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Reforming the Law on Pesticides

by

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REFORMING THE LAW ON PESTICIDES

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I. Introduction

Pesticides are designed to kill. They are intentionally formulated to destroy living organisms and vital cells, and to ravage nerve, respiratory, and digestive systems. The potency of synthetic chemical pesticides renders them the most widely used technique for exterminating and controlling pests. Each year, over one billion pounds of chemical pesticides are applied to the farms, forests, parks, schools, restaurants, homes,[1] and workplaces of this nation.[2] As a consequence, more than half of the average American's food intake contains chemical residues.[3]

Questions concerning the effects of these curious poisons on the public and on environmental health and safety dominate the regulation of pesticides today. The paradox inherent in the practice of intentionally utilizing toxic substances to safeguard health and welfare is perhaps the single most formidable obstacle to formulating a coherent, effective policy to regulate pesticides. An environmental toxicologist once cryptically expressed this dilemma, stating that "by and large, humans and pests are not that different."[4] In other words, because humans occupy a part of the web of nature, poisoning pests could ultimately backfire and poison us.

Attempts to quantify the actual risks that pesticides present to human health and the environment, and to weigh these risks against the benefits of pesticides, is the basis of current pesticide regulation in the United States. The complications inherent in such

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1 Each year, 69 million pounds of chemical pesticides are applied to American homes and backyards. U.S. Environmental Protection Agency, Pesticide Industry Sales and Usage (733-K-92-001) 10 (1992). This type of pesticide application is particularly perilous because of the relatively small size of the treatment areas and the fact that the applicators are often untrained, unable, or unwilling to follow precise directions and take proper precautionary measures against drift or careless exposure. Institute for Environmental Studies, Integrated Pest Management for the Home and Garden 3 (1980).

2 Pesticide Industry Sales and Usage, *supra* note 1, at 10.

3 Ronald A. Taylor, *Is The Food You Eat Dangerous to Your Health?*, U.S. News & World Rep., July 15, 1985, at 64, 64.

4 Rochelle L. Stanfield, *Politics Pushes Pesticide Manufacturers and Environmentalists Closer Together*, 17 Nat'l J. 2846, 2850 (1985) (quoting Ellen Silbergeld, environmental toxicologist for the Environmental Defense Fund).

an undertaking have resulted in an exceptional regulatory morass — a patchwork constructed out of two contradictory statutes, legislatively mandated science, creative agency interpretations of law, rules configured by courts, and the pesticide crisis of the moment.

Recent developments have further undermined the workability of current policy, fueling an outcry for comprehensive reform of pesticide regulation from all interested parties, including farmers, chemical manufacturers, environmentalists, consumer advocates, the Environmental Protection Agency (EPA), and even the Clinton Administration. Pesticide policy has therefore become a priority on the legislative agenda this year. The reform effort continues to rely on the risk-benefit approach and has focused on esoteric disputes concerning the definition of reasonable risks.[5]

This limited focus of current reform proposals is unfortunate because it ignores the failure of the current regulatory strategy to provide adequate protection for agricultural interests, the environment, and human health. The prediction of the incidence of human illnesses or damage to ecosystems as a function of the use of particular pesticides involves considerable uncertainty, debatable assumptions, and controversial judgments.[6] Moreover, the risks and benefits of pesticide use are unevenly distributed in our society, both in terms of who bears the risks and benefits, and when such risks and benefits accrue. It is undeniable that pesticides function to both benefit and injure our surroundings at the same time, but this inherent incongruity does not render risk-benefit analysis the exclusive or most appropriate approach to regulation. Risk-benefit analysis is particularly unsuitable for situations where risks are uncertain but strongly feared because they are at once grave, unfamiliar, and unavoidable, while benefits are disproportionately allocated and perhaps overstated. Pesticides are therefore especially suited for the "pollution prevention" approaches to regulation that have gained support in recent years as alternatives to the conventional "pollution management."[7]

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[5] *See infra* notes 127-34 and accompanying text (discussing the Clinton Administration's Food Safety Plan and the Food Quality Protection Act of 1993, H.R. 1627, 103d Cong., 1st Sess. (1993)).

