Status of Pesticide Policy and Regulations in Developing Countries

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ABSTRACT Current emphasis in integrated pest management (IPM) is shifting to more biointensive tactics (biological control, host resistance, cultural management), relegating the use of pesticides to a last-effort tactic. This logical and appropriate shift away from a pesticide emphasis does not exclude pesticides from the multiple-techniques strategy necessary for a sustainable crop protection system. Intensified agriculture in many developing countries demands such a system. A solution to the recognized pesticide problems of expense, resurgence, and environmental hazards will involve multiple approaches that include the combined use of alternative tactics leading to the avoidance or reduction of pesticide use as well as a direct, frontal attack on the many problems associated with such use. The frontal attack will involve three broad, but essential areas: research, information transfer and training in pesticide safety, and pesticide legislation and regulations leading to an enlightened and enforceable pesticide policy at both national and international levels. This paper discusses existing national policies in developing countries as well as international regulations and policies impacting on national programs. Such policy is an essential component in pesticide management and should be developed in both a biologically rational manner as well as in a socioeconomically sound manner. There must be better coordination of the many organizations involved in pesticide registration, and indeed all aspects of pesticide management, for specific regions of the third world.

KEY WORDS Pesticides, regulations, policy, developing countries, third world, international, pesticide management, crop protection

Development of integrated pest control strategies was catalyzed by the problems associated with pesticides when used as a single pest control tactic (Smith & Reynolds 1966, Frisbie & Smith 1989). As defined by Smith & Reynolds (1966), integrated pest control (management) is a pest population management system that utilizes all suitable techniques in a compatible manner to reduce pest population. Although the integrated approach emphasized biological and chemical controls,
Smith & Reynolds (1966) stressed the importance of integrating all control procedures and agricultural production practices into a single coordinated pattern. In spite of the original intent of Integrated Pest Management (IPM) and the availability of effective alternative IPM tactics in many cases, chemically dependent IPM has persisted in the United States (Frisbie & Smith 1989). They proposed the development of new, "bio-intensive" IPM systems that rely on biological control, host resistance, and cultural management, without complete reliance upon agricultural chemicals. More recently, the National Research Council (1995) noted the urgent need for an alternative approach to pest management that can complement and partially replace current chemically based pest management practices. The proposed system, identified as Ecologically Based Pest Management (EBPM), relies primarily on inputs of biological knowledge and secondarily on physical, chemical, and biological supplements. It is evident that continued reduction in reliance on the pesticide tactic is a major goal in the evolution of pest management strategy. It is important to realize, however, that this logical and appropriate shift away from the pesticide emphasis does not exclude pesticides from the multiple-techniques strategy necessary for a sustainable crop protection system. As offered by Smith & Reynolds (1966), "The positive values that can accrue from the use of chemicals must be a stimulus to the utilization of techniques that can overcome their disadvantages." The present paper discusses the problems with pesticide use in developing countries and their alleviation. Although not presented as a comprehensive treatise, the paper emphasizes the very complex role of pesticide regulation and policy in the alleviation of constraints on pesticide use in less developed regions.

Role of Pesticides in Developing Countries

In many third world countries, population pressures, land shortages, and weather adversities demand a greatly increased and sustainable production of food. Furthermore, an increase in agricultural production, either for local consumption or for export, is an accepted "essential" for economic development as well as for social and political stability (W. J. Knausenberger, personal communication).

An essential component in overcoming food deficits is reduction of pest-induced food losses. Agricultural intensification via monoculture and increased inputs, such as fertilizers, irrigation, and new varieties, often intensify pest problems. Increased pest problems will require a broadly based, sustainable crop protection strategy, involving all available tactics. Increased human population pressures and the demand for a rapid increase in food production, however, may dictate more intensive short-term crop protection measures while awaiting the development of alternative tactics, including innovative technologies and more sustainable IPM systems. Finally, agricultural production, particularly of staple food crops, in much of the third world is less risk tolerant than that of the developed world and pesticides are viewed, in many regions, as a more reliable tactic for stable food production.
Status of Pesticide Use in Developing Countries

