Pesticide Use in Thailand and the United States: Ecological and Human Health Effects

By Josh Kearns
December 2007

Industrial agriculture – the predominant form of agriculture now being practiced worldwide – relies heavily on the use of chemical pesticides to control crop loss from insects, animals and microorganisms. Over the past several decades, pesticides have revolutionized farming techniques and have facilitated the shift from small-scale, self-sufficient and diversified agriculture towards industrial monoculture. Today, over 250 million tons of chemical pesticides are applied widely and intensively in agricultural zones around the globe each year. Many of these chemicals are known or suspected to cause cancer, developmental and reproductive diseases, endocrine disruption and a variety of other toxic effects.[i] The World Health Organization has estimated that worldwide, exposure to pesticides results in three million cases of acute and chronic poisoning, 750,000 new cases of disease, and 20,000 deaths each year.[ii]

Only when viewed from a narrow and distorted economistic perspective does the application of chemical pesticides seem beneficial. It is now widely known that the agrichemicals being applied in staggering quantities worldwide pose serious hazards to both the environment and human health. Furthermore, as target pests mutate and evolve in response to pesticide application the chemicals decrease in effectiveness and thus must be applied in increasing quantity or replaced with new and stronger chemical varieties.

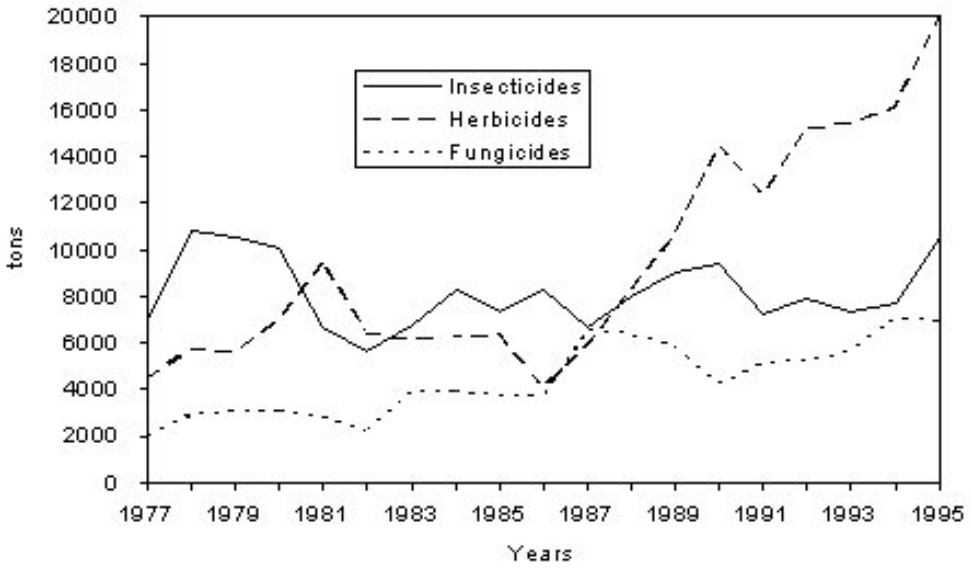
In developed nations such as the United States, concern over the impacts on human health and the environment has led to the banning of many pesticides and the strict regulation of others. However, agrichemicals represent a multi-billion dollar industry and the multinational corporations that manufacture large quantities of pesticides find markets for their products in the developing world. For example, seventy percent of the pesticides used in Thailand and India are banned or severely restricted in the West. A survey in the Indian state of Punjab detected DDT and BHC – agrichemicals banned in the west – in all of seventy-five samples of human breast milk.[iii] During the 1980s, the US was producing 100 – 150 million pounds per year of pesticides considered too dangerous for domestic use. These chemicals were produced for export to nations with less stringent environmental standards. Ironically, such nations often use these chemicals on crops that they grow for export back to the US and Western Europe – in this way, citizens of developed countries may be exposed to chemicals banned by their own governments.[iv]

Pesticide Economics

Pesticide and fertilizer contamination of drinking water from agricultural runoff is now a worldwide concern. This is especially true in Southeast Asian countries. Thailand imports the most pesticides in the region and over the past

three decades has exhibited an annual growth rate in the agrichemical market reaching as high as 8.8 percent.[v] The liberal pesticide market in Thailand has resulted in the widespread availability and use of imported chemicals. Seventy-three percent of the agrichemical imports into Thailand are classified by the World Health Organization (WHO) as category Ia (extremely hazardous), or Ib (highly hazardous).[vi] These substances proliferate under a wide variety of trade names and thus are difficult to track or regulate. For example, a 1990 study reported that monocrotophos was being sold under 274 different trade names, methyl parathion under 296 names, and paraquat under 55 names.[vii]

