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Gatekeeper Series no. 103

Beyond Safe Use: Challenging the International Pesticide Industry's Hazard Reduction Strategy

Douglas L. Murray and
Peter L. Taylor

2001

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The Gatekeeper Series produced by IIED's Sustainable Agriculture and Rural Livelihoods Programme aims to highlight key topics in the field of sustainable agriculture and resource management. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions for development that are particularly relevant for policymakers, researchers and planners. References are provided to important sources and background material. The Series is published three times a year – in April, August and December – and is supported by the Swedish International Development Cooperation Agency (Sida).

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2001

Executive Summary

The pesticide industry's Global Safe Use campaign reportedly has produced a dramatic decline in pesticide-related health and environmental problems in Guatemala. This paper argues that the campaign does not live up to its claims and may actually undermine effective pesticide hazard reduction. Claims of success have overreached supporting data because of a methodological error known as 'ecological fallacy', the confounding of outputs with outcomes, and an insufficient appreciation of the structural rather than merely attitudinal influences on pesticide practices. The pesticide industry's own ambivalence leads it to see the pesticide problem alternatively as a problem of public perception, or as a serious health and environmental hazard.

We propose an alternative approach to solving pesticide problems based on hazard reduction principles commonly found in industrial safety programmes. The following actions should be taken:

1. The most toxic pesticides should first be eliminated.

2. Safer products or alternative technologies (eg. Integrated Pest Management) should be substituted.

3. Administrative controls should be implemented, including training and education.

4. Finally, personal protective equipment should be introduced.

This strategy is already implicit in several pesticide problem-solving initiatives in the developing world, such as Indonesia and Central America, and should be more widely adopted. A multi-level response to pesticide problems will require a multi-sectoral approach involving government, civil society and the pesticide industry. This multi-sectoral approach, however, currently faces significant continued resistance from within the pesticide industry that will have to be resolved.

BEYOND SAFE USE: CHALLENGING THE INTERNATIONAL PESTICIDE INDUSTRY'S HAZARD REDUCTION STRATEGY

Douglas L. Murray and Peter L. Taylor

Introduction

In a recent paper (Murray and Taylor, 2000) we argued that the international pesticide industry's Safe Use campaign does not live up to its claims and may actually undermine effective pesticide hazard reduction. While this conclusion has drawn considerable attention,[1] there has been less attention paid to our alternative proposal for addressing the pesticide problem. In this paper we briefly review our critique of the Safe Use strategy. Then we discuss our proposal for an alternative approach to solving pesticide problems, based on the principles of hazard reduction commonly found in industrial safety programmes. We will argue that this approach, with some adjustments, is not only applicable to the agricultural sector, but is implicitly already incorporated in several of the most ambitious pesticide problem-solving initiatives underway in the developing world.

The Global Safe Use Campaign: Claims and Critique

Global pesticide use increased rapidly after the Second World War as technological advances led to dramatic expansion in agricultural production. The new production techniques and the rise of the modern chemical manufacturing sector were heralded as part of a 'miracle technology' promising an end to world hunger and disease. Nevertheless, a chorus of concerns by scientists and public interest groups emerged, exemplified by Rachel Carson's *Silent Spring* (1964) warning of the environmental and health dangers of overuse of chemicals. The growing public awareness and government regulation inspired by these critiques were countered by the pesticide and agri-food industries, which aggressively attacked the challenges to the development of the new chemical intensive approach to farming. Industry spokespersons argued, for example, "*in view of the challenges posed by world hunger, emotional attacks against conscientious agricultural chemical research are attacks against humanity*" (Barry, 1987).

1 See for example, Knott and Day, 2000; the San Diego Union-Tribune *Dec. 13, 2000:1; and various articles in the* International Journal of Occupational and Environmental Health, Special Issue on International Pesticide Use, *Vol. 7, No. 4, 2001.*

Nevertheless, the pesticide industry recognised that changes in the promotion and use of pesticides were necessary. Its Groupement International des Associations Nationales de Fabricantes de Produits Agrochimiques (GIFAP) began collaborating with the United Nations Food and Agricultural Organization (FAO) to promote "*new and better*" practices in the use of pesticides (Dinham, 1991). In mid-1991, the pesticide industry launched a voluntary initiative called the Global Safe Use Pilot Projects with a commitment of roughly $1 million from the GIFAP (now renamed the Global Crop Protection Federation—GCFP).