According to recent estimates (EPA 1993), annual world production of chemical pesticides is about 1.82 billion kg (4 billion lb) of active ingredient of which 3 billion are for agricultural use. In 1986, about 20% of global pesticide production went to developing countries. The percentage of pesticide use in developing countries increased to about 24% in 1990, of which 12% went to Asia, 8% to Latin America, and 4% to Africa (Anonymous 1990). Because these countries represent 55% of the world’s agricultural land and 75% of the world’s population, it is evident that their level of pesticide use is well below the world average. Africa has the lowest level of pesticide use, but use is increasing rapidly, particularly on high-value export and industrial crops that produce foreign exchange. Asia is expected to contain about 60% of the world population by the year 2000, and with the demand for food and fiber, the use of pesticides is forecast to increase in that region as well (Farah 1993). In fact, a major expansion is currently underway, primarily in the use of herbicides. Pest control in Latin America and the Caribbean has been heavily dependent on pesticides for some time. Pesticide sales more than doubled in the region between 1976 and 1980 (Bellotti et al. 1990), but growth has been slow since 1989. In general, pesticide use is expected to increase as agriculture develops, particularly for export, with herbicides increasing more rapidly than other types of pesticides.

Many countries in Africa, Asia, and Latin America do not have adequate foreign exchange to meet the food deficits they are currently or imminently facing and must rely on their own self-sufficiency in reaching food production goals. In the poorest countries, foreign exchange problems may prevent the importation of chemical pesticides, but in other countries it may be less costly over the short-term to purchase pesticides than to make up food deficits through importation. Intensified food production with increased inputs often is essential if limited land continues to be devoted to the production of export crops.

Even with increased emphasis on IPM, the recognized risks associated with pesticide use, and the influence of public perception on pesticide use policies, there will be continued use, if not increased use of pesticides—particularly herbicides—in many third world countries.

Constraints to Pesticide Use

 Appropriately used pesticides, along with other agrochemicals, have the potential to increase farmer profits, lower product prices, enhance product appearance, and stabilize consumer supplies, even though they pose real and potential risks to workers and consumers as well as the environment (Archibald 1990). It must be noted that risks in developing countries cannot be readily equated to risks in the developed countries. Problems associated with pesticide use in developing countries are largely associated with misuse, which is attributable to a plethora of causes: lack of education and training in pesticide use; pesticide subsidies (discussed later); information on associated hazards is often lacking or inadequate; difficulty in conducting needed research due to
fiscal constraints; the paucity of expertise; problems with communication and extension; unwillingness of farmers to accept risk of crop loss; the effect of tropical climates on the use of protective clothing; the absence of host-free periods; use of toxic materials in a more hazardous manner; and inadequate regulation and enforcement (Brader 1982, Schaefer 1990). Furthermore, it is argued (Murray 1991) that current development strategies relying heavily on pesticides are biased against the small farmer because they are generating problems for the reasons just discussed and heavily favor transnational and large-scale organizations.

The well-known constraints to pesticide use include cost, nontarget toxicity used in the broadest sense, and resistance, the former two of which are more critical in developing than in developed countries. The major constraint governing pesticide use in many third world countries is a lack of availability, largely because of escalating costs and the lack of available foreign exchange.

Solutions

Recognizing that pesticide use is a risk-associated tactic, the challenge is to manage use to reduce risks to an acceptable level, consistent with the socioeconomic standards of the region. Solutions to the pesticide problems of expense, resurgence, and environmental hazards will involve multiple approaches. Solutions will require both the combined use of alternative tactics, including innovative technologies that will lead to the avoidance or reduction of pesticide use, and a direct, frontal attack on the many problems associated with pesticide use. A solution to the problem of resistance may not exist and, as pointed out by others, the solution may well be simply one of delay.

The frontal attack will implicate three broad but essential areas: research; information transfer, i.e., extension, education, and training; and pesticide legislation and regulations leading to an enlightened and enforceable pesticide policy at both the national and international levels.