Quantity of Pesticide Imports to Thailand 1976-1995[xi]



The tax policies of the Thai government have generally been favorable to the growing market of agrichemical imports. A 1997 report indicated that since 1991, pesticides have been exempted totally from import duty and business and municipal taxes. This tax exemption can be interpreted as an indirect subsidy for pesticide imports and contributes to low pesticide prices.[v] Additionally, the Thai government maintains a fund for pest outbreaks wherein pesticides are given to farmers for free. Researchers identified this fund as a major pesticide subsidy and indicative of the Thai government and agricultural extension service's support for agrichemical use.[v] Furthermore, the Bank of Agriculture and Agricultural Cooperatives (BAAC) – the major Thai institute for the implementation of agricultural credit policy – has issued short-term credits for agricultural inputs including pesticides.[viii]

Pest Resurgence and Resistance

A major factor in the increased use of pesticides over the past few decades in Thailand, the United States and elsewhere is pest resistance and resurgence. Many pests quickly develop resistance to specific chemicals and maintain that resistance even when dosages are increased. Worldwide, the United Nations Food and Agriculture

estimates that between 1957 and 1980 the number of insect arthropods resistant to at least one form of insecticide rose from twenty-five to over 430.[ix] A 1990 report stated that approximately 504 insect and mite species, nearly 150 plant pathogen species, and about 273 weed species had become resistant to pesticides.[x] In 1990, crop losses in the US due to pesticide resistance were estimated at $1.4 billion/yr.[x]

In well functioning agro-ecosystems, pest predators or "natural enemies" account for up to 90% of pest control.[x] The use of toxic chemical pesticides often eliminate natural enemies and thus make crops more susceptible to pest damage. Despite the widespread use of pesticides in the United States, pests (principally insects, plant pathogens and weeds) destroy 37% of all potential food and fiber crops.[x] And while pesticide usage increased tenfold in the US from 1945 - 1989, total crop losses from insect damage nearly doubled from 7% to 13% over that time period. [x, xi]

In Thailand, a 1993 study revealed that the intensification of pesticide application by farmers led to the most severe outbreak of brown plant hopper on record. This organism did not constitute a threat to crops until pesticide application killed off the insects that naturally control its population; increased pesticide application thus served only to increase the severity of the outbreak.[xii] Similarly, a 1988 report indicated that pyrethroid application to cotton crops in Thailand decreased in efficacy from around eighty to nearly zero percent within one decade. Other studies have shown that resistance among vegetable crop pest has led to overdosing of pesticides by as much as a factor of eight times the recommended rate.[xiii]

Pesticide Exposure of Farmers and Farm Workers

Many farmers and farm workers are poisoned each year by pesticide exposure. A 1983 United Nations study estimated that between four hundred thousand and two million farmers worldwide were poisoned by pesticides each year, resulting in between twenty thousand and forty thousand deaths. A 1988 report estimated that three hundred thousand farm workers in the United States alone suffered from pesticide-related illnesses.[x]

Anecdotal evidence from speaking with farmers in and around our community at Pun Pun Farm in northern Thailand suggests that sufficient precautions are not taken by farm workers in the region when handling and applying pesticides. Our research so far corroborates these assertions. For example, a 1992 study concluded that farmers generally do not care about or are not aware of potential hazards pesticides may cause for themselves or the consumer. About one-half of Thai farmers apply higher than recommended concentrations and do not pay any or very little attention to labels and protective clothing.[xiv]

A typical backpack sprayer used for pesticide application. The bottle contains 2,4-D, a potential groundwater contaminant and possible human carcinogen.

A Thai farm worker applies pesticide while wearing minimal protective equipment.