The Safe Use project began in three countries: Guatemala, Kenya and Thailand (GCPF, 1998). In Guatemala, the project aimed in a first phase to train and educate a range of people involved with pesticides, to test and distribute more effective safety equipment and develop appropriate pesticide waste disposal facilities. Training topics included the protection of humans and the environment, preventing and treating pesticide poisoning, and proper disposal of empty containers. Training materials for agricultural technicians, distributors, farmers, school children, housewives and others were developed and distributed. In a second phase in 1995, the programme narrowed to focus on field visits, demonstration plots and master trainers residing in target communities. In Guatemala, the programme recently entered its 'self-sustaining phase' in which the Guatemalan pesticide association, AGREQUIMA, collects on behalf of the Guatemalan government a 0.05% levy on imported pesticide ingredients and products and administers the funds for training activities (Hurst, 1999). The industry reported that the Safe Use programme trained 226,000 Guatemalan farmers and housewives, 2,800 schoolteachers and 67,000 schoolchildren, 700 pesticide distributors employees, 330 technical and sales people and 2,000 physicians and health personnel (GIFAP, nd.).

AGREQUIMA staff pointed to a dramatic decline in reported pesticide poisonings over a two decade period, a claim subsequently echoed by the Guatemalan press (Grimaldi, 1998). Pesticide industry literature infers from the numbers of people trained and the apparent decline in poisonings, that the Safe Use programme has contributed to profound changes in pesticide use in Guatemala, part of a 'silent revolution' in improved pesticide use that is sweeping the developing world (GIFAP, nd).

We argued that such claims about the success of the Safe Use campaign are at least premature and overreach supporting data, for the following reasons:

First, the industry's claims involve an 'ecological fallacy', a methodological error in which population or group level data are used to draw conclusions about individuals. The report of dramatic decline in pesticide poisonings in Guatemala is suspect because of chronic underreporting of such poisonings in Central America. Underreporting was likely to have increased over the period in question because of the destructive effects of Guatemala's civil war and a drastic decline in public sector activities, worsened by economic recession and IMF-promoted structural adjustment policies (Spence and

Vickers, 1998). Recent studies suggest that acute pesticide illness remains very high in Guatemala (Campos and Finkelman, 1998). Similar studies are now underway in six more countries in the Central American region (see below). They are expected to demonstrate that pesticide poisoning remains a major occupational and public health problem throughout the region.

Second, industry claims about the success of Safe Use tend to confound outputs (the number of persons receiving training), with outcomes (actual adoption of safer pesticide practices). The number of people receiving training does not adequately represent the impact on pesticide hazards in the Guatemalan countryside. It is unclear, moreover, whether the numbers of trainees reported by the industry refer to people actually reached directly with pesticide-related information, or whether the numbers are based on estimates of success of its 'trainee becomes trainer' approach. Industry literature provides neither systematic explanations nor evidence of such a multiplier effect.

Third, the Safe Use programme in Guatemala employed a training model that assumes that a transfer of knowledge leads in linear fashion to changes in behaviour. But workplace research and long experience with such efforts, beginning with the Hawthorne project in the late 1920s (Perrow, 1986), suggest that behavioural changes may be temporary artifacts of participation in an intervention. Moreover, the Safe Use campaign is rooted in an assumption that the pesticide problem is caused by irrational behaviour and that it can be resolved by a more rational and common sensical understanding of "the facts" of pesticides (Renán and Felipe, 1998). Yet in reality, if common sensical behaviour is that which responds appropriately in a given situation, common sense may actually lead users to engage in practices which are indeed quite hazardous and bad for the environment. In Central America, an array of structures creates a context in which unsafe pesticide practices are at times the sensible, if not the only possible, line of action for many small farmers and wage workers. For example, in Honduras a group of 15 young melon workers were poisoned after applying carbofuran with their bare hands, then eating lunch without washing. They were not provided with safety equipment, nor was water made available for washing. Washing would have required leaving the field, losing their brief rest period or jeopardising their employment (Murray, 1994). The Pesticide Industry's Safe Use training assiduously avoids recognising or addressing these underlying factors.

