EVALUATION OF THE ENVIRONMENTALLY RESPONSIBLE MANAGEMENT PRACTICES FOR TREE CROPS IN THE FEATHER RIVER BASIN PROJECT

Alida Cantor
Lisa Kresge

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EXECUTIVE SUMMARY

The California Institute for Rural Studies (CIRS) conducted an evaluation of the outreach components of the Environmentally Responsible Management Practices for Tree Crops in the Feather River Basin project. The project, which ran from 2005-2009, was a collaborative effort organized by the Community Alliance with Family Farmers (CAFF) with the goals of improving water quality in the Sacramento River watershed. CAFF sought to encourage environmentally responsible orchard practices and pest management methods through education and outreach with orchard growers in Sutter and Yuba Counties, including outreach methods to better reach the previously underserved Punjabi-American farming community. Outreach was conducted in collaboration with UC Cooperative Extension of Sutter and Yuba Counties.

To assess the effectiveness of the project’s outreach and education efforts, CAFF contracted with CIRS to conduct an evaluation. The goals of this evaluation were to determine the degree to which the outreach component of this project has succeeded in increasing awareness, understanding, and adoption of environmentally responsible management practices amongst orchard growers in Sutter and Yuba Counties. The evaluation also sought to improve future outreach efforts.

The evaluation was conducted during March-September 2009. Research methods included 40 in-depth interviews with orchard growers (18 of whom were of Punjabi descent and 22 of whom were non-Punjabi) and 17 key informant interviews with persons either directly involved with the project or familiar with subjects related to the project.

Key findings

Information sources:
- Growers use a wide range of sources to get information, including print media, meetings, Internet, professional information providers, and word of mouth.
- Most growers in the study (83%) used Cooperative Extension at least occasionally. Growers most commonly sought information on general farming practices and disease control. Punjabi growers were slightly less likely than non-Punjabi growers to use Cooperative Extension resources (71% Punjabi vs. 84% non-Punjabi).
- In general grower perceptions of Cooperative Extension were positive. The main critique was that Farm Advisors do not have enough time and resources.

Outreach methods:
- Cooperative Extension newsletters, received by 80% of growers, were the most commonly used outreach method in the project and received positive feedback. Punjabi language translations of newsletters were less effective.
- Meetings, the second most commonly used information source in the project, were attended by 75% of growers interviewed. Both field days and indoor meetings received positive feedback. Growers prefer that meetings be timed to avoid the busy season.
- Television broadcasts on two local Punjabi television programs were viewed by 39% of the Punjabi growers interviewed, and received positive feedback.
- Demonstrations of specific on-farm practices were very helpful for project staff, PCAs, and growers involved in the demonstrations, but less helpful for those not directly involved.
Email is the preferred method of receiving information, seconded by mail. Punjabi growers preferred email to mail at a higher rate than non-Punjabi growers in the study.

**On-farm decision-making and pest management:**
- Growers cited economic pressures (market prices and input costs) as the primary factor affecting their chances of staying in the farming business. Growers make changes on their farms when it makes economic sense to do so.
- When making decisions about pest management, almost all growers consulted a PCA as their primary source of information. The majority of growers reported doing their own pest monitoring, rather than just relying on a PCA.
- Almost all growers reported using conventional pesticides. Over half were also using or had tried at least one alternative pest control material, most commonly pheromones.
- The majority of growers had at least some understanding of the meaning of reduced risk pest control and/or IPM methods. However, growers expressed skepticism that it was effective, or worried about risks to their crops.

**Water quality:**
- Most growers are members of a watershed group, but most were displeased with their membership, seeing it as an expensive mandatory intrusion.
- Only 38% of growers saw water pollution as a problem in the area. Punjabi growers were less likely than non-Punjabi growers to view water pollution as a problem (28% Punjabi as compared to 46% non-Punjabi).
- Of those who did see water pollution as a problem, many saw it as primarily a residential or homeowners’ problem.

**Project effectiveness:**
- Results were mixed as to the extent to which messages were getting through to growers. While a majority did not think water pollution was a problem, most growers did have an understanding of the idea of reduced risk pest control and IPM.
- Growers are adopting environmentally responsible orchard practices where they feel it makes economic sense to do so.
- The diverse array of outreach methods was a useful strategy for reaching a wide range of growers.

**Recommendations:**
- Because growers are caught between low prices and high input costs, relying solely on voluntary efforts is unlikely to be effective, and other incentives should be considered.
- Future messages about reduced risk pest control must continue to stress economic benefits. Messages should also include more education on why water pollution is a problem.
- Future projects should continue to utilize multiple forms of outreach and should increase use of high-tech outreach (email, smart phones, etc).
- Future outreach with Punjabi growers should include more collaboration with community organizations, continuing the television broadcasts and expanding online outreach. Maintaining a presence in the community is important.
INTRODUCTION

The Community Alliance with Family Farmers (CAFF) began the Environmentally Responsible Management Practices for Tree Crops in the Feather River Basin project in 2005 in collaboration with University of California Cooperative Extension (UCCE), the UC IPM program, the UC Davis Agricultural GIS Laboratory, the San Francisco Estuary Institute, local farmers, and Pest Control Advisors. The project focused on outreach to peach, prune, walnut, and almond growers in order to provide hands-on experience and improved understanding of environmentally beneficial orchard crop practices.