Several studies have identified a lack of information among Thai farmers regarding the danger of application and handling of pesticides as well as regarding the quality and formulation of pesticides, their production date and contents. One study reports that farmers' perceptions of crop loss are usually higher than their actual crop losses, prompting pesticide overdosing. Furthermore, farmer's decisions regarding pesticide usage are often based on information given by retailers, other farmers, agricultural extension service agents and even the pesticide companies themselves.[v]

Pesticide Poisonings

The consequences of pesticide misinformation are far reaching. One study of Hmong agricultural workers in highland communities and in urban Chaing Mai indicated that 20-69% of the adults surveyed exhibited risky or unsafe levels of cholinesterase inhibition (an indicator of neurotoxicity) as evidence of exposure to organophosphate and carbamate pesticides. The study also indicated the potential of increased risk among Hmong women who posses less Thai language skill than men and therefore have reduced access to information concerning the hazards of pesticide exposure or the use of protective clothing.[xv] For the years 1980 – 1994, an average of around 3,350 occupational pesticide poisoning cases were reported in Thailand;[v] however, many cases of pesticide poisoning are never reported. For example, a 1985 study concluded that only 2.4% of Thai workers who have been poisoned by pesticides go to the hospital.[vi] The study estimated that there could be up to 39,600 pesticide poisoning cases a year, with total annual health costs of about 13 million Baht (about US $0.5 million).

Furthermore, the World Health Organization identifies pesticide ingestion as one of the leading suicide methods worldwide.[xvi] An estimated three million cases of pesticide poisoning occur every year, resulting in an excess of 250,000 deaths, representing a substantial fraction of the 900,000 people who die by suicide every year. This phenomenon is particularly significant in rural areas, especially in Asian countries. The WHO estimates that in the last decade between 60% and 90% of suicides in China, Malaysia, Sri Lanka were due to pesticide ingestion. A 2005 study found that pesticide ingestion is the second leading method of suicide in northern Thailand, accounting for about one-quarter of suicide cases in the most recent years.[xvii]

Food Contamination

Researchers have documented that the majority of Thai farmers interviewed in pesticide surveys sprayed pesticides frequently, especially in the vegetable and fruit sector, and harvested their crops for marketing before the end of the products' recommended waiting period.[viii] Economic factors tend to drive farmers to market rather than accept the losses associated with this waiting period. This has resulted in pesticide exposure to consumers: a 1995 study by the Thai Division of Toxic Substances found that around 37 percent of vegetables, 20 percent of kale, 10 percent of cowpea and 73 percent of tangerines were contaminated with pesticide residues, consisting mainly of malathion, monocrotophos and methyl parathion.[xviii]

In the United States, a 1990 report by FDA estimated that 35% of the foods purchased by US consumers have detectable levels of pesticide residues.[x]

The Pesticide "Body Burden" in the US

In the United States, approximately 1.2 billion pounds of pesticides are used each year.[xix] In 2003, the US Center for Disease Control and Prevention (CDC) produced a study of the levels of 116 industrial chemicals – including 34 pesticides – in a nationwide survey of 9,282 people.[xx] This study and a subsequent report by the Pesticide Action Network of North America[xiv]indicate that CDC found pesticides and/or their breakdown products in 100% of the people tested. The average person in the US carries at least 13 pesticide chemicals in their body.

Moreover, many of the pesticides found in the test subjects have been linked to serious short- and long-term health effects including infertility, birth defects and childhood and adult cancers. The reports specified that children, women and Mexican Americans shoulder the heaviest "pesticide body burden."

Children - the population most vulnerable to pesticides - are exposed to the highest levels of nerve-damaging organo-phosphorous pesticides. The CDC data show that the average 6 to 11 year-old sampled is exposed to the pesticide chlorpyrifos at 4 times the level U.S. Environmental Protection Agency considers "acceptable" for a long-term exposure.

The reports showed that women often have significantly higher levels of organo-chlorine pesticides. This class of pesticides is known to have multiple harmful effects when they cross the placenta during pregnancy, including reduced infant birth weight and disruption of brain development, which can lead to learning disabilities and other neuro-behavioral problems.

Mexican Americans were shown to carry dramatically higher body burdens of pesticides and pesticide breakdown products than other ethnic groups.

Pesticide Contamination of Groundwater

A 1988 report estimated that nearly one-half of the ground water and well water in the United States is or has the potential to be contaminated by pesticides. In 1990, US EPA reported that 10.4% of community wells and 4.2% of rural domestic wells had detectable levels of at least one pesticide. One-half of the US population obtains its water from wells. A 1992 report calculated that if monitoring and cleanup activities were carried out in the US such that all pesticide-contaminated groundwater were cleared of pesticides before human consumption, the total cost would be approximately $1.8 billion annually.[x]

In Thailand, numerous studies have reported the detection of pesticide residues in soils and groundwater.[xxi] One such survey by the National Environment Board found residues in 100 percent of soil samples and 86 percent of water samples.[vi]

The discouraging reality of widespread contamination of our drinking water sources by dangerous chemical pesticides motivates present efforts at AqueousSolutions to design an effective drinking water treatment system that is simple and elegant in design, inexpensive to build, operate, and maintain, and will enhance the potential for community self-reliance in the vital sector of drinking water.