Finally, the Safe Use campaign is plagued by the pesticide industry's own internal ambivalence toward the pesticide problem. Its support of Safe Use is motivated by two contradictory definitions of the problem: that the pesticide problem is one of public perception and, alternatively, that it is a serious health and environmental hazard. We do not suggest that the pesticide industry choose between engaging its critics with public relations campaigns and promoting safe pesticide use. Nevertheless, the juxtaposition of both approaches has led to confusion in the industry's strategy, implementation and evaluation. If the problem is one of public perception, claims of success based on a clear

message about types of communication and numbers and types of people reached may be more effective in convincing regulators and consumers in Northern markets that the industry behaves responsibly. If, on the other hand, the problem is defined as a real and serious set of hazardous conditions, the industry's objective should be more focused on altering hazardous behaviour and conditions, rather than consumer and regulator perceptions. Progress toward that latter goal should be measured by careful and systematic analysis of such conditions as, for example, through comparisons of rates of adoption of safe use practices with changes in poisoning rates. Further, to assure validity such data should be collected and analysed in a transparent fashion by credible third parties.

Applying an Industrial Safety Approach to Pesticide Problem-Solving

We argue for a more effective strategy of pesticide hazard reduction based on a long established hazard reduction model used in industrial sectors of Northern industrialised countries. This strategy, when applied in the developing world, would require concerted efforts by multiple actors, including governments, the pesticide industry, employers, workers and civil society organisations. The strategy has traditionally been described as an Industrial Hygiene matrix (Plog, 1996) that depends on a combination of government regulatory measures and voluntary action by industry. In this approach, hazard reduction is pursued in a hierarchical fashion, beginning with the highest and most comprehensive level of actions and ending with measures of last and least impact which are dependent on prior steps at higher levels.

Level 1: engineering controls

Engineering controls represent the first and highest level of intervention in an industrial setting. When applied to the pesticide hazards in the agricultural sector of the developing world, we would propose the following actions:

Step (i): Eliminate hazards

In the context of the developing world's agriculture, governments and the pesticide industry together need to begin by banning the most problematic products currently in use. In many countries there are no more than three or four pesticides that cause the majority of acute pesticide poisonings. In Central America and elsewhere, these products usually fall within the World Health Organization's Category 1 Chemicals (see Table 1), those deemed highly to extremely toxic pesticides. Eliminating these pesticides would undoubtedly reduce pesticide hazards and pesticide-related illnesses significantly. Various studies have demonstrated that the use of safety equipment and related safe use measures have questionable impact in relation to Category 1 pesticides (Cole *et al.*, 1988; Fenske, 1993; Murray, 1994). The historical record in Central America suggests that where a dramatic decline in the use of certain chemicals has occurred, a comparable decline in pesticide poisoning has followed. This is particularly

true in the period when cotton production collapsed through the 1980s in Nicaragua, El Salvador and Guatemala. Cotton accounted for as much as 80% of the Category 1 pesticides used in the region during the 1960s to 1980s, and roughly 80% of the pesticide poisonings (ICAITI, 1977). As cotton production collapsed the volume of Category 1 chemicals and the number of poisonings declined, at least until the subsequent increase in banana production and other crops renewed the increasing import and use of the chemicals. Studies in other regions have demonstrated similar declines in poisoning rates when the use of particular chemicals was eliminated (Piola and Prada, 1999).

A combination of pesticide industry voluntary measures to end the marketing of certain pesticides, and government regulatory actions to cancel the registration of the most problematic pesticides, would be consistent with the impact that Level 1 hazard elimination measures normally have in an industrial setting. These measures should begin with the Category 1 pesticides.

Step (ii) Substitute safer products

Obviously when the elimination of these pesticides is pursued, the immediate concern is for what will replace them. Virtually all the most hazardous pesticides are products that have been on the market for many years. Most are among the least expensive pesticides available, which heightens the problem because so many farmers rely on them. But there is a range of alternatives available. There are less toxic products which in some instances are more expensive. In addition, there is an ever-increasing array of non-chemical measures within the Integrated Pest Management (IPM) paradigm, which also includes alternative biological control agents. These alternatives generally provide comparable levels of pest control (see, for example, Hruska and Corriols, in press). Thus far, the pesticide industry's approach to alternatives essentially continues to emphasise the exclusive reliance on pesticides (Benbrook, 1996; Rosset and Altieri, 1997). *It is time for both the pesticide industry and governments to take more aggressive steps to promote alternative products and practices to support the elimination of the most problematic pesticides*. Safe Use and pesticide-based IPM, as currently promoted by the pesticide industry, are not adequate for this task.