The Environmentally Responsible Management Practices project was focused on improving the quality of the Sacramento River watershed, specifically the Lower Feather River and the Sutter Bypass. Significant levels of toxicity, much of which can be directly linked to pesticide and herbicide use, currently threaten the watershed. In particular Diazinon, a pesticide commonly used in orchard crops, is highly toxic to many fish species in the Delta and is found in high levels in the Lower Feather River and Sutter Bypass watersheds. The project had five specific goals:

1. Reduce organophosphate pollution in the Lower Feather River and Sutter Bypass resulting from storm water run-off from orchards in the dormant season, particularly prune and peach orchards.
2. Reduce in-season pollution of waterways due to irrigation run-off and spray drift from orchards including prunes, peaches, almonds and walnuts.
3. Develop and improve innovative environmentally and economically sound production practices, assuring continuing improvement of the environmental impacts of orchards in the Southern Sacramento Valley.
4. Evaluate success of the program and identify opportunities for further improvement.
5. Strengthen linkages between Sutter and Yuba County growers and their pollution prevention resources with a special emphasis on the under-served East Indian community.

The primary focus of this report is on the grower education and outreach components.

Education and outreach to orchard growers were major focus areas of the Environmentally Responsible Management Practices project. CAFF worked to coordinate between UCCE Farm Advisors, PCAs, and experienced local farmers in order to promote environmentally sound orchard management practices, specifically focusing on the development and promotion of cost-effective IPM practices. CAFF also focused on improving outreach to Punjabi American orchard growers, a large segment of Sutter and Yuba County farmers that often does not respond to traditional outreach, according to UCCE Farm Advisors.

CAFF created an Outreach Plan in order to ensure that the education and outreach component of the project was fully addressed. The Outreach Plan explicitly acknowledged the importance of understanding the specific needs and communication styles of the Punjabi American farming community, and of recognizing and addressing cultural barriers between Punjabi American growers and predominantly non-Punjabi Farm Advisors and information providers. The Outreach Plan focused on the following objectives:

- Create an outreach program that brings dormant spray alternatives in peaches, prunes and almonds to an audience of growers who have not adopted these practices.
- Create outreach targeted to Punjabi-American farmers through local media, including radio, television and print media.
- Adapt materials already developed by the University of California specifically for the Punjabi-American community of tree crop farmers. The outreach topics focused primarily on general good production practices for healthy trees, which is the foundation of IPM. Outreach methods included:
  - **Field days**: A traditional staple of Cooperative Extension, field days were held to connect growers with Farm Advisors and other experts.
  - **Newsletters**: Farm Advisor newsletters were made available via email, and newsletters were translated into Punjabi language and made available at the Farm Advisor office.
  - **Fact sheets**: Fact sheets and brochures were produced in English and Punjabi to highlight pest management practices and general crop production advice.
  - **Television broadcasts**: The Farm Advisors filmed short clips highlighting good production and pest management practices, which were translated into Punjabi and shown on two locally produced Punjabi language television programs.
  - **Community outreach**: Project staff attended community events including the Punjabi American Heritage Festival, an important yearly celebration, in order to build connections with the Punjabi American grower community.

**About this evaluation**

In order to assess the effectiveness of the project’s outreach and education efforts, CAFF contracted with the California Institute for Rural Studies (CIRS) to conduct an evaluation. The primary goal of the CIRS evaluation was to determine the degree to which the outreach efforts have succeeded in increasing awareness, understanding, and adoption of sustainable orchard practices amongst all growers in the project area, both non-Punjabi and Punjabi American. A second goal of the evaluation was to assess whether the project has successfully built trust and improved working relationships between Punjabi American growers and predominantly non-Punjabi information providers such as Farm Advisors and others. The following research questions were developed cooperatively between Farm Advisors, project staff, and CIRS staff:

1. **Awareness, understanding, and perceptions of sustainable orchard practices**:
   a. What messages about good orchard management practices are getting through?
   b. What are grower attitudes and awareness around water quality and pesticide use?
   c. How have the messages affected attitudes and awareness?

2. **Adoption of good orchard practices**:
   a. Are the messages being translated to implementation? Which messages?
   b. What is adoption a function of?
   c. Are farmers changing their practices based on their new knowledge?

3. **To what degree have different specific outreach methods been effective?**
   a. To what extent have growers used the Punjabi language documents?
   b. To what extent have growers attended field days and demonstration projects?
   c. To what extent have growers seen and remembered the TV broadcasts?

4. **To what degree has the project built trust, understanding, and improved working relationships between the Punjabi American farming community and researchers and farm advisors?**

5. **What could be improved in the future in regards to outreach to Punjabi American orchard growers, both from the perspective of Farm Advisors and the perspective of growers themselves? What new methods or improvements on current methods should be considered?**
METHODS

Literature review

Evaluators began the study by conducting a brief literature review. Works consulted included literature on Punjabi-American farmers (Gibson, 1988; Gokhale, 2007; IPC, 2002; Leonard, 1985, 1992; Sibia; Terhune, 2005), literature on outreach regarding integrated pest management and pesticide reduction programs (Brodt, Goodell, Krebill-Prather, & Vargas, 2007; Brodt, Klonsky, & Tourte, 2005; Brodt et al., 2004; Moore & Villarejo, 1998; Swezey & Broome, 2000; Villarejo & Moore, 1998), and literature on biological and integrated pest management for nut and stone fruit (Epstein, Bassein, & Zalom, 2000; Steinmann, Zhang, Grant, Pickel, & Goodhue, 2008). The review also included articles from publications such as Ag Alert and information from websites including Cooperative Extension and the Punjabi American Heritage Society.

Key informant interviews

Key informant interviews were conducted with a total of 17 stakeholders who were either involved with the project or familiar with the farming community or content of the project. The key informants included six people directly involved in the Environmentally Responsible Management Practices project; five Punjabi American community members; three researchers who have studied Punjabi American culture in the Yuba City area; and three people with expertise in pest management and/or IPM methods. Key informant interviews were conducted in person, by telephone, and by email. The purpose of the key informant interviews was to assess project participant perceptions of the project, gain insight into the best strategies to engage the Punjabi American community, learn about the context of pest management and IPM, and to obtain an initial list of growers to contact for interviews.