For more information on pesticides and drinking water filtration using charcoal, see our website: ***aqsolutions.org***

References

[i] Pesticide Action Network of North America, website: www.panna.org

[ii] World Health Organization, Public Health Impacts of Pesticides Used in Agriculture, 1990.

[iii] The state of India's environment 1984 - 1985. Argawal A et al. Centre for Science and Environment, New Delhi, 1985.

[iv] The Circle of Poison. Weir D and Shapiro M. the Institute for Food and Development Policy, 1981.

[v] Analysis of Crop Protection Policy in Thailand. Jungbluth F. Thailand Development Research Institute. TDRI Quarterly Review Vol. 12 No. 1 March 1997, pp. 16-23. (http://www.tdri.or.th/library/quarterly/text/m97_3.htm)

[vi] Pesticide Use in Thailand. Pesticide Action Network North America Updates Service (PANUPS). Pesticides News, March 1997. Accessed on line 03/21/07. (http://www.panna.org/panna/)

[vii] CIRAD. 1990. Regional Agro-Pesticide Index. Vol. 1, Asia. Bangkok: ARSAP/CIRAD.

[viii] Grandstaff, S. 1992. Pesticide Policy in Thailand, Draft. Bangkok: Thailand Development Research Institute.

[ix] From the Ground up: Rethinking Industrial Agriculture. Goering P, Norberg-Hodge H, Page J. 1993.

[x] David Pimentel; H. Acquay; M. Biltonen; P. Rice; M. Silva; J. Nelson; V. Lipner; S. Giordano; A. Horowitz; M. D'Amore. Environmental and Economic Costs of Pesticide Use. *BioScience*, Vol. 42, No. 10. (Nov, 1992), pp. 750-760.

[xi] Pesticides, insects in foods, and cosmetic standards. Bioscience. 27 (3) 1977.

[xii] Setboonsarng, S. 1993. "Environmental Constraints to Thai Agriculture." Pp. 83-101 in Environmental Constraints to Pacific Agriculture, A.M. Rae and A.D. Meister (eds.). New Zealand: Center for Agricultural Policy Studies, Massey University.

[xiii] Waibel, H., and S. Setboonsarng. 1993. "Resource Degradation Due to Chemical Inputs in Vegetable-Based Farming Systems in Thailand." Journal of Asian Farming System Association 2: 107-120.

[xiv] Sinhaseni, P. 1994. Toxicological Concepts, Regulatory Provision and Appropriate Technology for Pesticide Safe Use: an Experience in Thailand. Bangkok: Pesticide Safe Use Unit, Faculty of Pharmaceutical Sciences, Chulalongkorn University.

[xv] Pesticide exposures among Hmong farmers in Thailand. KUNSTADTER Peter ; PRAPAMONTOL Tippawan ; SIRIROJN Bang-On ; SONTIRAT Auchara ; TANSUHAJ Antika ; KHAMBOONRUANG Chirasak. International journal of occupational and environmental health. 2001, vol. 7, no4, pp. 313-325.

[xvi] Pesticides are a leading suicide method. 9 September 2006. WHO website, accessed 03/21/07. (http://www.who.int/mediacentre/news/notes/2006/np24/en/index.html).

[xvii] Suicide in the North of Thailand. Lotrakul M. J Med Assoc Thai Vol. 88 No.7 2005.

[xviii] Palakool, S., S. Sukamak, B. Deenruy. 1995. Pesticide Residues in Fruit and Vegetables. Proceedings of the first Technical Conference of the Agricultural Toxic Substances Division. Agricultural Toxic Substances Division, Department of Agriculture, 23-25 August, Bangkok, Thailand.

[xix] *Chemical Trespass: Pesticides in our bodies and corporate accountability*. Pesticide Action Network of North America. May 2004. Available online at www.panna.org.

[xx] *Second National Report on Human Exposure to Environmental Chemicals*. United States Center for Disease Control and Prevention. January 2003.

[xxi] Tayaputch, N. et al. 1994. Pesticide Residues in Rice Paddy Environment in Selected Villages in Central Thailand. Bangkok: Toxic Substances Division, Department of Agriculture.