One measure worth considering is some form of government subsidy to address the price differentials between hazardous but inexpensive pesticides and less toxic alternatives, including IPM. Subsidies have fallen out of fashion with the rise of neoliberal market policies. But safety, health and environmental externalities currently not included in the pricing of pesticides represent a strong subsidy to the pesticide and agrifood industries. Moreover, subsidising the price of less toxic pesticides and alternative technologies like IPM may result in lower public expenditures on pesticide-related health and environmental problems.[2]

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2 See Hruska and Corriols (in press) for evidence of reduced health effects where IPM is employed as the dominant pest control paradigm.

Level 2: administrative controls

In the industrial setting, administrative measures begin with such things as job rotation, again after level 1 measures have been implemented. In the agricultural sector in the developing world, turnover among agricultural workers is very high, which actually increases pesticide hazards because training and skill development are undermined (McConnell *et al*., 1990). Thus we propose alternative organisational changes such as relying on a trained core of pesticide applicators, and providing appropriate exposure monitoring and control measures for pesticide users. Varying strategies will need to be developed to reflect differing scales of production, levels of capitalisation, etc. Certification of both pesticide vendors and pesticide purchasers might also be consistent with this level of intervention. This strategy is already underway in Central America in Belize.

While training and education are an integral part of this intervention, this only makes sense when higher levels of interventions have been achieved. Unfortunately, the pesticide industry and some governments in the developing world have made training the near-exclusive response to the pesticide problem without the necessary prior interventions. This is perhaps the fundamental flaw in the industry's Safe Use campaign. Ironically, if the industrial safety strategy proposed above were implemented, the Safe Use campaign might well have the kind of demonstrable impact on pesticide hazards that industry literature has already claimed.

However, a more viable training strategy will need to be employed if Safe Use is to achieve a significant and lasting impact. Training will need to be far more participatory, relying, for example, on farmer focus groups to identify hazards as well as structural constraints to responding to these hazards. Such an approach would also rely on third party monitoring and support to provide more effective responses to hazards and validation of training efforts. NGOs, unions and others would be likely candidates for such support (see Hurst, 1999).

Level 3: Personal protective equipment

Once the preceding levels of intervention have been implemented, personal protective equipment (PPE) can be used, but only as a measure of last resort. It is readily apparent in the developing world that PPE is neither effective nor appropriate in many settings. It is too expensive for many pesticide users, and is completely unrealistic for hot tropical climates. Industry efforts to promote the use of locally developed PPE, such as adapting plastic bags as protective clothing, may further compound the problem. Research has demonstrated that PPE gives a false sense of protection under the best of conditions, when in fact exposures can remain quite high when PPE is used (Fenske, 1993). These artisanal techniques being promoted by the pesticide industry's Safe Use campaign may aggravate this problem, and we urge the industry to reconsider this measure. As in previous levels, the adoption of PPE measures should only be

pursued once higher levels of intervention have been accomplished. Unfortunately, similar to Safe Use training, PPE is relied upon far too often as the near-exclusive response to pesticide hazards.

Comparable Initiatives to the Industrial Hygiene Matrix

Our argument is not radically new or innovative. On the contrary, as the following discussion demonstrates, several pesticide hazard reduction initiatives have implicitly incorporated this strategy. Our basic point is that this strategy has been in use for a long time in industrial settings, and should be more widely adopted in agriculture.

There are several examples of how this strategy has been or may yet be implemented in the developing world. Possibly the most famous was the prohibition of a list of Category 1 pesticides in Indonesia during the 1980s, consistent with Level 1 interventions discussed above. In this case the action was taken by the Indonesian government in support of a nationwide IPM initiative to stop a pesticide-driven crisis in rice production (Useem *et al*., 1992). While the ban was motivated primarily by economic concerns rather than health hazards, the action established the conditions for successfully implementing lower level interventions to resolve the crisis and pursue more viable alternative pest control strategies.