Grower interviews

Evaluators conducted interviews with 40 Yuba City area growers between June and September 2009. In-person interviews were conducted with 38 growers and two interviews were conducted over the phone. Interviewees were selected via a snowball sampling method. Of the 78 growers contacted for this study, 40 participated in interviews, for a response rate of 51%. Interviews were conducted on-farm, in growers’ homes or offices, or at a local food establishment and typically took between 30 minutes and an hour. The interview protocol was developed in collaboration with project staff including Farm Advisors and CAFF staff and consisted of questions on farming history, farm characteristics, on-farm decision making, information sources, Cooperative Extension use, awareness of specific project outreach efforts, orchard and pest management practices, and perceptions of water pollution.

1 The response rate was affected by the timing of the evaluation, which proved to be a challenge in accessing growers, since the bulk of the study took place during harvest season, the busiest time of year for orchard growers.
FINDINGS

Farmer characteristics

The participants in this study have been farming for an average of 26 years, with a median of 27 years.\(^2\) The majority (44%) of farmers interviewed for this study were between the ages of 40-60 while 36% were older than 60, and 21% younger than 40. Of the 40 interviews conducted, 18 participants (45%) were of Punjabi descent.\(^3\) The majority (72%) of the growers interviewed indicated that farming was their primary occupation. The remaining growers held a variety of other occupations including working as a truck driver, teacher, pest control advisor (PCA), real estate agent, banker, hardware store clerk, and TV producer.

Farm characteristics

The number of orchard acres farmed by study participants ranged from 19 acres to 5,000 acres. Participants reported farming an average of 624 acres of the orchard crops targeted in this study, including almonds, peaches, prunes, and walnuts. The median orchard acreage was 430 acres with 25% farming less than 140 orchard crop acres and 25% farming greater than 730 orchard crop acres. Ninety percent of growers reported that they have non-bearing (new) plantings. Approximately one-third (36%) of the growers interviewed reported farming other crops in addition to their orchard crops including rice, wheat, olives, kiwis, pomegranates, grapes, safflower, persimmons, pluots, melons, and cattle.\(^4\)

Farming information: Sources and use of Cooperative Extension

Growers were asked about where they get their information about farming, the extent to which they use various Cooperative Extension information channels, their perceptions of those information channels, and what types of information they would like to receive in the future.

General information sources

Growers reported using a wide array of sources, including print media, meetings, Internet, and talking with other people, in order to get information about farming. Print media sources included grower magazines, trade publications, and agricultural newspapers, along with newsletters from Cooperative Extension. Many growers reported attending a number of different types of meetings, including the Farm Bureau, commodity associations, marketing associations, agricultural commissioner meetings, classes held by chemical companies, and meetings and classes held by Cooperative Extension and UC Kearney Agricultural Center. Internet sources included the UC IPM website and Cooperative Extension emails and website. Growers also

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\(^2\) This statistic should be viewed with caution due to potential variances in farmer responses. The factors contributing to these variances include: respondents indicating the number of years that they have been farming in the US rather than in total, and respondents that grew up on farms stating either the number of years the farm has been in the family or the number of years that they have been involved in the farming operation in a management position.

\(^3\) A Punjabi community member informed us early in the study that while the community is sometimes referred to as “Indian” or “East Indian,” Punjabi or Punjabi-American is the preferred nomenclature because the Punjab region spans across eastern Pakistan as well as western India. We use “Punjabi” to refer to first-generation immigrants as well as those of Punjabi heritage or descent, after being informed by community members that even third and fourth generation immigrants consider themselves Punjabi.

\(^4\) Although some of these crops are orchard crops, they are categorized as non-orchard crops for the purpose of this study because they were not included in the scope of outreach efforts for the project.
reported getting information from other growers and people involved in agriculture, including independent consultants, professional PCAs, Farm Advisors, neighbors, family, and word of mouth.

**Use and effectiveness of Cooperative Extension information**

Most growers interviewed for this study (83%) use Cooperative Extension at least occasionally. The degree to which growers use Cooperative Extension as a resource ranges widely, from frequent use as a primary resource on general information about farming to rare use as an emergency contact. Of the growers who use Cooperative Extension, 20% said that they do not use Extension on a regular basis, but do seek information when they have specific serious issues. The most common types of information sought were general advice about farming practices and pest and disease control. A few growers (7 out of 40, 18%) did not use Cooperative Extension at all. Some of these growers replied that they use other sources of information, while other growers stressed that Cooperative Extension is not useful because they already know enough and do not need the help. Punjabi growers were less likely to use Cooperative Extension compared to non-Punjabi growers; 29% of Punjabi growers did not use Cooperative Extension whereas only 16% of non-Punjabi growers did not use Cooperative Extension. However, it is important to note that the sample size is too small to make definitive conclusions regarding this finding.

**Overall experiences and perceptions of Cooperative Extension**

In general, grower perceptions of Cooperative Extension were positive. Many growers valued the advice of Cooperative Extension Farm Advisors. Several answered that it was valuable to get multiple opinions. As a grower explained, “They provide another opinion on things. The more opinions the better, because it helps you make the final decision on things. I think they are helpful.” While growers value the information provided by Cooperative Extension, that information is not always easy to translate into actual on-farm practices. In some cases growers require more direct one-on-one assistance than Cooperative Extension currently offers. The main critique of Cooperative Extension was simply that the Farm Advisors do not have enough time, and are stretched too thin. Growers we spoke with would like Cooperative Extension to have more time and resources dedicated to working directly with growers.

**Outreach methods**

In the Environmentally Responsible Management Practices project, a number of different outreach methods were used to reach growers. The evaluation included questions about each of these specific outreach practices.