[6] Robert V. Percival et al., Environmental Regulation: Law, Science, and Policy 605-09 (1992); *see also* David Doniger, *The Gospel of Risk Management: Should We Be Converted?*, 14 Envtl. L. Rep. (Envtl. L. Inst.) 10,222 (June 1984).

[7] *See generally* William Reilly, *Taking Aim Toward 2000: Rethinking the Nation's Environmental Agenda*, 21 Envtl. L. 1359 (1991) (discussing the EPA's focus on integrated, voluntary pollution prevention approaches to environmental challenges).

A regulatory regime that minimizes dependence on chemical pesticides, while promoting effective alternative pest management strategies, may be the best way to achieve a balance among agricultural productivity, environmental safety, and public health. This Note offers suggestions for a new regulatory framework that reduces the use of broad-spectrum,[8] persistent biocides to manage pests.

Part II outlines the framework of pesticide regulation in the United States, highlighting the central issues that pesticide policy must confront. Part III examines the incapability of the current regulatory strategy to protect the three major interests driving pesticide policy, agricultural productivity, the environment, and human health. In response to the failures of the current system, Part IV proposes an Integrated Pest Management (IPM) approach that minimizes dependence on chemical pesticides and describes several regulatory strategies for implementing this approach. Part V concludes that IPM should be the cornerstone of any regulatory reform.

II. The Regulatory Focus of Pesticides

A. *The Insecticide Act of 1910*

The Insecticide Act of 1910[9] was the federal government's first attempt to regulate pesticide chemicals comprehensively. The statute was designed to protect farmers by requiring that pesticides have honest, accurate labels, with a minimum percentage of active ingredient required for some pesticide products.[10] The basis of the law was product reliability — to assure farmers that pesticides would perform their intended function.

The health and environmental concerns that are at the heart of modern pesticide regulation were not a part of the Insecticide Act. Nevertheless, the Insecticide Act's focus on farmers and farm production established an approach to pesticide regulation that has survived, at least in part. Today, the "benefit" side of the risk-benefit equation still focuses on the benefits to farmers or to the farm economy.[11]

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[8] Broad-spectrum pesticides are defined as pesticide chemicals with a killing action that is effective against many different pests. Northeastern Regional Pesticide Coordinators, Pesticide Applicator Training Manual 97 (1983).

[9] Insecticide Act, ch. 191, 36 Stat. 331 (1910).

[10] *Id.* at 332-33.

[11] *See, e.g.*, the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. § 136d(b) (1988) (imposing a duty on the EPA Administrator to consider "the impact of the action

Another significant contribution of the Insecticide Act to modern pesticide regulation was the Act's strong endorsement of pesticides as a pest management technique. The Act's requirement of stricter labeling and formulation standards encouraged larger and more sophisticated chemical manufacturers to become involved in the pesticide business.[12]

B. *Federal Insecticide, Fungicide and Rodenticide Act*

Enacted in 1947, the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)[13] requires all pesticide manufacturers to register their products with the EPA prior to the products' sale or movement in interstate commerce.[14] All pesticides must obtain EPA approval prior to marketing, and the EPA has the authority to suspend a pesticide's registration if "necessary to prevent an imminent hazard."[15]

A brief review of the history of FIFRA illustrates the underpinnings of the statute's current focus. Public concern about the hazards of certain pesticides, particularly DDT, had grown ever since the publication of Rachel Carson's *Silent Spring* in 1962.[16] In 1966, the Environmental Defense Fund initiated a series of lawsuits intended to put DDT "on trial" in the hopes of eventually forcing its suspension.[17] In one such case, the D.C. Circuit interpreted the FIFRA suspension provisions to require the initiation of cancellation proceedings against a pesticide whenever the agency finds a "substantial question about [its] safety . . . ."[18] This judicial activity reflected a clear shift in policy from the assurance of safe

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proposed . . . on production and prices of agricultural commodities, retail food prices, and otherwise on the agricultural economy" before restricting or canceling the registration of a pesticide product).