In addition to alternative practices, research should continue on chemical-based pest control technologies that can be used with more selective biological activity at lower rates of application. More research on user-friendly formulations for both new and existing products is needed. The introduction of safer, more efficacious and selective synthetic chemicals, along with safer and more efficient delivery systems, should significantly reduce the amount of chemical being introduced into the environment (Menn & Christy 1992). Assistance in the design and conduct of such research in developing countries should be provided by developed countries.

Clearly, research by itself is useless unless transferred in usable form to potential beneficiaries, particularly to small farmers. Information on the optimal use of current materials as well as newer, more selective biorational products should be made available to developing countries. Education and training programs on safe use and disposal of pesticides is critical to the solution of the pesticide dilemma. A recent Food and Agriculture Organization (FAO) report (Farah 1993) showed that only 20% of the countries surveyed have adequate pesticide use training programs. Unfortunately, as the role of the private sector in crop protection expands, agricultural research and extension
in the public sector is contracting. This reduction in research and extension impacts national capacities to develop efforts in various IPM efforts, including pesticides.

**Pesticide Policy in Developing Countries**

The development and enforcement of realistic pesticide policy and regulations represent the third, and equally important, component of the frontal attack on pesticide problems. Because pesticide users do not always consider the impacts of this practice on human health and the environment, it is necessary to implement policy and regulations to help manage these adversities (Farah 1993). It is important to point out that regulations alone cannot accomplish this objective unless they are enforceable, a challenge in many regions of the world. In their excellent review, Higley et al. (1992) suggested criteria for evaluating pesticide policies, which included availability of curative interventions to permit a stable food supply, minimization of true as well as perceived risks of pesticide use, encouragement of nonchemical tactics, and minimization of the costs of pesticide policy.

The 1993 FAO survey (Farah 1993) indicated that about 25% of developing countries lack any kind of a legislation to govern the distribution and use of pesticides, and 80% lack the resources to implement and enforce the legislation. About 60% do not have the analytical facilities to verify and control the quality of pesticides, and most do not have systems in place to adequately handle the importation of banned or restricted compounds. The picture emerging from the 1993 FAO survey (Farah 1993) is that in many developing countries, there is inadequate capacity to set, implement, and enforce a regulatory system for pesticide use.

As many as 76% percent of the countries in Africa lack pesticide control statutes. Among the 10 countries of the South African Development Cooperation Committee (SADCC), only three—Zimbabwe, Tanzania, and Mozambique—have pesticide registration schemes, with enforcement being somewhat obstructed in Mozambique (Schaefers 1992). In West Africa, except for Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, and Senegal, there is no legislation or comprehensive registration and control schemes.

The status of legislation in East Africa is in a rudimentary stage of development with the possible exception of Kenya. In Kenya, The Pest Control Products Act, which became operational in 1982, represents one of the more advanced pieces of pesticide legislation in East Africa. This act requires registration of all imported products and spells out standards of packaging, labeling, and data needed for registration. To date, however, about 150 products have been fully registered out of about 400 presently sold in Kenya. Many functions are covered, or will be covered, in a series of subsidiary regulations such as licensing of premises, registration regulations, import and export regulations, and labeling. This information is controlled by technical subcommittees, but these badly need to be reinforced with expertise. The number-one priority most often stated is the lack of technical equipment for monitoring pesticide levels.
Legislation is in various stages of enactment and enforcement throughout the Asian-Pacific countries. Existing legislation is supposedly modeled on FAO guidelines; i.e., registration data, label requirements, formation of a technical advisory committee, appointment of inspectors to monitor and enforce the regulations, control of imports, and restrictions on availability of pesticides. Before 1987, Nepal, Papua New Guinea, and Eastern Samoa did not have any form of legislation. Laos did not have any legislation in place until 1990 and Burma and China until 1992 (Farah 1993).

As with Africa and Asia, the status of regulations among various Latin American countries is varied, ranging from well-established, clear-cut legislation, to those that lack legislation totally or the resources to enforce them. Attempts to transfer regulations from developed countries met with little success because of inadequate or nonexistent support in terms of scientific research and technological strategies. Thus, the rapidly expanding use of pesticides is not being accompanied by necessary regulatory arrangements (Farah 1993).

