

# **RECREATING THE DELIVERY OF INFORMATION: PACKAGING EXISTING IPM KNOWLEDGE IN MORE TRANSPARENT WAYS**

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## **ABSTRACT**

Over the past 50 years, pest management approaches have developed in quantum leaps from chemically dependent to integrated, environmentally responsible and our delivery methods have advanced as well. The newest delivery format from the UC Statewide IPM Program is the Year-round IPM Program. It is a web-based, multi-pest, seasonally-integrated program that allows the user to explore a large database of information and delve as deeply as needed for details on how to carry out specific activities.

## **INTRODUCTION**

Relevant and current information is the stock and trade of dynamic and robust IPM programs. For each pest or problem, one must correctly identify the cause, estimate the population density, establish the threat to the crop, and make control decisions. Each of these steps requires knowledge, the application of information to rational decision-making and management approaches that result in as few secondary consequences to the environment as possible. In advanced IPM programs, the practitioner must further integrate activities for multiple pests and cultural practices so that they function in a compatible manner. Providing information and guidance in accessible, relevant and accurate media that growers or PCAs can and will use has been and continues to be a challenge to the University of California Division of Agricultural and Natural Resources.

## **DELIVERING PEST CONTROL INFORMATION: THE EARLY PEST CONTROL CIRCULARS**

Since at least the early 1950's, The University of California Cooperative Extension (CE) and Agricultural Experiment Station (AES) have been producing leaflets and bulletins that provide guidance in the timing and use of control options. These publications usually have included not only chemical control, but cultural and biological control and suggested monitoring techniques as well.

During the 1960s and 1970's, the series entitled "Pest Circulars" was the primary source of pest management information. These publications were developed and written by crop and pest discipline experts who gathered together and reached a consensus of best control approaches, but usually focused on pesticide options. By the mid-1980's, with increasing retirements of campus faculty and increased emphasis on publishing in peer review research journals, production of these circulars and other timely, relevant pest management publications dwindled.

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When the UC Statewide IPM Program was established in 1980, a major goal was to revive UC's practical pest management publications for growers and PCAs and promote available IPM methods. The first series of publications put out by the program were the IPM manuals. These manuals were developed by dedicated technical writers who researched literature, interviewed individuals, convened discussion meetings and gathered the best production and pest management information available for major California crops. (Sixteen crop IPM manuals are now available from UC IPM). For example, IPM for Alfalfa Hay (Flint, 1981), provides great detail on the biology, monitoring and decision making for major arthropods, weeds, disease and nematodes. Hundreds of photographs were obtained for identification and diagnosis of pests. These manuals also include information about crop development, regional production areas, and abiotic problems. Management guidelines were provided, including information on biological and cultural controls but specific pesticide suggestions were not made to avoid locking in pesticides that were subject to change over short time durations. The manuals were dedicated to collecting information that did not substantially change over a 5- 10 year time period.

### **DELIVERING TIMELY INFORMATION: DEVELOPMENT OF PEST MANAGEMENT GUIDELINES**

The IPM manual for alfalfa was the first of the UC IPM manuals and was published in 1981. It was revised slightly in 1985 and then reprinted without revision in 1990. While much of the information is still accurate (e.g. biology and identification pests, crop cycles), farm advisors and others identified a need for publications that contained pesticide recommendations similar to the Pest Control Circulars. Beginning in 1987, the UC IPM Program began to develop the Pest Management Guidelines (PMGs) as a companion publication to provide relevant, timely and easily revised information about pesticides and other pest management decisions. There are currently 44 PMGs available which are revised on a three year cycle.

The Alfalfa PMG (Summers et al, 2006) consists of sections on general information (IPM, biological control, use of a sweep net and selectivity of insecticides), insects and mites, diseases, weeds management in seedling alfalfa, weed management in established alfalfa and nematodes. A typical entry on an insect pest includes description of pest, damage, and management, including cultural, biological and organically approved methods.

UC IPM Pest Management Guidelines are written by UC faculty, CE Specialists and Farm Advisors following a standard format and assisted by an IPM Project Pest Management Guideline Coordinator. The PMG Coordinator initiates and coordinates 3-year revisions with authors. Updates may also be initiated when changes in registrations or use of pesticides occur or requested by authors.

While the PMGs offered brief descriptions of non-chemical options, at first they were primarily aimed at providing guidance on relative efficacy and selectivity of pesticide choices. The PMGs are arranged by pest organism... Limited information about the pest, its biology and damage, sampling and action threshold information was provided, but the reader was often referred to an IPM manual if available. However, for those crops without a companion IPM manual, PMGs provided the most complete collection of information.

When they were first produced in the late 1980's, the PMGs were printed and circulated centrally. They were available from both the ANR central publications warehouse and county Cooperative Extension offices for a cost. The entire collection can be purchased on subscription basis and updates are mailed as they occurred.