12 Angus MacIntyre, *Why Pesticides Received Extensive Use in America: A Political Economy of Agricultural Pest Management to 1970*, 27 Nat. Resources J. 533, 547 (1987).

13 7 U.S.C. §§ 136-136y (1988).

14 *Id.* § 136a.

15 *Id.* § 136d(c)(1).

16 Rachel Carson, Silent Spring (1962). *Silent Spring* dramatically alerted many Americans to the threat that chemical pesticides like DDT could pose to both human health and the environment. Percival et al., *supra* note 6, at 488.

17 Christopher J. Bosso, Pesticides and Politics 135-37 (1987).

18 Environmental Defense Fund v. Ruckelshaus, 439 F.2d 584, 595 (D.C. Cir. 1971); *see also* Angus MacIntyre, *A Court Quietly Rewrote the Federal Pesticide Statute: How Prevalent is Judicial Statutory Revision?*, 7 Law & Pol'y J. 249, 258-65 (1985) (interpreting *EDF v. Ruckelshaus* as holding that the mere prima facie presentation of a "substantial question of safety" automatically triggers the issuance of a preliminary cancellation notice).

and effective pesticide use to the control of pesticides to reduce unreasonable risks to people and the environment.[19]

The 1972 amendments to FIFRA largely confirmed the changes that had already occurred. The amendments required a manufacturer to show that a pesticide could "perform its intended function without unreasonable adverse effects on the environment."[20] The 1972 amendments also directed the EPA to address the chronic health effects of pesticides as well as acute toxicity.[21] The EPA was similarly required to reregister all pesticides using the same standards now mandated for new pesticides.[22] Thus, the regulatory strategy finally included a consideration of the risks to non-farm consumers and the environment, introducing modern risk-benefit analysis into pesticide regulation. But the new standard still left much room for regulatory discretion.[23]

FIFRA was amended again in 1975, 1978, and 1988. These revisions were driven by the difficulties encountered in gathering and processing the data required for accurate risk-benefit evaluations for the enormous number of pesticide products on the market.[24] Some provisions also complicated the EPA's task. The amendments required the EPA to indemnify any person who owned any quantity of the pesticide before the registration was suspended and suffered a financial loss "by reason of the suspension or cancellation of the pesticide."[25] Lack of "essentiality" was also forbidden as a criterion for denying pesticide registration.[26] Thus, despite the incorporation of a risk-benefit approach, FIFRA remains protective of pesticide users and manufacturers, but questionably ade-

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[19] Mary Jane Large, Comment, *The Federal Environmental Pesticide Control Act of 1972: A Compromise Approach*, 3 Ecology L.Q. 277, 297 (1973).

[20] 7 U.S.C. § 136a(c)(5)(C) (1988).

[21] *Id.* § 136w(c)(2).

[22] *Id.* § 136a-1(a).

[23] For example, the 1972 amendment did not identify a threshold danger level and did not determine the relative weight of the factors in the balancing process. Large, *supra* note 19, at 297.

[24] Estimates of the number of products subject to reclassification or registration in 1972 alone range from 30,000 to 60,000. Scott Ferguson & Ed Gray, *1988 FIFRA Amendments: A Major Step in Pesticide Regulation*, 19 Envtl. L. Rep. (Envtl. L. Inst.) 10,070, 10,073 (Feb. 1989).

[25] 7 U.S.C. § 136m(b)(1)(C). This provision, which forced the agency to contemplate depletion of its own operating budget any time it sought to cancel a pesticide to protect public health, was revised by the 1988 FIFRA amendments, which provided that indemnification would no longer be paid from the EPA's operating budget, *id.* § 136m(b)(3), and would be limited to "end users" of the pesticide product. *Id.* § 136(m)(b)(1).

