



PESTICIDE USE TRENDS

In California Agriculture

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SUMMARY

Farmers are successfully transitioning to safer, more environmentally friendly compounds to combat pests and diseases. The analysis of pesticide use in California described in this report shows a 66 percent decline in the use of older, traditional broad based chemistries over a 12-year period in favor of more targeted, softer and often organically approved pest and disease control alternatives.

A recent U.S. Environmental Protection Agency report supports this trend nationally.

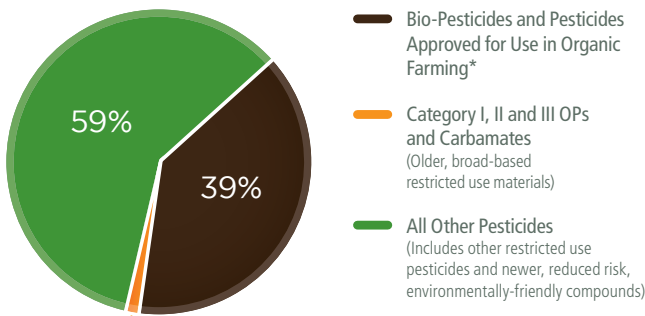
The California Department of Pesticide Regulation has the most extensive pesticide use reporting system in the United States and supports one of the most comprehensive pesticide regulatory programs in the world. As part of these regulations, annual reporting of pesticide use in the State of California is mandatory for agriculture and pest control businesses.

The most recent report of pesticide use issued by DPR is for the 2009 calendar year. A detailed look at the top 100 pesticides used in 2009 shows the #1 and the #3 most-used pesticides in California are approved for use in the production of organic foods. These two pesticides alone account for over one third of all pesticides used in California agriculture and reported to DPR.

The purpose of the analysis provided in this paper is to examine long-term use trends for the older broad based and, in general, more highly regulated pesticides in California agriculture. Specifically, the report tracks the use of what DPR classifies as Category I, Category II and Category III organophosphate and carbamate classes of insecticides between 1998 and 2009.

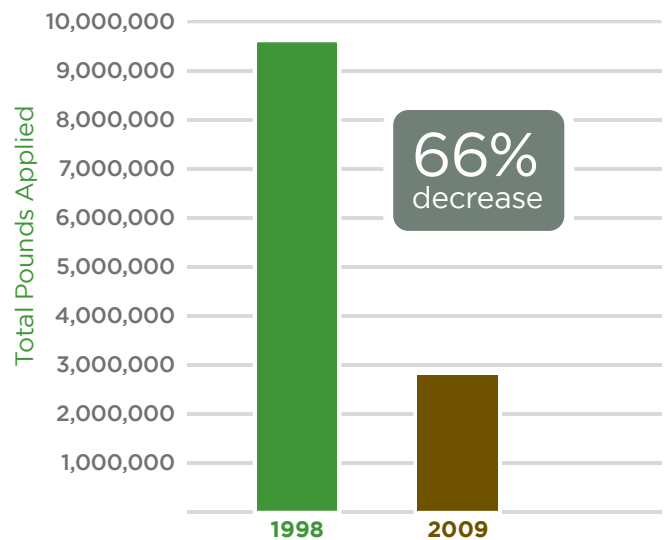
The analysis indicates a very clear decline in total usage of these pesticides going from 9.6 million pounds in 1998 to 3.3 million pounds in 2009 – a reduction of 66 percent.

Current Pesticide Use in California



*Based on estimates comparing the CDPR Pesticide Use Report and pesticides listed as approved by the National Organic Program.

Reduction of Pesticide Use Category I, II and III OP and Carbamate Insecticides



Conversely, the number one pesticide currently used in California is sulfur – a product that is approved for use on organically grown crops – with over 42.3 million pounds of sulfur reportedly applied in 2009. Another organically approved pesticide, mineral oil, was the third leading pesticide applied in 2009 at just over 11.6 million pounds. The analysis also estimates another 7.5 million pounds of pesticide used in California during 2009 are bio-pesticides or other compounds approved for use in organic farming bringing the total of bio-pesticides and pesticides approved for organic farming to 61.4 million pounds or 39% of all pesticides applied in 2009. The older, more highly regulated pesticides, analyzed in this report represent just 2 percent of all pesticides applied in the state.