**Newsletters from Cooperative Extension**

Newsletters were the most commonly used information source coming from Cooperative Extension. A majority of the growers interviewed (80%) said that they receive newsletters, and most said that they were helpful. Of the growers not receiving the newsletters, 100% expressed interest in receiving them. Newsletters were received by slightly fewer Punjabi growers (72%) than non-Punjabi growers (82%). Many growers felt the newsletters were most helpful as a reminder of best practices, not as an introduction of new information.
**Punjabi translations of newsletters and fact sheets**

While the English-language newsletters were a very highly regarded source of print-based information, the newsletters and fact sheets translated into Punjabi were less effective. The idea behind the translations was to show the Punjabi community that Cooperative Extension was working with them. However, no one we spoke with had read the Punjabi language translations and only one grower was aware of them. According to the growers we spoke with, most of the Punjabi farming community speaks and reads English, and even if they do not, they have someone in their family that does. Also, a few growers indicated that Punjabi is used primarily as a spoken language, not a written one.

**Cooperative Extension meetings**

After the newsletters, meetings, including indoor meetings and field days, were the second most well used source of information from Cooperative Extension. Three-quarters (75%) of growers reported attending meetings at least occasionally. Field days and indoor meetings were both considered valuable for different reasons. Some growers valued the interaction prompted by the field days. Others appreciated the efficiency of the indoor meetings. In particular, growers valued the hands-on information presented at the meetings, particularly at the field days. The opportunity to meet and learn from other growers was one of the most widely appreciated aspects of the meetings. A few growers mentioned that they would like to see a recap of the information presented in the indoor meetings and in the field days.

The timing of the meetings is crucial and was one of the main factors that kept growers from going to meetings. In particular, growers who have off-farm jobs have trouble attending meetings. It is important to note that there were differences in meeting attendance between Punjabi and non-Punjabi growers. Of the Punjabi growers interviewed, 67% reported attending meetings, as opposed to 81% of non-Punjabi growers.

**Television broadcasts with Farm Advisors**

Of the Punjabi farmers we spoke with, 39% had seen the Cooperative Extension TV broadcasts on *Punjabi Waves* and/or *Des Pardes*. Those who did see the TV broadcasts found them helpful for the most part, and liked the fact that Cooperative Extension was making an effort to reach out to more growers and get the messages out. Several members of the project staff reported hearing positive feedback about the TV broadcasts as well. However, technological barriers keep some from viewing the broadcasts: a number of farmers said they have not seen the programs because the broadcasts are only on cable TV, whereas many rural residents get satellite instead. A few expressed interest in seeing the broadcasts expanded in both English and Punjabi either to other TV channels or to the Internet, where growers are increasingly turning for information.

**Demonstration projects**

Demonstration projects in which project staff collaborated with farmers in the area were held in order to test new practices (cover crops and spray alternatives) and learn more about their implementation, and to create visibility of the practices and encourage farmers to implement them. The demonstration component of the project was met early on with difficulties coordinating between two major entities involved in the project, the Water Board and the UC ANR, and UC Cooperative Extension was unable to financially participate in the project. This limited grower contact and outreach around demonstration projects.
Demonstration projects seemed to be very helpful for the farmers who were directly involved and for the PCAs and project staff involved, but less helpful for other growers in the community. In general, growers had positive experiences working with CAFF and Cooperative Extension on the demonstrations. However, a few demonstration hosts were confused as to the actual goals of the demonstration projects, and wanted more explanation or involvement from project staff. Most of the growers involved in the demonstration projects described having positive experiences as to the actual efficacy of the practices being demonstrated, but cost effectiveness was an issue. For the cover crop growers, the aesthetics proved to be the biggest drawback, since growers felt they made the farm look messy. Overall, demonstration projects seemed successful at changing practices of the growers actually involved in the demonstrations.

Future information

When growers were asked what kind of information they would like to see from Cooperative Extension in the future, a large percentage of growers (40%) indicated that they would like more information on disease and pest management, and some growers (18%) indicated an interest in nutrient management to maintain healthy trees. After learning more about on-farm practices, farmers were most interested in new research (30%). Saving money was another area that growers (23%) expressed an interest in learning more about from Cooperative Extension in the future.

Methods of receiving information

Email and mail were the primary methods by which growers prefer to receive information. Email was preferred by 47% of growers, while 32% preferred mail and 21% prefer to receive both emails and mailed information. Punjabi growers preferred mail to email at much higher rates than non-Punjabi growers in the study. Of the Punjabi growers interviewed, 59% preferred email, and only 18% preferred mail. In comparison, only 38% of non-Punjabi growers preferred email, and 43% of non-Punjabis preferred mail. Twenty four percent of Punjabi growers wanted both mail and email, while 19% of non-Punjabi growers wanted information in both forms. For time-sensitive or very important information, several growers said they would prefer a phone call. Several growers also pointed out that most people have cell phones and/or smart phones and they would like to get more information this way.

On-farm decision making

A main goal of the evaluation was to better understand how growers make decisions about pest management and about farming in general. Growers were asked about the factors that affect their chances of staying in business and other factors affecting how they make decisions on their farms. They were also asked about recent changes in farming practices, in order to better understand how these decision-making factors actually play out.

Decision making factors

Economic pressures, including market prices and input costs, were by far the first and foremost factor affecting the viability of the farm and were cited by 85% of growers interviewed. Specifically, 75% of growers cited market prices, 40% cited input costs, and 30% mentioned both. The second factor in determining success of the farm, cited by 50% of farmers, was the impact of weather. Like the economy, weather is not within the control of growers. Following economic factors and weather, the impact of regulations was mentioned by 45% of growers as an
important factor regarding their success. Several growers pointed out the difficulty of competing in a global market when California growers are more regulated than farmers in other countries. There was a significant difference between Punjabi and non-Punjabi growers in terms of the perceived impact of regulations: 61% of Punjabi growers mentioned regulations as an important factor, compared to only 32% of non-Punjabi growers. Labor was also cited as important by 40% of growers. Finally, water was mentioned by 28% of growers as a critical determinant of farm success, both in terms of cost and availability.