An even more ambitious initiative is now underway in Central America. A 10-year, seven country health initiative called PLAGSALUD has been funded by the Government of Denmark and implemented through the Panamerican Health Organization, in collaboration with the Ministries of Health in the region. The project's primary goal is to reduce pesticide poisonings by 50% over the life of the project (Keifer and Pacheco, 1991). Over the first six years of the project, activities have focused largely on documenting the scope of the worker and public health problem. Preliminary results of a study to be presented early in 2002 suggest the pesticide problem remains quite serious in the region, with estimates placing the annual number of poisonings in Central America in the range of 300,000.[3]

The project is about to enter a final four year phase in which the most ambitious steps for reducing pesticide-related illness will be initiated. The cornerstone of this final phase is a legislative initiative aimed at banning or restricting a large list of pesticides in the region. The list is drawn from two sources. The first is a list of 12 pesticides identified through an epidemiological surveillance system developed by the project, as causing the majority of health problems in Central America (Table 1).

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3 This dramatically higher estimate of pesticide poisonings in the region is based in part on the inclusion of such pesticide related conditions as chemical burns to the skin, the eyes, and other conditions which are commonly reported in industrialised countries, but traditionally not in developing countries.

Table 1. Central America's Dirty Dozen*

Pesticides	WHO Toxicity Classification
Methyl Parathion	IA
Terbophos	IA
Ethoprophos	IA
Aldicarb	IA
Methamidophos	IB
Methomyl	IB
Monocrotophos	IB
Carbofuran	IB
Endosulfan	II
Clorpirophos	II
Paraquat	II
Aluminium Phosphate	(unclassified)

*Note that several of these pesticides were among the original Dirty Dozen list, established by the Pesticide Action Network in the 1980s. See www.panna.org for further information on the original Dirty Dozen Campaign.

Source: Tegucigalpa: Agreement #9, RESSCAD, September 12-13, 2000.

Combined with this list are 115 pesticides whose registration has been cancelled in one of the seven countries in the region.[4] The project aims to create a harmonised list of prohibited pesticides in Central America, where a pesticide banned in one country should be banned in all seven.

This proposal for a harmonised list of banned and restricted pesticides, including the list of the 12 most problematic pesticides, was adopted by the seven Ministers of Health in Central America (plus the Minister of Health of the Dominican Republic) in the Annual Regional Health Sector Meeting (RESSCAD) held in Tegucigalpa, Honduras, September 12 and 13, 2000 (Agreement #9). The Ministers of Health agreed to pursue the adoption of the harmonised list with the national authorities charged with pesticide registration in each country. The Ministers will present progress reports toward this goal in future annual meetings.

The RESSCAD agreement represents the most ambitious action to date to address the pesticide problem in a manner consistent with the Industrial Hygiene matrix. The PLAGSALUD project also pursues the promotion of alternatives, safe use training, etc. But the project recognises the logic of the industrial safety strategy by emphasising the critical importance of Level 1 interventions which eliminate as much of the hazard first before proceeding to lower level measures.

4 Some of these additional 115 pesticides were withdrawn from the registration lists for reasons other than health or environmental hazards, which means the list may be reduced somewhat in the future.

A third example of the hierarchical problem-solving strategy proposed in this paper is still in the design stages. The IPM Facility of the Food and Agriculture Organization of the United Nations in Rome is developing a project called Integrated Pest and Plant Management-2015. The central focus of the project is the promotion of IPM on a global scale by the year 2015. But integral to the strategy is a multi-stage policy reform process that begins with a phase out of Category 1 pesticides by a specific date. Once IPM measures have been adopted as substitutes (consistent with step ii in Level 1 above), the project proposes to phase out Category 2 pesticides by a subsequent target date, and then proceed down to the least toxic pesticides still deemed necessary. While this project is not yet underway, it represents a potentially far-reaching strategy, consistent with the Industrial Hygiene matrix, that may one day bring the pesticide problem under control on a much broader scale than is now being pursued either in Indonesia or Central America.

Conclusion

The task ahead is formidable. Pesticide problem-solving initiatives must first recognise that Safe Use training and related efforts will never bring the pesticide problem under control. Industry and other claims to the contrary only delay the adoption of the measures that hold out hope for an end to widespread poisoning and environmental contamination from pesticides. The Safe Use campaign may also consume scarce public resources, such as the tax revenues that the Guatemalan government returns to the pesticide industry for Safe Use activities, which could be applied to more effective pesticide hazard reduction strategies.