[26] *Id.* § 136a(c)(5). "Where two pesticides meet the requirements of this paragraph, one should not be registered in preference to the other." *Id.*

quate in promoting non-user public health or environmental quality.

C. *Federal Food, Drug and Cosmetics Act*

The 1938 Federal Food, Drug and Cosmetics Act (FFDCA)[27] was devised to ensure, among other things, the safety of products that humans directly consume by prohibiting the sale of commodities that are "adulterated."[28] The FFDCA contains specific provisions that regulate the occurrence of pesticide residues on food. Section 402[29] provides that any raw food product that contains a pesticide residue is deemed to be adulterated unless it has been authorized specifically under Section 408.[30] Section 408 provides that any registrant of a pesticide under FIFRA may also file with the Secretary of Health, Education, and Welfare (now Health and Human Services) to establish residue tolerance levels for the use of that pesticide on food crops.[31]

Similar to FIFRA, the FFDCA contains language that seems to endorse a risk-benefit approach to the regulation of pesticides. In establishing residue tolerances, it calls for the consideration of "the necessity for the production of an adequate, wholesome, and economical food supply; . . . ways in which the consumer may be affected by the same pesticide chemical or by other related substances . . . ; and . . . the opinion" of the Secretary of Agriculture.[32] Thus, the Act mandates a balancing of the pesticide's risks to human health against the benefits it offers in terms of more efficient food production.

The FFDCA contains one other provision that relates to pesticide residue tolerances. The infamous Delaney Clause, named for the New York Congressman who authored it over thirty-five years ago, prevents the Food and Drug Administration (FDA) from finding that a food additive, including a pesticide,[33] is safe "if it is found to induce cancer when ingested by man or animal, or if it is found,

[27] 21 U.S.C. §§ 301-393 (1988).

[28] *Id.* § 331(a).

[29] *Id.* § 342(a)(2)(B).

[30] *Id.* § 342(a)(2)(C).

[31] *Id.* § 346a(d).

[32] *Id.* § 346a(b).

[33] Pesticides fit within the FFDCA's broad definition of "food additive" which includes "any substance the intended use of which results or may reasonably be expected to result . . . in its becoming a component . . . of any food." *Id.* § 321(s).

after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal."[34]

The FFDCA, however, explicitly limits the effect of the unreservedly health-protective Delaney Clause. Section 402 of the FFDCA[35] provides that raw agricultural commodities are not adulterated so long as their residues are within the tolerance levels set using the risk-benefit balancing criteria of section 408.[36] In addition, section 402 provides for a "carryover" of pesticide residues into processed foods so long as the concentration of the residue in the processed food does not exceed the concentration allowed in the raw food.[37] The effect of these provisions limits the operation of the Delaney Clause to those situations where the chemical is a suspected carcinogen and has concentrated beyond its raw commodity tolerance level in processing. Although technological advances[38] and the Supreme Court's rigid interpretation of the Delaney Clause[39] risk more frequent application of the provision, this health-protective standard still plays a minor role compared to that of the risk-benefit standard under the FFDCA.

The development of these three statutes, the Insecticide Act of 1910, FIFRA, and the FFDCA, illustrates the evolution of modern pesticide regulation. While the initial concern for agricultural productivity remains intact, the modern statutes also address the environment and human health by endorsing the risk-benefit approach. As the next section indicates, however, the risk-benefit approach is incapable of adequately protecting these three conflicting interests.

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34 *Id.* § 348(c)(3)(A).

35 *Id.* § 342(a)(2)(C).

36 *Id.* § 346a(b). Because these criteria make no specific mention of carcinogenicity, they treat cancer like any other risk that must be weighed against the benefits of the pesticide. *Id.*

37 *Id.* § 342(a)(2)(C).