Most of the above are seen by growers as basically out of their control. These external factors create the context of farming and of making decisions on the farm. In terms of the Environmentally Responsible Management Practices project, it is important to remember this context, in which growers see themselves as severely constrained by economic and regulatory pressures out of their control, and are always looking for ways to save money.

Growers described a few decision-making factors over which they had more control, including long-term planning and paying attention to crops. Managing tree health is another important factor that is at least somewhat within the growers’ control. Adjusting farming practices to cut costs was also mentioned as areas that can fall under the growers’ control. Additionally, some growers mentioned protecting themselves through diversification of business activities. Finally, a few farmers cited the availability of information and advice as an important factor in their success. Several growers stated that in making decisions, it is important to see other farmers implement a practice first.

Changes in farming systems

The overwhelming majority of farmers (93%) had changed or were in the process of changing from flood irrigation to micro-irrigation or drip. The reasons cited were that it uses less labor and less water, and can therefore save money. Growers were overwhelmingly positive about their switch in irrigation systems. Several growers (40%) were using or experimenting with planting cover crops. The primary reasons included saving money and labor, since cover crops reduce the need for tillage and the associated work and fuel expenses. Secondary reasons included improving water penetration and nitrogen fixation. A handful of other changes were mentioned, including planting trees closer together in a “hedgerow” style for mechanical pruning, installation of soil probes for testing moisture to better inform irrigation, switching to softer chemicals, and upgrading equipment.

Often, when describing their new farming practices, growers cited multiple reasons and benefits including economic (using less fuel), environmental (less erosion or runoff), and saving time and labor. Several growers cited making these changes on the advice of Cooperative Extension or their PCA. Others said they made the changes due to NRCS funding, or that they would be interested in implementing changes if there was funding available to assist their transitions.

Growers were also asked about future changes they would like to make. Some of the most desired future changes included increased use of IPM methods, increasing the acreage under micro-irrigation, use of soil moisture probes, and hedgerow spacing. Several also mentioned wishing to switch to new crops beyond the typical crops grown in the area.

Pest management

The evaluation sought to provide a better understanding of how growers are currently managing pests, how they get information and make decisions about pest control, and the degree to which growers are aware of reduced risk pest control methods.
**Pest control methods**

Peach twig borer, codling moth, oriental fruit moth, and walnut huskfly present the majority of pest problems for growers. Almost all growers we talked with reported using conventional pesticides to control pests. The most commonly used pesticides included Asana and Lorsban, along with others such as Warrior and Imidan. Several growers noted that peaches give them the most problems in terms of pests.

Over half of growers (55%) had tried or were currently using at least one form of alternative or reduced risk pest control material. Pheromones were the most commonly used reduced risk pest control material; of the 55% of growers who have tried at least one reduced risk material, 73% had tried or were using pheromones. Of the total sample of growers, 40% had tried or were using pheromones. Other reduced risk materials in use included Dipel, Dimlin, Delegate, Intrepid, fall applications of Asana or Imidan plus oil, “other organics,” and Cyd-X (used in a trial). Several growers cited concerns about effectiveness and cost as reasons they did not use the reduced-risk pest control materials. Cost was also an issue for interested growers.

**Perceptions of pest problems**

Close to half of the growers (43%) stated that pests and pest control present a major problem to their farm. Of the 57% who did not think pest control was a problem, 30% still considered it a serious issue that required time, money, and/or energy. When asked if the pesticides they currently use are doing a good job, the majority of growers (65%) replied yes, but many added that they only work “if I spray when I should” or “if we do it right.” Some growers who agreed current pesticides are effective also expressed a desire for more options and less regulation. Growers who felt that the pesticides were not effective stated that the current pesticides are “not as good as the old ones.” Others added that resistance seems to be increasing. Several growers wanted pesticides to be more target-specific so they would not kill beneficial insects.

**Information about pest management**

When making decisions about pest management, almost all the growers we spoke with consulted a PCA. Almost half (45%) reported using a private/independent PCA, 75% used a chemical company PCA, and 25% were using both. Those who used independent PCAs stated that they value getting information from someone who is perceived as more neutral because they are not selling a product. For the most part PCAs were the primary source of information about pest management. A few growers did not use PCAs regularly, citing their long-time experience, but did consult PCAs on occasion. Many supplemented the advice from the PCA with information about pest control from a variety of other sources, including Cooperative Extension Farm Advisors and classes, the County Ag Commissioner’s office, word of mouth and talking to neighbors, classes held by the chemical companies, conferences, UC Kearney Agricultural Center, and websites.

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5 Due to the limited working knowledge of evaluators in the realm of pesticide materials, combined with vagueness and/or limited knowledge on the part of growers interviewed, these results should be interpreted with caution. Additionally, a substantial number of growers for the study were recruited via an independent PCA who tends to promote alternative pest control methods, so these numbers may be larger than average for the area.

6 These numbers may not be representative of growers in the Sutter & Yuba region as a whole, due to our snowball sampling methodology. As part of our sampling, we consulted with an independent PCA for names of area growers, so our sample likely includes more growers using an independent PCA than is average for the area.
It is notable that there were some differences between Punjabi and non-Punjabi growers in terms of what types of PCAs were used. Ninety-four percent of Punjabi growers that we interviewed cited that they use a chemical company PCA while 59% of non-Punjabi growers indicated that they use a chemical company PCA. While only 28% of the Punjabi growers consulted an independent PCA, 59% of non-Punjabi growers took this approach. This may indicate that in order to better reach Punjabi growers it is important to collaborate with chemical company PCAs. It may also mean that Cooperative Extension should emphasize that, like the chemical companies, they provide free advice.

