Consumer Issues in Creating a Sustainable Agriculture

Laurie Mott
Natural Resources Defense Council
San Francisco, California, USA

Introduction

Since the mid 1980s, surveys have consistently demonstrated widespread consumer concern about pesticide residues in food. Between 1984 and 1988, more than 70 percent of consumers ranked pesticide residues as a serious health hazard (Food Marketing Institute, 1988). A survey (Public Voice for Food and Health Policy, 1993a) found that 71 percent of Americans are very concerned about agrichemicals in the water supply and 68 percent are very concerned about the health effects of pesticides on children. Farmers are also concerned about agrichemicals; a 1992 poll found that farmers believe contamination of surface water and groundwater by pesticides and fertilizers is the most serious environmental issue facing agriculture (Sandoz Agro, Inc., 1993).

Regrettably, these concerns about pesticides are valid. Agrichemicals pose threats to both public health and the environment. The U.S. federal government programs intended to prevent the hazards of pesticides are seriously flawed, and even if reformed will never be one hundred percent successful. Ultimately, alternative agricultural methods that reduce reliance on pesticides are the best means to protect public health and the environment.

Extent of U.S. Pesticide Use

Since 1966, the pounds per acre of active pesticide ingredients applied to U.S. cropland have increased by 125 percent. In 1966, 1.2 pounds per acre of active ingredients were applied. By 1991, the amount had increased to 2.7 pounds per acre (Public Voice for Food and Health Policy, 1993b). Overall, approximately 25,000 products, containing some 750 active ingredients, are on the U.S. market today (U.S. General Accounting Office, 1992). In 1991, conventional pesticide use had doubled to over one billion pounds and accounted for close to 25 percent of worldwide use. Agricultural use of pesticides results in several different types of human exposure such as residues in food and drinking water, and in the workplace.

Pesticides in Food

The pesticide exposure affecting virtually the entire U.S. population occurs with our food. In 1992, 35 percent of the United States food samples analyzed by FDA contained pesticides (U.S. Food and Drug Administration, 1993). Yet this number most certainly underestimates the actual occurrence of pesticides in food because the five most commonly-used laboratory tests can detect only half of the pesticides used on food (U.S. Food and Drug Administration, 1993). Moreover, these multi-residue methods cannot detect some of the most toxicologically-significant and widely-used pesticides.

Today, the total health risks presented by pesticide residues in our food supply remain unknown. Experimental data indicate that of the 300 pesticides used on food, as many as 71 are known as probable or possible human carcinogens (U.S. Environmental Protection Agency, 1992). More probable carcinogenic chemicals will be found as pesticides are finally tested for their health effects. Other pesticides in food have been shown to cause neurotoxicity or reproductive toxicity. Because of the obvious difficulties, no epidemiology studies have ever been conducted to determine the link between pesticide residues in food and human illness. To do such a study would require two populations identical in every regard except their exposure to pesticides in food - an impossibility. However, the aldicarb poisonings of nearly 1,000 people in the western U.S. who consumed illegally-treated watermelons in July 1985 exemplifies both the extreme toxicity of aldicarb and the failure of the federal regulatory system to detect illegal residues in food (aldicarb was not registered for use on watermelons).

Given the difficulty of determining the true risks posed by pesticides in food, being conservative in regulating their presence in the food supply is especially critical. However, the U.S. Environmental Protection Agency (EPA) underestimates the actual risk of pesticides in food in three basic ways,

thereby compromising the health of consumers. First, pesticides in food are regulated on an individual basis even though our food supply contains hundreds of pesticides. EPA and the Food and Drug Administration (FDA) do not review the cumulative effects of dietary exposure to pesticides, although ample evidence demonstrates that many pesticides can be found in a single fruit or vegetable, let alone a meal. For instance, one report found two or more pesticides in samples taken from supermarket warehouses between 1990 and 1992 - residues on 62 percent of orange samples, 44 percent of apple samples, and from 25 to 30 percent of cherry, peach, strawberry, celery, pear and grape samples (Wiles, 1993). If any of these pesticides exhibit common toxicity, the combined effect of their exposure could be serious. This effect is further compounded by the presence of so-called “inert” ingredients in pesticides. These substances may cause synergistic effects when coupled with the active ingredients, or may even be toxic themselves (U.S. Environmental Protection Agency, 1991).