While use of organophosphate and carbamate pesticides in California are on the decline, the need for effective pest control for both commercial agricultural and home gardeners has not diminished. For both users, increased regulation has resulted in the removal of some products from the market. However, in recent years, environmentally friendly alternatives are becoming increasingly available to both home gardeners and farmers. In addition, both users are incorporating techniques used in organic farming into their production practices.

For both home gardeners and farmers, the ability to judiciously apply some of the older, broadly effective compounds is still important to maintain as some pest outbreaks can be very difficult to control. In addition, California is increasingly experiencing the introduction of exotic pests which have the ability to destroy entire commodities, compromise the health of our forests and

can be devastating to landscaping and home gardens. Unlike home gardeners, when pesticides are applied to commercial agriculture crops, their application is highly regulated by both federal and state agencies. This is particularly true for the use of the older restricted use compounds which can be subject to as many as 70 different laws in the state of California each time one is applied.

METHODOLOGY

This report was commissioned by the Alliance for Food and Farming, a non-profit organization which represents both conventional and organic farmers. Analysis was performed by Environmental Solutions Group, a consulting firm specializing in environmental regulatory and policy issues research and management.

The purpose of this report is to examine whether long term pesticide use trends support the widely held belief that the uptake of Integrated Pest Management (IPM) strategies by farmers and the development of modern pesticides targeted to control specific, economically important pests, have resulted in decreasing use of older, broad based chemical technologies.

Organophosphate and carbamate pesticides widely used throughout the 1960's and 1970's, are broadly toxic to insects, which means that they kill both detrimental and beneficial insects. Integrated Pest Management strategies employ a range of techniques to control pests, including relying on beneficial insects (good bugs) to help control insect pests (bad bugs). The trend in development of new pesticide products is toward compounds with a narrower spectrum of activity, used at far lower rates than the older pesticides. The goal is to control the pest insects while not disrupting the beneficial pest population in the field. These newer chemistries also tend to have lower human toxicity and are more environmentally friendly.

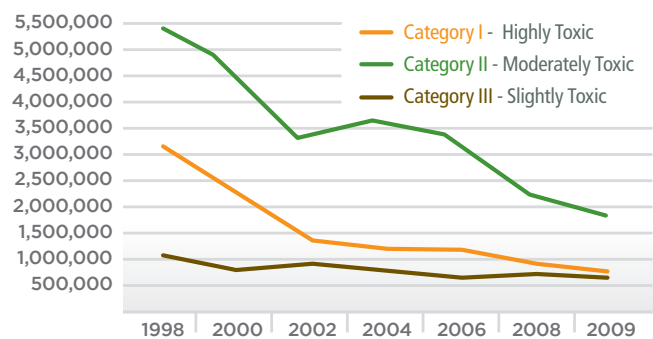
California law requires that all applications of pesticides to agricultural crops and all applications made by licensed structural pest control operators must be reported to the Agricultural Commissioner of the county of use. For agricultural pesticides, each use record contains information on the location of use, total number of acres treated and the pounds of pesticide active ingredient applied. These reports are transmitted to the California Department of Pesticide Regulation (CDPR) where they are maintained in a database and reported annually in the department's Pesticide Use Report.

The pesticide products subject to this analysis are in the classes of chemicals known as organophosphates and carbamates. Organophosphate (OP) pesticides were developed as insecticides after World War II. They are toxic

to a broad range of insects and became widely used in the 1970's when DDT and other chlorinated hydrocarbon pesticides were banned. Carbamate insecticides were first registered in the U.S. in 1969. While there are fewer carbamate products, they are similar in insecticidal activity to OPs and also broadly toxic to insects. Carbamates and organophosphates were staples of insect pest control throughout the 1970's and 1980's and into the 1990's.

This analysis compared the total pounds of use of 40 organophosphate and carbamate pesticides for the calendar years 1998, 2000, 2002, 2004, 2006, 2008 and 2009. Any OP or carbamate with 5,000 or more pounds of reported use in 1998 was included in the analysis.

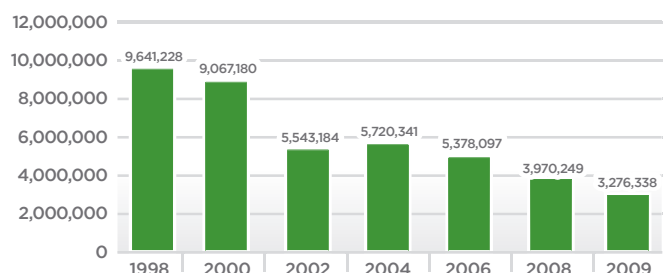
Pesticide Use Decline by Category
(OPs & Carbamates) Total Pounds Applied
1998-2009



In the United States, all pesticides, including cholinesterase-inhibiting OPs and carbamates have been organized into USEPA Toxicity Categories, i.e., Category I-Highly Toxic, Category II- Moderately Toxic and, Category III-Slightly Toxic. OP and carbamate pesticides in all three categories were totaled and used in this report.