Pest monitoring and decision-making

The majority of growers (65%) responded that they do monitor their own pests, rather than relying solely on a PCA to do the monitoring. It should be noted that the interpretation of “monitoring” was left up to the grower, so the extent to which monitoring is a significant activity in pest management was unclear. Some growers did not elaborate on what “monitoring” entailed to them, while others described a range of activities they considered monitoring, from just keeping an eye out for pests such as aphids to sophisticated trapping and counting systems. Growers who did monitor found that having more eyes on the field allowed them to catch pests faster. Some growers who did not check for pests on their own considered pest monitoring something they should be doing but just were not able to find the time to do, while others considered it the job of the PCA and thus not their responsibility. How growers actually make decisions regarding pest control methods varies widely, from taking careful consideration of field conditions to just spraying by calendar.

Awareness and understanding of reduced-risk pest control

When asked what the idea of “reduced risk pest control” meant, growers had a wide range of answers. Only 25% of growers did not have any idea or definition of what reduced risk pest control entailed; a few replied that they had “no idea” or “I haven’t heard of that before, is it new jargon?” The majority (75%) of growers did have some ideas of what reduced risk pest control meant, though definitions ranged widely from a simplistic understanding that it was better for people and the environment to a complex understanding of IPM management concepts. Those with an understanding of reduced risk chemicals fell into two broad categories: those who defined it as using less toxic chemicals and those who defined it as using less chemicals. Motivations included reducing toxicity for workers as well as the environment.

A few growers expressed a strong stewardship ethic. One described reduced risk pest control as “Less poisons. I’m a steward of the land—if I poison the land I’m poisoning myself.” However, some growers expressed doubt that it is possible to reduce toxicity of chemicals and also control pests adequately. Of those with a working definition of reduced risk pest control, 30% expressed skepticism that it was effective, or expressed concerns about the increased risks to the farm from using less toxic materials.

When asked more specifically about awareness of Integrated Pest Management (IPM), some growers did not know much at all. Other growers, though, described their IPM programs in more detail, which included reducing toxicity of chemicals and monitoring. Several who were

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7 The question, “Are you aware of or using any IPM methods? What IPM methods are you using? Where do you get information about IPM?” was added after interview 20 when evaluators reviewed the interview protocol and refined it based on interviews up to that point. This section is thus based on 20 interviews rather than 40. Statistics are not calculated for this section because of the smaller amount of data.
interested and/or implementing IPM practices cited barriers to using more IPM methods, including pest control practices of neighbors, and knowledge and information. Those who did use IPM methods relied on their PCA, Cooperative Extension, NRCS, and the Internet for information. Many were involved in programs with the NRCS to use softer chemicals.

**Perceptions of water quality**

To gauge perceptions and views of water quality, growers were asked two questions related to water, one about their involvement with a watershed group and one about whether they saw water pollution as a problem in the area.

**Watershed groups**

Most growers (78%) reported that they are members of a watershed group. Since involvement in watershed groups is more or less mandatory (growers must either be a member, or initiate a lengthy and expensive monitoring process themselves), this number may be low; it is possible some growers did not recall signing up. Involvement ranged from active watershed group board members to those who were not entirely sure they were members or what the organization did. Of those involved, a few seemed positive about the role of the watershed groups in monitoring runoff. However, the majority of growers involved in watershed groups were displeased with their involvement, viewing the watershed groups as an unwanted and expensive mandatory intrusion. Although these growers technically were members of the watershed group, they did not see it as representing their interests or acting on their behalf.

**Water pollution**

Growers were asked whether they thought water pollution was a problem in the area. The question generated a wide range of responses and attitudes ranging from matter-of-fact to heated and defensive. Most growers were not concerned with water pollution, and only 38% of those we interviewed saw it as a problem. There were some differences based on ethnicity. While 46% of the non-Punjabi growers viewed water pollution as a problem in the area, only 28% of Punjabi growers saw water pollution as a problem. Growers’ perceptions of water pollution fit into several categories: those who did not see it as a problem; those who saw water pollution as primarily a residential or homeowners’ problem; those who saw it as a problem, but only from a few “bad” farmers and not from their own farms; and those who thought it was indeed a problem.

Growers gave three main reasons for why they did not think water pollution was a problem: because regulations already take care of it, because farmers do not want to waste water or chemicals, and because of the natural landscape. Perhaps the most common sentiment from growers regarding water pollution was that it is primarily a residential or homeowners’ problem, not a problem related to agriculture. This response came from almost one-third of the growers interviewed, and was often accompanied by strong emotions about how farmers get blamed too much. Farmers see themselves as less responsible for pollution than other causes, because “chemicals are expensive, and we’re trying to cut down. Other causes are worse, but we [farmers] get blamed anyway.”

Along with pointing out how good farming practices kept water pollution from being a problem, growers worried about a few irresponsible farmers not using these practices: “Some people violate the rules and cause pollution and then we all get blamed. Maybe two percent of farmers are responsible. It’s just a few farms.” Finally, there were a minority of growers who
felt that water pollution was indeed a farming problem, and that all growers, themselves included, were at least partially responsible.

Those who did see water pollution as a problem suggested that education about water pollution would be useful to increase awareness. Given that only 38% of growers saw water pollution as a problem, this suggestion to increase basic education on what the problem is and how it should be dealt with seems well placed. Along with education, one grower called for increased monitoring and enforcement of rules. Another suggested increased collaboration between environmentalists and farmers.

CONCLUSIONS AND RECOMMENDATIONS

Project effectiveness
This assessment of project effectiveness examines the degree to which the project has been successful at conveying messages about responsible orchard management practices and encouraging the adoption of these practices. It also looks at the effectiveness of specific outreach methods, and examines how successful the project was at strengthening trust and relationships between growers and information providers.