Organophosphate insecticides, for example, have a common toxicological effect; they disrupt the production of an enzyme critical for accurate nervous system functioning. Exposure to two organophosphate insecticides simultaneously will most commonly double the nervous system effect. Thus, even though more than five different organophosphates are allowed for use on oranges (40 C.F.R.), EPA's policy is to establish legal limits for individual compounds without considering the potential for cumulative exposure to more than one organophosphate. It is estimated that 17 percent of the preschool population (three million children) is cumulatively exposed to residues of organophosphate insecticides above levels considered acceptable by EPA (Sewell and Whyatt, 1988).

Second, children may be uniquely vulnerable because their food intake is a larger percentage of their body weight than that of adults. The average toddler drinks 31 times more apple juice as a percentage of body weight than her mother, and the typical preschooler, 18 times more. Preschoolers eat six times as much fruit as adult women (U.S. Department of Agriculture, 1985). Therefore, children are getting greater exposure to pesticides in food. Children’s unique risks from pesticides in food were the subject of a recent report by the National Research Council of the National Academy of Sciences. The five-year study concluded that the current regulatory system does not specifically consider infants and children who are likely to be at greater risk because of their differential exposure to pesticides in food (National Research Council, 1993).

Finally, in calculating dietary risks, EPA ignores one major category of dietary exposure to pesticides, i.e., drinking water. Many water supplies now contain pesticides. To limit the maximum amount of pesticides that can occur in food without determining the contribution from drinking water makes no sense and fails to protect the public in those areas with pesticide-contaminated drinking water.

Pesticides in Water

Groundwater. Pesticide contamination of groundwater is extensive. In a 1988 report, EPA documented the presence of 74 different pesticides in groundwater of 32 states. In particular, EPA discovered widespread contamination by aldicarb, atrazine, and alachlor. Aldicarb, an insecticide, is the most acutely toxic pesticide registered by EPA and it was detected in 16 states. Atrazine, classified as a possible human carcinogen, was detected in 13 states. Alachlor, banned in Canada, is a probable human carcinogen and was found in 12 states (Williams et al., 1988).

A more extensive EPA study, released in November 1990, found further evidence of contamination, in particular the frequent detection of atrazine and DCPA (dimethyl tetrachloroteraphthalate). Based on sampling results, EPA estimated that 10.4 percent of community water system wells and 4.2 percent of rural domestic wells in the U.S. contained at least one pesticide or pesticide degradation product. EPA’s survey reveals that, at a minimum, over 1.3 million people are drinking water contaminated with one or more pesticides from private wells. In addition, the agency estimated that about 60,000 rural wells contained at least one pesticide at a level above the Maximum Contaminant Level (MCL) for humans (U.S. Environmental Protection Agency, 1990).

The threat of groundwater pollution is widespread throughout the United States. The USDA has

estimated that 46 percent of all U.S. counties contain groundwater susceptible to contamination from agricultural pesticides or fertilizers (Nielsen and Lee, 1987). Approximately 54 million people rely on groundwater sources for drinking water in these counties. In addition, any proposed decontamination projects will be expensive, and contamination may persist for many years after remedial actions are introduced. Estimated costs for groundwater monitoring alone range from $0.9 to $2.2 billion for the nation, and cleanup using carbon filtration would cost up to $25 million per site (Nielsen and Lee, 1987). This technique does pot always reduce pesticide contamination to safe levels.

Surface Water. A recent U.S. Geological Survey (USGS) study illustrates that pesticide contamination of surface water has grown to critical proportions. This 1991 survey of selected herbicides for eight rivers in the Mississippi River Basin, pinpointed the carcinogenic herbicides, atrazine and alachlor, as major contaminants. Atrazine was detected in every one of the 136 samples taken, and exceeded the federal drinking water standard or Maximum Contaminant Level (MCL) in 27 percent of the samples. Alachlor was found in 88 percent of the samples, 4 percent of the time at levels greater than the MCL. Alachlor levels rose above the acceptable level in three of the eight rivers, sometimes nearly doubling the MCL. The study also evidenced a significant rise in pesticide contamination immediately after the planting season, when herbicide application occurs (U.S. Geological Survey, 1991).