**Pesticide Subsidy Policies**

Subsidized pesticide use is a common practice in many developing countries. Subsidies are used to increase food production to overcome deficits, and in the process, preserve foreign exchange that would normally be spent on food imports. They also allow the production of foreign exchange via exports. Repetto (1985) found that such subsidies ranged from 15%–90% in the countries studied. In some countries not only are the chemicals 100% subsidized but also application is free of charge. The unfortunate result of these practices is that they encourage farmers to use more chemicals than they would if paying full cost, thus undermining the more sustainable, multitactic IPM approach. In some countries, subsidies more often benefited the larger commercial growers that produced cash crops, and small farmers—the backbone of food production—often had to pay full price. Pesticide subsidies can run into the millions of dollars annually and may represent the largest government expenditure on crop protection.

A solution to the subsidy issue is not necessarily in their cessation. The use of subsidies should be based on needs of the small farmer, only to the extent necessary, and never to the extent of 100%, i.e., there must be a threshold level that will force economic decisions onto the farmer. Some West African countries have removed subsidies and replaced them with new incentives in the form of higher producer prices, but pesticide use continues to increase.

Although most subsidies are nationally based, there are problems developing with subsidies from international “donors.” For example Japan is a major pesticide producer, and it has donated pesticides to many countries of East Africa and elsewhere. Pesticide contributions from Japan and other sources were commonly observed by the author during the late 1980s locust outbreak in North Africa. Two problems develop: misuse and creation of a pesticide treadmill, and the disposal of large quantities of unused materials. Clearly, restraint is needed in the donation of free pesticides and plans for their safe use and disposal must be incorporated in the contribution.
International Regulations and Policy Impacting Developing Countries

A number of international actions involving pesticide policy and legislation have been undertaken to improve pesticide management, a practice that can help reduce pesticide misuse and maintain the utility of pesticides in the third world.

In 1990, FAO published an amended version of the “International Code of Conduct on the Distribution and Use of Pesticides.” Basically, the “Code,” which is voluntary in nature, is meant to serve as a point of reference, particularly until such time as countries have established their own adequate regulatory infrastructures for pesticides. It was amended to include Prior Informed Consent (PIC) for the shipment of materials that have been banned or severely restricted by any country participating in PIC. The Code also requires exchange of information when there is a change in registration status of a pesticide. Other articles in the Code deal with recommendations on pesticide management, testing of pesticides, reducing health hazards, regulatory and technical requirements, availability and use, distribution and trade, labeling, packaging, storage, disposal, and advertising. The Code is proving useful and has been adopted, at least in principle, by many third world countries.

FAO/World Health Organization (WHO) created the Codex Alimentarius Commission in 1963. The Commission establishes legislation that impacts international shipments of food items. It attempts to harmonize international pesticide residue standards by establishing acceptable minimum residue limits for food coming into international trade. These are then offered to participating countries for acceptance. The limits are being accepted but very slowly.

The guidelines of WHO for a recommended classification of pesticides by hazard, based on acute risk hazards, provide a means of common reference for use by member states, international agencies, and regional bodies. Such information is useful to developing countries, which use it as a basis for final classification of formulated materials; the information also enables standardization of warning labels. The U.S. Environmental Protection Agency (USEPA) is currently considering whether to require WHO hazard classification on the label of pesticides for export.

The U.S. Agency for International Development's (USAID) Environmental Procedures (Section 216 of Chapter 22 of the Code of Federal Regulations) “Reg. 16” requires the agency to assess the impact of pesticides on public health and the environment before approving project funding for the provision and use of pesticides. Changes resulting from the successful implementation of this policy include a reduction in the amount of pesticides provided through USAID projects when compared to past practices, restrictions on their use to protect health and the environment, revisions by some countries or agencies of their pesticide use policies, and initiation of projects that directly address environmental concerns.

