they perceive on the farms with which they have contact. At the ends of Years 2 and 3, the Project Coordinator will collect and compile these notes. In addition, at the beginning of year 3, they will answer a questionnaire to evaluate their level of knowledge acquisition.

Contact information will be collected from workshop attendees. At the workshops they will be asked to keep track of their use of knowledge gained through the workshop and reading of the manual. During the latter part of Year 3, they will be contacted to determine (i) whether they perceived improvement in weed management skills as a result of the workshop or manual, (ii) the extent to which they used the information in their work, and (iii) how many farms they know of that changed weed management practices as a result of their advice. Contact will be first by e-mail, with telephone calls to non-responders.

Introduction:

Farm surveys and case studies show that weeds often cause substantial problems for organic farmers and others who avoid the use of herbicides. Nevertheless, weeds are consistently well controlled on some organic farms. Many cultural and mechanical procedures are available for suppressing weeds in sustainable cropping systems. A key factor in successful weed management in sustainable agriculture, however, appears to be sound understanding of the biology of weeds and how to use weed biology to leverage effective management.

The project developed a manual on ecologically based weed management "Manage Weeds on Your Farm: A Guide to Ecological Strategies" to be published by SARE Outreach, and used drafts of this manual in a series of training workshops for

extension personnel and other agricultural professionals throughout the Northeast. The manual includes sections covering the biology of various types of weeds, explains the advantages and limitations of various cultural procedures, and discusses how to effectively apply various types of tillage and cultivation. The manual also discusses identification, ecological characteristics, and management of 78 major weeds of the United States, 50% of which are problems for growers in the Northeast. Finally, by profiling weed management practices on exemplary farms throughout the U.S.A. it demonstrates how ecological weed management strategies are integrated on real farms.

An Advisory/Training Team of ultimately nine farm educators reviewed and critiqued the manual. They also assisted in a series of eight workshops for extension personnel and agricultural professionals held throughout the Northeast. Workshops explained principles of weed biology and ecologically based weed management and then trained participants on use of the manual for solving weed problems. Draft copies of the manual were distributed to workshop participants so that they could begin using the information on ecological weed management well before the book could wind its way through the publication process. The project was evaluated through extension activity logs of the Advisory/Training Team members, by evaluation forms at workshops and by e-mail/telephone surveys of workshop attendees conducted 12 to 18 months after the workshops.

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Educational Approach

Educational approach:

Not required by SARE-NE

Milestones

Milestone #1

Accomplishments:

Publications

The following is organized by milestones. Since progress was slower than expected throughout the project, milestones, though often met, were usually met later than expected. Consequently, milestones 2 and 4 are discussed together and milestones 3 and 5 are discussed together.

Milestone 1: "The authors will complete the draft of the core of the manual, and the project Advisory/Training Team will review it and provide feedback. (2nd half of Year 1)."

The core four chapters of the manual were developed through revision of materials previously written. These included an introduction and chapters on the biology of weeds, cultural management methods and physical management methods. Several species accounts were written, bringing the total up to 36. These covered most of the major agricultural weeds in the Northeast, allowing the manual to be used effectively in workshops. This draft of the manual was distributed to members of the Advisory/Training team during the 2nd half of Year 1 as planned.

Six of the nine active project Advisory Training Team members returned comments on the draft manual.

Milestone 2: "The Project Coordinator and members of the Advisory/Training Team will conduct three training workshops for extension personnel on the principles and implementation of ecological weed management. Copies of the draft manual will be distributed at these workshops and feedback solicited. These workshops will be attended by a minimum total of 70 people (Year 1)."

Milestone 4: "Project leaders and members of the Advisory/Training Team will conduct 5 additional training workshops for extension personnel on the principles and implementation of ecological weed management. Copies of the draft manual will be distributed at these workshops and feedback solicited. These workshops will be attended by a minimum total of 140 people. (Year 2)."

Arranging workshops proved harder than expected. Although seven of the projected eight workshops were eventually given, they were spread over the entire span of the project, with the last only given six weeks before the end of the project. The total attendance exceeded projections, but attendance by extension personnel and agricultural professionals did not meet projections (see Outcomes and Impacts and Table 1).