Evidence of such widespread contamination resulting from routine agricultural use is particularly troubling for residents of urban areas who receive their drinking water from surface water. Unfortunately, standard treatment procedures for surface water are not designed to eliminate pesticides. A 1986 report by the Iowa Department of Natural Resources found that after standard treatment procedures, 90 percent of drinking water samples contained at least one pesticide. Furthermore, 58 percent of the samples contained four or more pesticides (Kelley, 1986).

Occupational and Other Non-Dietary Exposures Pesticides

Knowledge about the chronic health effects of pesticides in humans is limited. However, a small but growing body of epidemiological evidence suggests a strong correlation between pesticide exposure and human cancer (Moses, 1989). Many of the epidemiological studies correlating pesticide exposure with cancer in the human population involve occupational exposure, particularly among agricultural workers. A 1992 study by the National Cancer Institute reviewed approximately two dozen previously published reports and found that farmers had elevated risks of several forms of cancer (Hodgkin's disease, multiple myeloma, Ieukemia, melanoma, and cancers of the lip, prostate and stomach) despite their generally healthier lifestyle and reduced rates of mortality from heart disease and certain other cancers (lung, esophagus, bladder, colon, liver, and kidney) resulting from low prevalence of smoking, low body fat, and high physical activity. Although the study was not designed to identify the causes of the cancer, its authors named pesticide exposure as one of five likely suspects among nitrates in drinking water, fuels and oils, ultraviolet radiation, and animal viruses. Pesticides may be responsible because of their ability to compromise the body’s immune system (Blair et al., 1992).

Numerous other studies have specifically identified pesticides as risk factors for cancer, particularly among farmers (Blair, 1990). For instance, a 1986 National Cancer Institute study found that farmers who were exposed to herbicides for more than 20 days-per-year had a six-fold higher risk of contracting non-Hodgkins lymphoma than non-farmers; an even higher risk was found for farmers who frequently mixed or applied herbicides them-selves. A particularly strong association was found with exposure to 2,4-D (Hoar et al., 1986). A follow-up study in Nebraska found a tripling of the risk for farmers exposed to 2,4-D more than 20 times a year (Hoar et al., 1988). These two studies also showed a very disturbing pattern: increasing exposure to pesticides is correlated with an increasing risk of cancer, or an “exposure response gradient.”

The exposure response gradient was also observed in a 1993 study that detected a strong association between breast cancer and DDE, the major metabolite of DDT; higher levels of DDE were observed

in women who developed breast cancer compared with those who did not. After adjusting for known risk factors, such as family history and age at first full-term pregnancy, the authors reported a four-fold increase in relative risk for breast cancer between those individuals with the lowest reported DDE blood levels and those with the highest reported DDE concentrations (Wolff et al., 1993).

Another disturbing pattern that has become evident is the risk to children as a result of their parents' occupational exposure to pesticides. Two separate studies have noted an increase in cancer among children whose parents are exposed to pesticides in the workplace. A 1992 study found paternal occupational exposure to pesticides was a strongly significant risk factor for children with Ewing's bone sarcoma (Holly et al., 1992). A similar pattern of parental occupational exposure to pesticides resulting in a greater risk of acute non-lymphocytic leukemia in children was reported in 1989 by the Children's Cancer Study Group (Buckley et al., 1989).

The Promise of Sustainable Agriculture

To consumers, the evidence is clear and compelling; pesticides are dangerous to health and the environment. But now consumers are beginning to understand that alternatives to pesticides do exist and that the correct path is to decrease the use of these chemicals. Farmers too are looking for alternatives because they are faced with a sometimes daunting number of potential pest problems including insects, weeds and diseases that threaten crop yields and ultimately their very livelihood. Concerns about the environment, pest resistance and the high cost of pesticides, however, are forcing many farmers to reevaluate their reliance on chemicals to control pests. Although government policies have hindered rather than helped farmers to reduce pesticide use, a growing number are successfully employing sustainable agricultural practices that reduce chemical inputs.

A 1991 study by the Natural Resources Defense Council found that a 25 to 80 percent reduction in pesticide use for nine major U.S. crops could be accomplished by using currently available, non-chemical technologies. The crops analyzed included California-grown alfalfa, citrus, cotton, grapes, lettuce, rice and tomatoes, and Iowa-grown corn and soybeans. Techniques such as Integrated Pest Management (IPM), crop rotations, cover crops, biological control, ridge-till and banding were found to be viable methods that, when implemented, had no significant impact on yields and production costs (Curtis et al., 1991). A study by Cornell University entomologist David Pimentel estimates that if 50-percent of pesticides now used in American agriculture were replaced by non-chemical control techniques, crop yields would not decline and food prices would rise less than one percent (Pimentel et al., 1991).