Messages about orchard management practices
A major goal of the project was to convey messages to growers about the importance of general production practices that ensure healthy tree and crop growth. Results were mixed as to whether messages about environmentally responsible orchard management practices are clearly getting through to growers.

According to the staff of the Environmentally Responsible Management Practices project, the project has had limited success achieving its goal of getting the messages out to growers. A project staff member said that they were “doing the work, but not sure if it is changing things.” One problem with the project, according to staff, is that the messages of environmental responsibility do not resonate well with growers and the attempt to frame the project around saving money has not worked well.

The grower interviews confirmed that the project has had mixed success at conveying general messages about environmentally responsible orchard practices. Success at conveying information related to water quality was particularly limited. The project seems to have had better success in spreading messages about reduced risk pest control. However, while growers know about reduced risk pest control, many expressed doubt or skepticism about its efficacy, and were concerned about the risks of not spraying enough. The evaluation found that growers consider economic concerns the most important factor as to whether they are able to stay in business. Future projects conveying messages about reduced risk pest control must therefore stress the economic benefits if they are to reach growers effectively. The impact of regulations was also an important factor to growers. Messages may be made more effective by emphasizing that increased regulations are likely if growers do not address issues of pollution and pesticides themselves.

Adoption of orchard management practices
Along with bringing messages about good orchard management practices to growers, the project also sought to increase the actual adoption of those practices. It is somewhat difficult to
tell the extent to which this project has changed orchard practices, since there is no baseline assessment from the beginning of the project. Overall, it seems growers are adopting techniques where it makes economic sense to do so.

According to project staff, one of the major barriers to implementing alternative practices is simply that growers have been farming using their current practices for many years, and the practices they use are effective. It is difficult to convince growers to voluntarily switch from proven effective pest control methods to potentially risky new methods, and use of IPM methods such as the threshold system or lower-toxicity sprays makes growers nervous. Risk aversion is strong in a context in which few determinants of farm success are within growers’ control. Project staff also pointed out that while CAFF and Cooperative Extension may consider this a high priority project, it does not necessarily match the growers’ priorities. Growers did not demand the project; rather, the impetus came from other players. In the evaluation, when asked what kind of information they wanted, growers were primarily concerned with saving money by improving their cultural farming practices. This points to another barrier recognized by project staff and confirmed by growers: that of cost. Growers may experiment with alternative methods if someone else pays for it, as in the demonstration projects. But, many of the alternative pest control demonstrations proved expensive and were not cost efficient, discouraging growers from using these methods.

Adoption of management practices varied widely depending on the practice. Some practices were in use by a significant number of growers. Ninety three percent were incorporating micro-jet or sprinkler irrigation, 65% were monitoring pests on their own instead of relying solely on a PCA, 48% had at least tried some alternative sprays, mostly pheromones, and 40% were using cover crops and even more were using some sort of ground cover. Many growers expressed interest in using more IPM practices in the future, which is encouraging news for future projects.

Effectiveness of outreach methods

The project sought to improve outreach methods, and to create outreach materials targeted specifically to Punjabi farmers. A major goal of this evaluation was to assess the effectiveness of these outreach materials.

Newsletters: Newsletters were very effective, and growers found the information useful and valuable. However, the Punjabi language translations were less effective. Although the project staff felt the “effort is really appreciated,” no Punjabi growers interviewed had actually read the translated newsletters. In the future, efforts to increase email newsletters may be more effective than the language translations.

Meetings: The meetings received positive feedback, and growers particularly appreciated practical information and the opportunity to connect with other growers. However, project staff observed that the meetings generally had a low percentage of Punjabi growers in attendance. Staff noted that some of the meetings were successful and well attended, particularly those in which economic data was presented, and those in which Cooperative Extension teamed up with other organizations. Growers also heavily stressed the importance of scheduling meetings during the winter when they have more time.

Demonstration projects: The growers who participated directly in demonstration projects found them valuable, but most of the growers not directly involved had not heard much about the demonstrations. Project staff observed that the demonstration projects were most valuable for
the researchers themselves. Additionally, according to the project staff, the demonstrations would have benefited from more involvement from PCAs.

**Television broadcasts:** Those who had seen the television broadcasts gave them positive reviews and found the shows interesting and informative. The producers consider it important to have programming about agriculture, since the Punjabi community is agriculturally based and a large percentage of area growers are Punjabi. For future outreach, the television broadcasts seem to be effective and well received, and broadcasts should be expanded to other TV channels and the Internet.

**Strengthening trust and relationships**

One of the main project goals was to strengthen linkages between Sutter and Yuba County growers and their pollution prevention resources with a special emphasis on the Punjabi community. The degree to which the project has succeeded at strengthening trust and relationships is unclear. Project staff identified a number of perceived barriers to working more closely with the Punjabi-American population, including language barriers and lack of attendance at meetings. Project staff speculated that the tightly woven fabric of the Punjabi community means growers do not seek social networking opportunities via Cooperative Extension.

According to members of the Punjabi community, it is important for Cooperative Extension to keep reaching out to Punjabi growers. Punjabi community members we spoke with noted that the community is proud of its strong agricultural heritage, since many were farmers in India and consider farming part of their culture. They suggested that Cooperative Extension and other projects engaging Punjabi growers would do well to be more involved in community events. Also, since a number of Punjabi farmers have off-farm jobs, holding evening and weekend meetings and classes might help make the meetings more accessible to Punjabi farmers. The television broadcasts were well received, suggesting that this method should be continued along with expanding a personal presence in community events.

**Suggestions for future work**

**Future outreach on IPM and water quality**

This evaluation suggests that future outreach seeking to improve water quality must first concentrate on educating growers about water pollution problems. Along with education about water pollution in general comes the question of incentives to change practices. There are a number of ways of encouraging growers to implement practices to curb water pollution, including voluntary efforts, increased regulation and enforcement, and market-based models.