38 Scientific and technological advances have generated significant data on both chemical residue amounts and toxicity. *See* Regulation of Pesticides in Food: Addressing the Delaney Paradox Policy Statement, 53 Fed. Reg. 41,104, 41,104 (1988) [hereinafter Delaney Paradox]. More sophisticated toxicology may reveal that a chemical previously thought to be non-carcinogenic produces cancer in animals, implicating the Delaney Clause. As of 1988, the EPA announced that there was at least "limited evidence" of carcinogenicity for 66 or more of the approximately 350 food use pesticides already approved and that it expected this number to rise as data accumulated. *Id.* at 41,108.

39 The EPA has been unsuccessful in attempting to craft an administrative response to the rigid Delaney Clause requirements. *See* Les v. Reilly, 968 F.2d 985 (9th Cir. 1992) (rejecting the agency's attempt to read a "de minimis" exception into the Delaney Clause), *cert. denied*, 113 S. Ct. 1361 (1993).

III. Protectable Interests

Pesticide policy has traditionally sought to protect three separate interests. The first fundamental interest of pesticide policy has traditionally been the protection of farmers and food producers,[40] the heaviest users of pesticide products in our country.[41] A second interest is the environment.[42] Finally, pesticide policy seeks to protect human health, in part by preventing diseases and illnesses associated with long-term exposure to the chemicals used to combat pests.[43] Because human contact with pesticide residues is so pervasive in our society, questions about the health effects of these toxins have not only dominated pesticide regulatory policy but have also affected the way we view the wholesomeness and integrity of our food supply, the character of government in a free market society, and our culture itself.[44] The interplay of these three interests has built an almost irresistible pressure for the reform of national pesticide policy. Therefore, it is worthwhile to consider the current regulatory system's failures to protect each of these three interests.

A. *Agricultural Interests*

It is generally presumed that chemical pesticides benefit farmers and that any regulation that restricts access to these compounds injures farmers. Agriculturists have consistently warned that a reduction in pesticide use would lead to a devastating increase in crop losses, threatening the food supply.[45] One agriculturist warned that in a world without pesticides, "[o]ur concern will not be that of *silent spring*, but a *silent summer*, *silent autumn*, *silent winter* and a *silent world*. Silence will be broken only by those crying for food. The name of that game is famine!"[46]

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40 *See, e.g.*, Insecticide Act, ch. 191, 36 Stat. 331 (1910).

41 In the United States, "[a]griculture accounts for over two-thirds of national pesticide expenditures, and three-fourths of the quantity used annually." Pesticide Industry Sales and Usage, *supra* note 1, at 2, 8-9.

42 *See, e.g.*, 7 U.S.C. § 136a(b)(5)(C), (D) (1988).

43 *See, e.g.*, *id.* § 136(bb).

44 *See, e.g.*, Wendell Berry, The Unsettling of America: Culture and Agriculture (1977) (criticizing the modern agricultural ideal, including agribusiness, factory farming, and concentrated land ownership).

45 David Pimentel et al., *Benefits and Costs of Pesticide Use in the U.S. Food Production*, 28 Biosci. 772, 772 (1978).

46 *Hearings on FIFRA before the House Comm. on Agriculture*, 95th Cong., 1st Sess. 134 (1977) (statement of Arthur Bassett, Secretary, Pest Control Association of New York).

In 1991 farmers spent over six billion dollars on pesticides in the United States.[47] This expenditure represented nearly five percent of total farm expenditures.[48] Since 1966, farm-sector use of pesticides has risen from fifty percent of total use to more than seventy-five percent.[49] Some researchers have estimated that the return for farmers is in the range of three to five dollars for every dollar invested in pesticide products.[50] These figures seem to indicate that, however one might characterize the risks of pesticides, they provide an important and lucrative benefit to farmers.

The figures actually conceal some important facts. The distribution of pesticide use among farmers, both geographically and by particular crops, is uneven.[51] For example, half of all insecticides used in agriculture are applied to non-food crops, such as cotton or tobacco, grown primarily in the Southeast.[52] Pesticides are applied to more than seventy-five percent of the total acreage of relatively few crops, mainly fruits and vegetables.[53] On a per acre basis, only seventeen percent of total U.S. cropland is treated with herbicides, six percent with insecticides, and less than one percent with fungicides.[54] Thus, the benefits of pesticide use are distributed among farmers who control a relatively small amount of total agricultural production acreage.