The analysis shows a dramatic drop in the use of OPs and carbamates; a 66% reduction from 1998 to 2009. More importantly, the decline has been steady over the 12 year period, indicating that it is not just the result of "low pest" years, but a trend in pest management strategies. The data also indicate that, when it is necessary to use a cholinesterase inhibitor, the trend is toward the products classified as slightly toxic.

Pesticide Use Trend
(Class I, II & III OP and Carbamate Insecticides)



The reduction in Category I and II OPs and carbamates was 67% while the use of category III OPs and carbamates, classified as only slightly toxic has fluctuated up and down with pest pressure in some years, but overall has decreased by 39%.

DISCUSSION

As any homeowner knows, insect pests reproduce rapidly, often resulting in several generations per season. This creates a situation ripe for the development of resistance to pesticides. Just as some diseases of humans have evolved to be resistant to antibiotics, some pests can evolve resistance to frequently used pesticides. The danger of resistance is highest when one chemical class becomes the dominant treatment for a particular pest. Therefore, an important principle of pest management is to keep as many weapons in the pest control arsenal as possible and to alternate strategies so that pest populations cannot develop immunity to specific chemicals.

The use of non-chemical strategies in an integrated pest management system, along with targeted use of pesticides of various classes is critical to maintaining control of pest populations. The key is to keep the pests guessing from a biological perspective.

Integrated pest management systems (IPM) rely on a variety of non-chemical strategies, such as “good bugs” to prey on and control the “bad bugs”, crop rotation to vary host plants, discouraging the multi-year build up of mega pest populations and a number of other cultural techniques. In addition, pest populations are closely monitored to determine the correct time for the judicious use of pesticides. If a pest population develops resistance to the pesticides used, the entire system can fail.

As this analysis demonstrates, modern farmers are shifting away from older, broad spectrum pesticides incompatible to IPM systems. However, as noted above it is important to maintain the ability to selectively use traditional pesticides when necessary to keep the pests guessing and avoid resistance. There are other reasons to maintain the ability to use these pesticides as well.

IPM systems work when the field ecology is in balance. For example, if the system includes taking advantage of non-pest predator insects to maintain control of pest insects, the ratio of predators to pests must be maintained at the proper levels. Sometimes, weather or some other external factor can cause the prey species to spike, overwhelming the ability of the predators to keep them in check. When this happens, a targeted application of a quick knock-down OP pesticide can reduce the prey and allow the predator/prey relationship to get back in balance, maintaining integrated management.

Another reason for maintaining the ability to use broad spectrum chemistries is to combat invasive pests which are not native to the state. These exotic pests, introduced into California from other countries or regions may have no natural enemies here. Consequently the pest populations explode and can virtually wipe out a host crop. At the same time, because the pest is new for the area, there is not an established IPM program to combat it and usually no effective pest-specific pesticides are registered. It is critical in these cases, to have a broad spectrum pesticide available to quickly eradicate the invasive pest before it becomes established in the new territory, thereby preventing severe economic loss and the necessity for much more pesticide use in the future.

Whenever and for whatever reason pesticides are used in California, that use is strictly controlled by the most advanced regulatory program in the nation. Before a pesticide can be used, it must be evaluated thoroughly; first by the U.S. Environmental Protection Agency and then, separately by the California Department of Pesticide Regulation. Dozens of studies must be performed assessing potential human toxicity, potential food residues and possible impacts on the environment. Only those pesticides the state has determined can be used safely are allowed to be sold. Once a product passes this high level of scrutiny, use in agriculture is controlled by a detailed and comprehensive pesticide regulatory system. State pesticide regulators, in conjunction with Agricultural Commissioners in every county, license and certify professional operators and inspect thousands of pesticide applications yearly to ensure compliance with pesticide labels, laws and regulations.