The basic workshop consisted of two parts: a lecture/discussion on how to use knowledge of the ecology of weeds to leverage management and a participatory exercise in which attendees used the draft manual to solve difficult weed management problems that they identified. Each part took about 1.5 hours. Although the full workshop was given at the majority of sites, one or the other section was left out of some workshops due to time constraints of the host venue (Table 1). Evaluation forms were collected at the workshops and the results were compiled (see Outcomes and Impacts for results of these evaluations). Copies of the draft manual were distributed at each workshop. Because most of the attendees at the Virginia Biological Farming Association conference workshop were expected to be growers, the project only paid for 20 copies for the expected

extension and agricultural professionals and the conference paid for the remainder.

Milestone 3: "The authors will revise the draft based on comments of the Advisory/Training Team, and will complete descriptions of ecology and management of individual species. The revised manual will be reviewed by the Advisory/Training Team. (Year 2)."

Milestone 5: "Text of the manual will be revised based on comments of the Advisory/Training Team and others. The draft will be submitted for publication (Year 3)."

Due to the Project Coordinator (the principle author of the manual) developing a substantial visual impairment coupled with serious, prolonged illness in his immediate family, progress on the manual was slower than expected. Also, most of the individual species accounts have been more difficult to develop than was projected based on the initial accounts that were prepared before the project began. This is largely because the first species accounts were for species common in the Northeast. More information is available and easier to find on the ecology of weeds that are problems in the Northeast and northern Midwest than for species that occur primarily in the West and South due to regional variation in the academic culture of the weed science profession.

At present, about 40% of the advisor's comments have been incorporated into the manuscript. Of the 63 species accounts, 49 have been prepared and these cover 62 of the 79 species that will be discussed in detail. Two of the five profiles of case study farms have been written, another is in preliminary draft form and two extensive interviews have been conducted for a fourth. We need to locate a farm in the Southeast for the fifth planned profile.

To free more time for writing, the PC retired in Oct of 2010. Completion of the manuscript is expected in late spring or summer of 2011.

Milestone 6: "Records of extension activity by the Advisor/Training team and their observations on changes in farmer weed management will be compiled for evaluation (end of Year 2). Knowledge acquisition of Team members will be assessed (early Year 3)."

Six of the nine active advisors have demonstrated thoughtful reading of the manual by returning comments. Two of those who were unable to do so have, however, played an important role in the project by helping organize and conduct workshops. A third has absorbed the material sufficiently to have now given four talks on ecological weed management to large grower audiences. Thus, knowledge acquisition by the Advisory/Training Team has been sufficient to create a cadre of experts around the region as planned. Two Advisors dropped out of the project, but Mark Schonbeck was added as a replacement. He has supplied extensive comments on the manuscript and helped organize and conduct the workshop on 27 Feb 2009 in Richmond, VA (See table 1).

Records of extension activities of advisors were obtained and compiled at the end of 2007, 2008, 2009 and 2010. Advisors failed to keep records at first and only three were able to file reports for 2007. Eight out of nine, however, filed reports for 2009 and 2010. See Outcomes and Impacts for discussion of activities reported.

Performance Target Outcomes

Performance target outcome for service providers narrative:

Outcomes

Evaluations of the workshop have been highly favorable, with 79% of participants indicating that the workshop substantially or very substantially increased their knowledge of weed management. Over 92% indicated that their ability to solve weed problems was improved, and 92% indicated that they were likely to use the manual in their extension work.

Copies of the draft manual were distributed to 261 people (65 copies for farmers paid for by the Virginia Association for Biological Farming). Most of these were distributed at workshops, but 11 were given to members of the advisory team, and 7 were given to extension personnel who were unable to attend a workshop but requested a manual for use in their work.

Six advisors helped lead workshops for extension educators. This is 2 short of the 8 projected in Performance Target 1. However, another two gave workshops on ecological weed management in venues not supported by the project but based on materials and learning acquired through the project. Advisors conducted extensive and diverse extension activities on ecological weed management. Advisors led 4 half to full day short courses on ecological weed management with 157 attendees plus 108 other presentations containing substantial ecological weed management content with a total audience of over 4,400. This output is more than 15 fold greater than the 300 contacts projected in Performance target 1. They produced 22 print and internet publications on ecologically based weed management, and advised over 640 growers individually through telephone or e-mail contacts. The audience sizes and number of individual contacts indicated above are conservative in that some advisors did not list audience size for some presentations; others indicated only the minimum number of personal contacts made; and some did not report activities, particularly in the first reporting year.

Although some of this activity would probably have taken place without the project, all Advisors have indicated extensive use of training materials produced by the project in their work. Several did not provide weed management advice prior to the project but now do so. The majority of Advisors indicated that they regularly instruct other cooperative extension personnel and agricultural professionals on ecologically based weed management, either through presentations or one-on-one advice with particular problems. Thus, the Advisors have become resources for other professionals in their states, as envisioned in the project proposal.