Several European countries including Sweden, the Netherlands, and Denmark have taken the lead in establishing pesticide use reduction programs. Each of these programs shares the goal of addressing the environmental problems caused by pesticides while at the same time maintaining the competitiveness of agricultural production.

Agricultural production is particularly critical in the Netherlands, the world's second largest exporter of agricultural products. Their goal is to reduce pesticide use by 30 percent between 1991 and 1995, with an additional 50-percent reduction to be achieved between 1996 and 2000. Their program focuses on financial assistance to farmers and an increase in the number of extension agents to help make the transition to less chemical-dependent farming practices (World Wildlife Fund, 1992).

Sweden has already achieved a 50-percent reduction in pesticide use between 1986 and 1990 and has established a second 50-percent reduction goal to be met between 1991 and 1997. The first 50-percent reduction resulted from a shift to ultra-low volume herbicides and better calibration of application equipment. Sweden has also reduced the total number of chemicals on the market by 50 percent as a result of stricter pesticide registration requirements (World Wildlife Fund, 1992).

Other countries are also mandating various types of pesticide use reduction programs to prevent environmental problems. For example, in 1991, 18 countries in the Mediterranean region agreed to phase-out the use of organophosphate pesticides "hazardous to human health and the environment"

by the year 2005. The countries are parties to the Convention for the Protection of the Mediterranean Sea against Pollution (known as the Barcelona Convention) (Jewell, 1992).

In 1986, the Indonesian government adopted a national IPM pest control program. Thus far, the program has resulted in a 60-percent reduction in pesticide use on rice nationwide and a 90-percent reduction among rice farmers employing IPM. The program was established in response to evidence that uncontrolled pesticide use and pest resistance and resurgence were threatening the country's entire annual rice crop. Farmers have experienced improved yields and dramatically-reduced costs (Kenmore, No date).

The governments of the Canadian provinces of Quebec and British Columbia have also pledged to cut pesticide use. Quebec is aiming for a 50-percent reduction by the year 2000 principally through better monitoring of pest populations and increased research into the biological and mechanical methods of control (Anonymous, 1992). British Columbia is striving to achieve a 25-percent reduction by 2001 by promoting the use of IPM and other non-chemical alternatives (B.C. Environment, 1991).

In California several major growers are starting to switch to alternative agriculture practices. Pandol and Sons reduced chemical use by 70 percent on their 3,000 acres of table grapes. Gallo, J.G. Boswell, and Dole - to name a few - are switching to sustainable techniques to varying degrees on their acreages. Paramount, the largest citrus grower in California, has placed one-third of its 10,000 acres in a sustainable agriculture production program.

Even in Washington, D.C., sustainable agriculture is being recognized as a viable method that should be widely adopted. In June 1993, after the release of the National Academy of Sciences report on pesticides in children's food, EPA Administrator Carol Browner announced the Administration's commitment to reducing pesticide use and promoting sustainable agriculture. Details about the Administration's proposal were provided in Browner's testimony before a Senate and House joint hearing in late September. One key element is a proposed goal of developing and implementing IPM programs for 75 percent of total crop acreage by the year 2000. Without definition, IPM does not necessarily mean reduced, or least-toxic, pesticide use. The Administration's proposal must specifically spell out that IPM should use biologically-based pest control techniques, with only the least toxic pesticides applied as a last resort. Furthermore, environmental and consumer advocates would like to see stronger pesticide reforms that phase out the use of the most dangerous pesticides, protect children and all others from pesticides in food, and actively promote the development and implementation of sustainable agriculture, not just IPM.

Conclusions

The current Administration and U.S. Congress have made pesticide reform a high priority. However, consumers will not be satisfied with any reform proposal unless it reduces pesticide use on food. The current Administration's package needs substantial improvement to address longstanding consumer concerns about pesticides in food. But ultimately what consumers want is food produced through sustainable agricultural techniques. In the long run, sustainable agriculture benefits both consumers and farmers, and it protects the environment. We must all work together in the fields, research facilities, marketplaces, and halls of Congress to champion sustainable agriculture. Agriculture's future is sustainability.

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