Once it is recognised that more aggressive measures are necessary, the pursuit of a multi-level strategy, implemented in a descending hierarchical order of importance, is likely to be the most effective means for addressing the problem. This strategy will require a multi-sectoral response involving government, civil society and of course the pesticide industry.

Recruiting the pesticide industry to this more ambitious approach will not be easy. While the industry has been active in a variety of organisations designed to develop more effective problem-solving strategies, its role has not been one of unequivocally advancing the process. Recently, for example, the GCPF organised a meeting at the World Bank headquarters to develop a plan to integrate agro-chemical industry and public sector organisation efforts to promote IPM and sustainable farm management. The meeting reportedly failed because of public sector concerns that the industry had a conflict of interest between reducing reliance on chemical controls and meeting pesticide sales targets. Public sector participants reportedly also objected to a perceived gap between published industry policies and actual company practices in the field (Lynch *et al.*, 1999; see also Dinham, 1991; and Sesmou, 1991).

Similarly, the pesticide industry in Central America has been pursuing its own regional harmonisation initiative, parallel to the RESSCAD agreement. The industry-favoured proposal, which has been presented to the Ministers of Agriculture of Central America through the International and Regional Organization for Plant and Animal Protection (OIRSA), also calls for a harmonised list of pesticides in Central America. But it calls for each country to register a pesticide if that product is registered in any of the countries in the region. In effect, the two strategies represent contrasting priorities. The health ministries' approach is to regulate up to a higher standard of safety by prohibiting products regionally where they have been banned in a single country. The pesticide industry strategy is to regulate downward to an easier standard of pesticide importation and sales, registering a pesticide in all countries if it is registered in a single country. This industry initiative effectively ignores the problem of pesticides already banned in a country but registered in a neighbouring one.

The PLAGSALUD project and FAO proposal represent significant evidence of a growing critical mass for change. Yet as the example of the competing regional harmonised lists for Central America suggests, influential elements within the pesticide industry are likely to fight against the kind of change these projects represent. As long as the pesticide industry insists on the efficacy of, and near-exclusive reliance on, the Safe Use paradigm, and ignores the need for prior and higher level interventions, the ability to significantly alter the nature of the pesticide problem in the developing world will remain in question.

This continued resistance by the pesticide industry will likely provoke continued and ever more aggressive demands for regulation and intervention by those seeking more effective pesticide problem-solving. It was in part the recognition of the pesticide industry's influence over pesticide regulation in the United States, and the ineffectiveness of that regulatory process, that led to the creation of the Environmental Protection Agency (EPA) in 1970 (Marcus, 1980), and the subsequent transfer of jurisdiction for pesticide regulation from the United States Department of Agriculture to the EPA in 1972. While this transfer was hotly contested by the industry, it has in some ways brought greater credibility to the industry among the American public. As we have argued previously (Murray and Taylor, 2000), the ironical outcome of this contentious process of pesticide problem-solving in the developing world may yet be that the pesticide industry's critics will once again save the industry from itself.

Acknowledgements

We wish to acknowledge the generous support of the John D. and Catherine T. MacArthur Foundation, Program on Peace and International Cooperation, Research and Writing Grants for Individuals, which provided funding for early research that went into this article.

References

AGREQUIMA and GIFAP. 1995. Se reduce el número de pacientes accidentados en el trabajo por el uso de Plaguicidas. *Uso y Manejo Seguro Noticias* (March):3. Guatemala City, Guatemala: AGREQUIMA/GIFAP.

Barry, T. 1987. *Roots of Rebellion: Land and hunger in Central America*. Boston, Mass: South End.

Benbrook, C., with Groth, E. III, Halloran, JM., Hansen, MK. and Marquardt, S. 1996. *Pest Management at the Crossroads*. Yonkers, NY: Consumers Union.

Blalock, HM. Jr. 1982. *Conceptualization and Measurement in the Social Sciences*. Beverly Hills: Sage Publications.

Campos, M. de and Finkelman, J. 1998. *Situación Actual del Uso y Manejo de Plaguicidas en Guatemala*. Guatemala City: OPS/OMS.

