Pesticides: Risk, regulation and research

Frank G. Zalom, Director
Statewide Integrated Pest Management Project
University of California, Davis

California agriculture, which supplies nearly half of the food brought to American tables, is undergoing an evolution of historic proportions. Complex issues involving water use, farm labor, rural communities, urbanization and agricultural chemicals are challenging California growers and institutions as never before. Changes are being brought about as California's overwhelmingly urban population competes with farmers for common resources, and calls for regulation of agricultural practices that have environmental and health impacts.

Pesticides have been one focus of public concern, resulting in federal and state structures which strictly regulate their availability and use. Pesticides are not a single group of chemicals, but a variety of materials that have a common use — to control pests. Household bleach and chlorine become pesticides when they are used to kill organisms around our homes or in industry. Minerals such as sulfur and copper, and naturally occurring plant derivatives such as pyrethrum, become pesticides when they are used to control plant diseases or insects. Relatively recent alternatives to conventional pesticides such as microbial agents and pheromones are regulated as pesticides when they are used for pest control. Pests encompass all organisms which are damaging to plants or animals including insects, weeds, pathogens, vertebrates and nematodes. Pests also include organisms which are of public health importance or which threaten natural systems such as forests.

Methyl bromide's phaseout, the subject of a special section in this issue, is one example of the complex challenges that come with pesticide regulation. Before this widely used fumigant is canceled in 2001, the nation must resolve thorny questions surrounding the actual contribution of agricultural methyl bromide to ozone depletion (currently a matter of scientific debate); the environmental, health and economic costs of proposed alternatives, and how to mitigate economic impacts of the phaseout. Policies formed during this debate — an unusually long one for a pesticide's fate — will set precedents for future regulatory actions.

Methyl bromide has been widely used since the 1930s as a soil fumigant in agricultural production, to protect stored commodities and to kill structural pests. In 1991, almost 14 million pounds were applied for agricultural, nursery and postharvest uses in California. An additional 3.7 million pounds were applied for structural pest control. Methyl bromide became widely used because it was recognized as an effective and economical method of addressing a variety of pest problems. A USDA Economic Research Service report issued earlier this year estimated the loss of methyl bromide would cost about $1 billion annually in combined effects on American growers' net revenue and consumer cost. Methyl bromide is being phased out as a result of the Federal Clean Air Act which requires all class 1 ozone depleting substances (which include methyl bromide) to be phased out by the year 2001 or within 7 years of listing.

Unfortunately, because of the diverse uses and target pests for methyl bromide, no single alternative can duplicate its myriad functions. Alternative pesticides are either not as effective as methyl bromide or may be equally effective for only certain applications. Some require registration or reregistration. At least some of the alternative materials might be subject to environmental or health regulations which could jeopardize their availability. Current nonchemical alternatives are typically less effective or uneconomical for most situations, however a recent survey of UC research and extension staff identified at least 20 individuals conducting studies to improve or develop alternatives to methyl bromide. In spite of these efforts, acceptable alternatives will not be available soon. It takes time, typically a decade or more, to complete necessary laboratory and field studies leading to reliable pest management strategies. Further, resources for this research are increasingly limited.

While few would question the need for restricting the use of materials known to have serious environmental or health impacts, research published in the journal *Science* earlier this year raises questions about the impact of grower-used methyl bromide. Scientists have identified other significant sources of ozone-depleting methyl bromide, including natural sources such as fires and marine emissions. In addition, there is virtually no empirical data from which to estimate the fraction of methyl bromide that escapes to the atmosphere during and after agricultural fumigation.

The profound issues challenging California's growers have altered the agricultural mission of UC's Division of Agriculture and Natural Resources. Ensuring an abundant, reliable and reasonably-priced food supply was once a sufficient goal for the University, and the results were evident in the strength of California's agricultural industry. Today, the University must also help growers maintain viable enterprises within a growing array of constraints on what they can do and how they can do it. As a public institution the University must also address the environmental and health concerns of all Californians.

Proposed methyl bromide alternatives must be evaluated in terms of their efficacy and economics, as well as their own set of risks. More than identifying pest management problems and alternatives, research must provide a scientific foundation for assessing environmental and health risks. Ideally, regulators and scientists would foresee the need for such data, and develop it prior to regulatory decisions. There will always be major disagreements about what constitutes risk. However, growers, consumers, environmentalists, labor, government agencies and the University must work together to identify both acceptable risks and acceptable solutions to economic, environmental and health problems. All groups have a common interest in preserving a viable agricultural system, while protecting the environment and human health.