### **DELIVERY OF INFORMATION THROUGH THE INTERNET**

With the advent of the internet, information could be delivered to individual desktop computers. The UC Statewide IPM Program's web site went on line in 1995 with the Pest Management Guidelines as a central feature. PMGs could be delivered for free as printable files or read on-line. The on-line versions of the PMGs featured thousands of color photographs of pests, natural enemies, and pest damage unavailable in the paper versions.

However, the internet allowed even greater opportunity than simply providing delivery and printing services and photographs. New approaches to packing and presenting information become apparent and electronic PMGs (e-PMGs) were born. E-PMGs had the advantage of providing linkages and relationships between different types of information. New opportunities for blending IPM manuals and PMGs became available. For example, real time weather models could be linked into appropriate pest information and degree-day models to allow for predictive activities. The collection of IPM images developed from manuals could be digitized and made available for identification keys. Interactive web pages provided the opportunity for users to customize the information they sought. The most recent example of e-PMG advantages over PMG is the incorporation of WaterTox. This program is linked to a data base modified from USDA-NRCS WIN-PST (Pesticide Safety Tool for Windows) and provides rankings for potential pesticide water quality hazards for high risk soil types.

PMGs evolved into interactive electronic documents. While PDF files were still available for printing, the information could be more easily found and accessed as an "e-PMGs". However, the e-PMGs were still organized along pest lines and looked similar to the hard copy except the home page serves as a hyperlinked table of contents.

### **YEAR-ROUND PROGRAMS: THE NEXT STAGE OF DELIVERY**

As attention to environmental issues has increased during the first decade of 2000, the demand that IPM information address environmental quality has also increased. Issues such as water and air quality, worker safety and food security require relevant IPM responses. In addition to adding features such as WaterTox, selectivity charts, mode of action classes, and impacts of pesticides on natural enemies, the UC IPM Program recognized the need for reorganization of e-PMGs based on seasonal activity rather than pest species. The resulting Year-round IPM programs (YRP) were designed to alert farmers and PCAs to major activities they might need to be doing at each crop growing/development period to implement a comprehensive IPM program (Strand and Flint, 2005).

By organizing information around annual crop events, year-round programs provide more grower-friendly access to information than simple lists of pests. Growers plan their activities around the growing season and knowing what pests or pest management activities should be

considered at any one season makes it easier for them to plan or implement a comprehensive IPM program. This innovative structure creates new opportunities for accessing knowledge and seeking solutions to individual questions. It also facilitates the planning and use of preventive methods that are essential to good IPM programs. In the alfalfa year-round program, the “year” is divided into sections focused on activities in winter, spring, summer, fall and the unique situation of establishing a stand. For each season, the program provides information on special issues related to water quality and activities that should be carried out such as which pests should be monitored. Activities related to insect, weed, vertebrate, nematode, pathogen and often cultural practices are integrated on the same check list.

For detailed information on how to monitor or manage pests, the year-round program links with the Pest Management Guideline. Within individual pest guidelines, users can “drill” down, seeking as much information as they desire. PDFs of pest monitoring forms and pest or damage identification guides are also incorporated into the new programs. The ability to easily investigate information as deeply as you want is a major difference between paper PMGs and e-PMGs.

Another very useful feature of the YRP is the Annual Checklist. This checklist is a summary of all activities required to carry out a comprehensive IPM program in that crop. The grower or PCA can easily record the completed tasks through the production season. This checklist provides a good communication tool for PCAs and growers and can also serve as a personal record keeping tool or can provide a record for agencies requiring proof of IPM activities. YRPs are recognized as the University of California’s best management practices (BMPs) for pest management in the crops on which they have been developed. Year-Round IPM programs are currently available on the UC IPM web site for alfalfa, almonds, cotton, grape, nectarine, peach, plum and prune. Several others are under development. Beginning in the 2007 season, NRCS is providing financial incentives for growers who implement and document the use of YRPs for one of these crops (<http://www.ca.nrcs.usda.gov/programs/eqip/>).

## **THE FUTURE OF IPM INFORMATION DELIVERY AND LEARNING**

Year-round IPM programs represent a big step toward implementing more comprehensive IPM programs. The seasonal approach allows growers to easily grasp what pests need to be watched during each crop development period, potential implications to the environment if pesticides are used, alternate approaches and product choices (high risk vs. low risk products), and clear cut guidelines for how to monitor for pests and apply treatment thresholds. These integrated programs provide the opportunity for new, self-directed learning environments. The user is not limited to a linear experience in seeking information, but rather because the information in the YRP and e-PMG are relationally linked, the user can explore issues and topics of their immediate interest and relevance, and learning experiences emerge along unique pathways.

A next step in this process might be to provide application opportunities for using these programs in a continuing education environment. On-line training and evaluation could be developed around YRPs to allow a user to test their knowledge and apply it in a safe and virtual

environment. Such applications could be tailored to the individual learning style to allow for exploration of this knowledge at their own pace.

While the technology to deliver IPM information has rapidly changed in a single generation, the goal of teaching people to apply current research-based information has not. The goal of developing relevant, integrated and sustainable crop and pest management approaches that end users can easily access and apply will be as important over the next 50 years as it has been over the past 50 years.

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