Carson, R. 1964. *Silent Spring*. Greenwich, Conn.: Fawcett Publications.

Cole, DC., McConnell, R., Murray, D. L., and Pachec Aonton, F. 1988. Pesticide illness surveillance: the Nicaragua experience. *Bulletin of the Pan American Health Organization* 22 (2):119-132.

Dinham, B. 1991. FAO and pesticides: promotion or proscription? *Ecologist* 21 (2):61-65.

Fenske, RA. 1993. *Flourescent Tracer Evaluation of Protective Clothing Performance*. Cincinnati, Ohio: Risk Reduction Engineering Laboratory, USEPA.

GCPF. 1998. *Safe Use Pilot Projects: Guatemala, Kenya, Thailand. GCPF Sponsored Pilot Projects Fostering the Safe and Responsible Use of Crop Protection*. Brussels, Belgium: Global Crop Protection Federation.

GIFAP. n.d. *Protección de Cultivos: Proyectos de Uso y Manejo Seguro en America Latina*. Guatemala City: Grupo Internacional de Asociaciones Nacionales de Fabricantes de Productos Agroquímicos.

Grimaldi, L. 1998. *Disminuyen Accidentes por uso de Plaguicidas*. Prensa Libre. Guatemala City, 18-19.

Hruska, A. and Corriols, M. in press. The impact of training in Integrated Pest Management among Nicaraguan maize farmers: increased net returns and reduced health risk. *International Journal of Occupational and Environmental Health*, Vol. 8(3): July-Sept 2002.

Hurst, P. 1999. February. *The Global Pesticide's Industry's 'Safe Use and Handling' Training Project in Guatemala*. Geneva: International Labour Organization.

ICAITI. 1977. *An Environmental and Economic Study of the Consequences of Pesticide Use in Central American Cotton Production*. Instituto Centroamericano de Investigación y Tecnología Industrial.

Keifer, MC. and Pacheco, F. 1991. *Reporte de Encuesta de Subregistro de Intoxicaciones con Plaguicidas Sobre el Año 1989, Region 2, León, Nicaragua*. Managua: CARE International.

Lynch, S., van der Wulp, H., von Grebner, K., and Wightman, J. 1999. *Summary of IPM Roundtable Organized by GCPF in Washington, D.C. 19 October (mimeo).*

Marcus, A. 1980. Environmental Protection Agency. In: Wilson, JQ. (ed). *The Politics of Regulation*. New York: Basic Books.

McConnell, R., Pacheco, F., and Murray, D. 1990. Hazards of closed pesticide mixing and loading systems: The paradox of protective technology in the Third World. *British Journal of Industrial Medicine*, 49(9):615-620.

Murray, DL. 1994. *Cultivating Crisis: The Human Cost of Pesticides in Latin America*. Austin, Texas: University of Texas Press.

Murray, DL. and Taylor, PL. 2000. Claim no easy victories: evaluating the pesticide industry's global Safe Use Campagin. *World Development* 28 (10):1735- 1749.

Piola, JC. and Prada, DB. 1999. Influencia de medidas regulatorias en la morbilidad y mortalidad por talio y parathion en Rosair, Argentina. *Acta Toxicologica Argentina*, (7):41-43.

Perrow, C. 1986. *Complex Organizations: A critical essay*. New York: Random House.

Plog, BA. 1996. *Fundamentals of Industrial Hygiene*. Ithaca, NY: National Safety Council.

Renán, AA. and Felipe, AC. 1998. El sentido común y los plaguicidas. *Tierra Fertil* 2.

Rosset, PM. and Altieri, MA. 1997. Agroecology versus input substitution: a fundamental contradiction of sustainable agriculture. *Society and Natural Resources* 10:283-295.

Sesmou, K. 1991. The Food and Agriculture Organization of the United Nations: an insider's view. *The Ecologist* 21 (2):47-56.

Spence, J. and G. Vickers. 1998. *Promise and Reality: Implementation of the Guatemalan Peace Accords*. Cambridge, Mass.: Hemisphere Initiatives.

Useem, ML., Setti, L. and Pincus, J. 1992. The science of Javanese management: organizational alignment in an Indonesian development programme. *Public Administration and Development* (12):447-471.

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ISSN 1357-9258

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