The project conducted 7 workshops, mostly in conjunction with extension in-service and other training events (Table 1). Only the workshop held in Maine was organized as a stand-alone event because we found that in other states extension personnel did not have time for travel to a single purpose event. The structure of the workshops varied somewhat depending on what the sponsoring organization felt they needed. The basic workshop consisted of two parts: a lecture/discussion on how to use knowledge of the ecology of weeds to leverage management and a participatory exercise in which attendees used the draft manual to solve difficult weed management problems that they identified. Each part took about 1.5 hours.

The full workshop was given at four of the seven sites (ME, MD, NY, and VA), the lecture alone was given at PA and the NY CCA training, and the

problem solving exercise was used as part of a full day organic weed management program in NJ with additional content provided by the Project Coordinator throughout the day. The seven workshops fall one short of the eight projected in the proposal. We tried repeatedly to organize a workshop in the New England area outside of Maine, but this was not possible due to the highly scattered nature of extension personnel in that region. The total attendance at the seven workshops was 243. This exceeded the target attendance of 210. However, two of the workshops included growers as well as extension and agricultural professionals (VA and NJ). As a result, only 135 extension and agricultural professionals were reached in the workshops. Organizers of the Virginia Biological Farming conference indicated that they expected about 20 extension and agricultural professionals would attend the workshop. Although attendance at the conference and workshop was good, the attendees at the workshop were nearly all growers.

In addition to the workshops shown in Table 1 and discussed above, the PC used components of the workshop or the full workshop at six grower conferences and these reached another 410 people. Some substantial but undetermined number of these were extension personnel and other agricultural professionals.

We sent an e-mail evaluation of the project's usefulness to the 107 Extension and ag professional attendees of workshops held at ME, MD, NY, and PA and the NY CCA workshop between 12 and 18 months after each was held. We followed up with telephone calls to non-responders and a second telephone call was made if we could not establish contact the first time. We gained survey responses from 51 (48%) of the attendees at these workshops. Many of those we were unable to contact had disconnected telephone numbers or had left their former place of employment. Only two attendees refused to answer the survey; both of these attended the NY CCA workshop. No survey of the attendees at the VA workshop was made since only one agricultural professional attended that. The NJ workshop was held too late in the project period to allow for a follow-up evaluation. Of the respondents, 30 (59%) said that the workshop and manual had improved their weed management skills either "Moderately" or "A lot". When asked how often they had used information from the workshop and manual in their extension work 26 (51%) said greater than 5 times and 8 (16%) said greater than 12 times. Only 6 (12%) said that they had not used the information at all.

If the sample is reasonably representative of the extension and agricultural professionals engaged during the course of the project, then 88% of the 135 advisors, or 119, were using the information provided, and this substantially exceeds the 90 projected in Performance Target 1. Note that this may be an underestimate since (i) extension and agricultural professionals reached at farmer conferences other than NJ were not counted in the 135 contacts and (ii) evaluations at the NJ workshop were particularly enthusiastic, but these people could not be surveyed 12 to 18 months later. Fifty one percent of those responding to the survey had referred to the manual more than 5 times in the last year. Nearly all of the educators who were not using the information much indicated that this was because their work rarely involved weed management activities. A few of the educators in PA indicated that they already knew most of the information; this may be attributed to the strong ecological orientation of the weed management group at the Pennsylvania State University.

The educators estimated that they had reached over 1,900 growers through talks or direct contacts with information on ecological weed management, and potentially over 22,000 through newsletter and magazine articles. Perhaps most significantly, these educators knew of 220 farmers and 55 home gardeners who had modified their weed management practices based on the educators' advice on ecological weed management. Overall, the evaluations indicate that the project is having a substantial impact on some educators and that this is translating into benefits for growers.

- [Table 1. Workshops given](#)

Additional Project Outcomes

Project outcomes:

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Assessment of Project Approach and Areas of Further Study:

Potential Contributions

Not required by SARE-NE

Future Recommendations

The principle recommendation is that future Professional Development applications should be encouraged to include money for extension educators to travel to training events. Salary replacement money for time spent at the training would further encourage attendance. The reality is that extension staff are stretched very thin and in many cases must demonstrate income to their programs to support activities. The time and expense that would have been incurred by participants in a New England workshop was a major factor that prevented this from occurring.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE.



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