Increasing attention has been given to the problem of exporting hazardous non-registered pesticides to developing countries. Some pesticides originating in developed countries have been prohibited, severely restricted, or never registered for use, but under current law it is perfectly legal for manufacturers to export these products to developing countries. There is major concern in the
United States that non-registered pesticides are being applied to crops that are exported to the United States. Recent reports (GAO 1993) estimate that the United States imports from 10%-20% of its supply of fruits and vegetables, mostly from Mexico. Export problems result when manufacturers turn to the expanding market for pesticides in developing countries and export inappropriate materials.

In support of FAO's PIC Amendment, USEPA published their Final Pesticide Export Policy Statement in February 1993 (EPA 1993). Effective 19 April 1995 was the requirement for a purchaser-acknowledgment statement to be in the possession of exporters of non-registered compounds, which include those under consideration, those never registered, and banned materials. The legislation does not ban the export of non-registered compounds but leaves their acceptance voluntary on the part of the purchaser. Banning the export of non-registered compounds is not presently favored by the USEPA because the United States is only one of many exporters and actually exports only 10% of the world's pesticide consumption. It may be more effective to concentrate on the management and use of all pesticide products. Regulatory decisions are based on risk/benefit evaluations specific to the United States, and these may differ from those in other countries; thus, manufacturers may not seek to register a product in the United States simply because there is no need for it. For these reasons, USEPA strongly supports upgrading information and technical assistance to other countries to help them make sound decisions on pesticide use and regulation. The Policy Statement requires USEPA to immediately notify countries about all regulatory actions taken on the basis of health or environmental concerns and to also provide countries with an annual summary of all pesticide regulatory actions.

Certainly, U.S. pesticide legislation is the most complex of any country's legislation, and the history of this legislation is long and varied. A proliferation of increasingly stringent legislation has occurred for the registration and reregistration of pest control products, each with significant impacts on worldwide availability and the selection and use of crop protectants. This legislation creates economic incentives for farmers to use nonchemical pest control methods. Although policy and legislation are aimed at improved pesticide management, they may have negative impacts that constrain the role of pesticides in IPM programs. Furthermore, the lack of registration and removal of products can lead to accelerated resistance development when limited choices are available.

Stated major goals of USEPA are to ensure the safety of U.S. food supplies and to enhance the protection of public health and the environment from unreasonable adverse effects of pesticides both in the United States and throughout the world by promoting the sound management and regulation of pesticides. Such goals require informing countries that intend to export food products to the United States of regulations regarding pesticide use, encouraging international standards, assisting other governments in the development of their own regulatory programs, and promoting internationally consistent regulations.
Conclusions

It is evident that pesticide use in the third world is a matter of public controversy and debate, which can only be alleviated through the promotion of suitable IPM programs and the incorporation of intensified pesticide management. Problems associated with pesticide use, other than that of resistance, can be managed through proper pesticide use training, research, and appropriate and enforced legislation. Regulatory policy is an essential component in pesticide management and should be developed not only in a biologically rational manner but also in a socioeconomically sound manner, and not on a zero-risk basis attempting to avoid all of the negative aspects of pesticide use (Hutchins & Gehring 1993). In agreement with FAO strategies, it is recommended that a regional approach to regulation be encouraged. The idea of regional collaboration for harmonization of pesticide registration is a practical and attractive one. Agreement can be reached on common factors. These could be extended to include a common source of toxicological information and analytical services. Clearly, efforts to force a frontal attack with USEPA or European Economic Community (EEC) registration models would be futile. Although in principle, an internationalized harmonization of registration methodology is ideal, in practice, such methodology can only serve as generalized guidelines. Not only must there be better coordination of the many organizations involved in pesticide registration but also there must be a system to fine-tune registration, and indeed, all aspects of pesticide management for specific regions of the third world. Multidisciplinary advisory bodies for international regulatory development should be established on a regional bases to facilitate the enactment of such legislation as well as to review and update existing statutes. Finally, nongovernmental, regional pesticide information resource centers should be established to provide information flow on the ever-changing registration status of pesticides to concerned governments of developing countries.

Acknowledgment

The author gratefully acknowledges the help of colleagues, Drs. E. H. Glass, W. H. Reissig, C. E. Eckenrode, and W. Knausenberger in the review of this manuscript.

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