Because growers are in such a tight cost-price squeeze, they cannot afford to be making on-farm decisions based solely on altruism, and should not be expected to change farming practices purely on a voluntary basis. It is critical to emphasize economic benefits in the cases where responsible practices are financially beneficial. In terms of regulations, future education about water pollution could stress the potential regulatory consequences of not addressing the issue along with the benefits of addressing water quality. Market-based solutions in which growers receive a price premium for meeting environmental standards are another potential approach. Some examples include organic certification, or the “Lodi Rules” system to promote environmentally friendly winegrape growing. Another solution for outreach on water pollution
and IPM may be to target multiple audiences for environmentally responsible practices, including homeowners and developers, so that growers feel less unfairly burdened.

Coordination between organizations

Increasing coordination between different entities and organizations could be helpful for addressing water pollution and encouraging environmentally responsible practices. The monitoring done by watershed groups, the conservation payments from the NRCS, projects by Audubon Society, and the research and education from Cooperative Extension are all important pieces and by coordinating efforts and educational goals, this existing structure could be more effective. The evaluation showed that currently most farmers belong to watershed groups, but do not see the groups providing useful information. The watershed group structure might be leveraged as a tool to educate growers about water pollution and positive practices. Teaming with other organizations such as commodity boards, marketing cooperatives, and the Farm Bureau to educate growers about environmentally responsible management practices could be effective, since many growers already attend these meetings.

Working with PCAs

Both growers and project staff raised the issue of the pest control advisor system. Many growers rely heavily on the advice of PCAs employed by chemical companies. These PCAs provide free advice to growers, and make their money from sales of chemicals. According to key informants, although many PCAs are ethical and do not try to sell unnecessary chemicals, PCAs working for companies do rely on chemical sales to make a living, and thus may have an incentive to sell more products or spray by calendars rather than monitoring. Private PCAs who are paid for their advice directly by growers, so their income is not correlated directly to their chemical sales, but they do charge fees, so many growers choose not to use them.

Finding an alternative incentive structure for PCAs could be key to improving water quality, since growers rely so greatly on the advice of the PCAs. Working directly with PCAs was one useful technique employed in this project that could be expanded upon, since having the “buy-in” of PCAs is a crucial element in convincing growers to change their practices. Another potential way to rework the structure of the PCA system, suggested by a PCA, was that the people who make recommendations should have more liability for the application of the pesticides. Project staff also mentioned the desire to communicate more strongly to growers that there are other options beyond the advice of the PCAs and that growers should critically think about their decisions.

Future Cooperative Extension outreach

One of the most effective aspects of Cooperative Extension outreach is providing multiple formats of outreach. Cooperative Extension should continue and expand upon a comprehensive outreach strategy in which every piece of information goes through multiple channels, including newsletters, meetings, emails, press releases to publications, other agriculture-related meetings, and other organizations. Higher-tech outreach should be considered, as well. Many growers have smart phones or at least cell phones, so information via email and text messaging could reach a large number of growers. Information could be formatted specifically for smart phones, and videos could be posted online in both English and Punjabi. The timing of messages is also very important. It may be helpful to send timely
information as needed throughout the appropriate season, but also to send recaps about what was learned or covered during meetings and field days during the winter, when growers are less busy.

Regarding the messages themselves, Cooperative Extension should continue to stress simple, hands-on messages that explain practices, pros and cons, and include testimonials or advice from growers who have tried the practice. Every piece of information or new practice should come with a cost-benefit analysis and should stress the economic aspect. Messages about environmentally responsible pest control methods should emphasize why water pollution is a problem, how it is caused, how the method might improve it, and what happens if growers do not improve water quality. Messages about IPM methods must stress quick, easy techniques that are not too complicated, time consuming, or expensive.

Finally, several key informants observed that the overall Cooperative Extension structure at the state level has been changing in ways that may be problematic. The University of California has been encouraging Cooperative Extension to have more group meetings and do less one-on-one outreach. However, the project staff observed that the most positive interactions with growers, particularly Punjabi growers, occur in a more one-on-one setting. Shifting away from individual assistance, and more towards group events means that Cooperative Extension staff are less able to develop individual relationships with farmers. This likely cannot be fixed at the county level but should be taken into consideration in future work.

Future outreach with Punjabi growers

The evaluation found that the television programs were much more effective than the translated Punjabi language newsletters at reaching Punjabi growers. Expanding the television broadcasts, for example, broadcasting them on other local channels, archiving them on the Internet in both English and Punjabi, or sharing DVDs via temple or community organizations, could be a worthwhile future project. Additionally, Punjabi growers preferred to receive information by email as opposed to mail at a much higher rate than non-Punjabi growers, which stresses the importance of using networking opportunities and events with Punjabi growers as chances to build email databases.

Several key informants stressed that the Punjabi community is very proud of their agricultural heritage. This may prove a useful inroad for future work with Punjabi growers. Those wishing to work with Punjabi growers should consider connecting with temple organizations and working closely with groups like the Punjabi American Heritage Society. For example, a future project could include collaboration with the Punjabi American Heritage Society to create promotional materials (videos or publications) or awards featuring examples of Punjabi farmers who are excellent stewards of the land and are implementing positive practices.

Maintaining a presence at community events such as the Punjabi American Heritage Festival and other events throughout the year is important for building connections. As one interviewee noted, project staff and Farm Advisors “could be more involved in community events… mostly they just need to continue to have a presence.” Also, working closely with the PCAs that work primarily with Punjabi clients could be effective. Project staff noted that the Punjabi growers are very involved in their own community and have strong social networks.

They may find it effective to tap into those existing social networks instead of trying to convince growers to participate in Cooperative Extension networks.
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