CONCLUSIONS

Analysis of DPR Pesticide Use Reporting for the past 12 years shows that:

- There has been a significant reduction in the use of older, more highly regulated organophosphate and carbamate pesticides in California. Their use has declined 66 percent in the past 12 years.
- The amount of these older, more highly regulated pesticides is far, far lower when compared with other pesticide classes including many newer, safer and more environmentally-friendly pesticides and those approved for use on organic crops. Currently, these older compounds comprise just 2 percent of the total pesticides used in California.
- The reduction in use of older compounds indicates that California farmers are, in fact, successfully transitioning away from use of older, broad-based pesticides. This is likely the result of increased development and adoption of Integrated Pest Management strategies and a move toward softer, more environmentally-friendly compounds.

- There is still a need for farmers to maintain the ability to use some of these older compounds for many reasons including the resistance of pests to more frequently used materials; the influx of exotic pests; and the lack of suitable alternatives in some instances. In addition, these materials may play a key role when used as a last resort to gain control of a pest outbreak that has overwhelmed an Integrated Pest Management system, allowing growers to re-establish IPM strategies.
- It is important to note that these older compounds are also the most highly regulated. In California, which has the strictest pesticide regulations in the world, farmers using these products are subject to as many as 70 different laws each time an application is made.
- Findings from the analysis conducted in California are similar to those reported by the U.S. Environmental Pesticide Agency concerning pesticide sales and usage throughout the nation.

This report can be accessed at:
www.epa.gov/opp00001/pestsales.

About the California Department of Pesticide Regulation Pesticide Use Report:

California's pesticide use reporting program is recognized as the most comprehensive in the world. In 1990, California became the first state to require full reporting of agricultural pesticide use in response to demands for more realistic and comprehensive pesticide use data. Under the program, all agricultural pesticide use must be reported monthly to county agricultural commissioners, who in turn, report the data to DPR.

California has a broad legal definition of "agricultural use" so the reporting requirements include pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. In addition, all postharvest pesticide treatments of agricultural commodities must be reported along with all pesticide treatments in poultry and fish production as well as some livestock applications. The primary exceptions to the reporting requirements are home-and-garden use and most industrial and institutional uses.

For more information, please review the following information available at www.cdpr.ca.gov – DPR Pesticide Use Reporting: An Overview of California's Unique Full Reporting System.

(<http://www.cdpr.ca.gov/docs/pur/purovrw/ovr52000.pdf>)

About the Alliance for Food and Farming

The Alliance for Food and Farming is a non-profit organization formed in 1989. Its membership includes approximately 50 agriculture associations, commodity groups and individual growers/shippers who represent farms of all sizes and includes conventional as well as organic production. The Alliance works to provide a voice for farmers to communicate their commitment to food safety and care for the land. Learn more about the Alliance at www.foodandfarming.info.

ABOUT THE AUTHOR

James W. Wells is President of Environmental Solutions Group, a consultant firm specializing in environmental regulatory and policy issues. Prior to forming Environmental Solutions Group, Mr. Wells served as a Senior Managing Regulatory Consultant with Exponent, an international environmental consulting firm; Senior Vice President in charge of Novigen Sciences, Inc. Western Office and a Vice President in the consulting firm of Jellinek, Schwartz and Connelly. He also served for eight years as the first Director of the California Department of Pesticide Regulation (CDPR) in the California Environmental Protection Agency (CAL-EPA). Before the formation of CAL-EPA in 1991, Mr. Wells held a series of leadership positions in the Pesticide Division of the California Department of Food and Agriculture (CDFA) over a span of 18 years. In his 26 years of service with CDFA and CAL-EPA, Mr. Wells worked closely with every segment of the agricultural industry in California.

Advisory Appointments

- *USEPA Children's Health Protection Program, Children's Health Protection Advisory Committee*
- *Dean's Advisory Council, College of Agricultural and Environmental Sciences, UC Davis*
- *External Advisory Panel, Agricultural Health and Safety Center, UC Davis*
- *Policy Advisory Committee, Center for Pest Management Research and Extension, UC Davis Professional Affiliations*

Professional Affiliations

- *Governor's Environmental Policy Council*
- *United Nations Environment Programme, Methyl Bromide Technical Options Committee*
- *President, Association of American Pest Control Officials (1993-1994)*
- *Chair, State FIFRA Issues Research and Evaluation Group Working Committee for Enforcement and Certification (1990-1991)*
- *USEPA Food Safety Advisory Committee for the Food Quality Protection Act*
- *USEPA Worker Protection Advisory Committee for the Worker Protection Standard*