More significantly, figures calculating the per year dollar return on pesticides belie a very important fact. Chemical pesticide use has proven to be inefficient and ineffective over the long-term. Between 1942 and 1974, crop losses to insect pests nearly doubled, while the amount of pesticides applied increased tenfold.[55] Estimates of the value of the portion of crops "saved" by pesticides each year ignore the fact that farmers are using more pesticides to protect less of their crops. The real reward of a nearly eleven-fold increase in pesticide use has been a corresponding dramatic increase in the amount of crops claimed by pests. This, coupled with the fact that the price of pesticide products has risen an aver-

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47 Pesticide Industry Sales and Usage, *supra* note 1, at 8.

48 *Id.* at 13.

49 *Id.* at 18-19.

50 Pimentel et al., *supra* note 45, at 781-82.

51 *Id.* at 778.

52 *Id.*

53 *Id.* Many acres of the land devoted to the production of grains and pasture receive little or no insecticide treatment. *Id.*

54 *Id.*

55 *Id.* at 778-79.

age of twenty percent in recent years,[56] has put farmers who depend on pesticides on a treadmill, forcing them to spend more money on pesticides while losing more of their crops to pests.[57]

There is even evidence to suggest that the use of the chemical pesticides themselves has played a major role in fueling the treadmill. The biological processes by which pesticide use leads to a need for successively larger doses and eventual dependence varies depending on several factors, including the particular compound, the target pest, the crop, and the use history.[58] Outcomes, however, have been remarkably uniform and predictable. The "mechanisms by which agricultural ecosystems respond to chemically-induced disruptions are reasonably well understood."[59]

The dramatic initial control that many pesticide products achieve obscures the problems of pest resurgence, secondary pest outbreaks, and genetically acquired resistance that they can cause.[60] Pest resurgence and secondary pest outbreaks occur when pesticides interfere with the system of natural pest controls.[61] Ironically, when these problems occur, the farmer usually increases reliance on the very pesticide that may have caused the problem.

The quandary becomes practically nightmarish when successive sprayings, combined with the remarkable reproductive capacities of some pest species, trigger a rapid selection of pesticide resistant populations. The creation of these "monster" pests that come to

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56 Integrated Pest Management for the Home and Garden, *supra* note 1, at 2.

57 *See* MacIntyre, *supra* note 12, at 552. Despite the declining effectiveness of pesticides, agricultural productivity has risen more rapidly in this period than pest losses, because of higher yielding crop species, more efficient harvesting technologies, and cultural weed control practices. Pimentel et al., *supra* note 45, at 778.

58 *See* MacIntyre, *supra* note 12, at 552.

59 *Id.*

60 *Id.*; *see also* Michael J. Dover, World Resources Institute, Study 4, A Better Mousetrap 5-6 (September 1985).

61 Pesticides can affect the natural enemies of pests, including beneficial insects, in two ways. First, they deplete the food supply of the control species by quickly killing off a large proportion of the pests. The corresponding disappearance of natural controls permits any pests that survive to repopulate with fewer natural checks on their survival. *See* Robert Van Den Bosch, The Pesticide Conspiracy 22-28 (1978); MacIntyre, *supra* note 12, at 552-53; *see also* Pimentel et al., *supra* note 45, at 778 (stating that substantial increases in crop losses, despite increased insecticide use, are due in part to the destruction of natural enemies of certain pests). Second, broad-spectrum biocides interfere with natural pest controls by directly poisoning pest predator and parasite species. This kind of violent disruption to the agricultural ecosystem leads not only to a subsequent outbreak of target species, but also to flare-ups of once harmless species. Van Den Bosch, *supra*, at 25.

dominate pest populations then leads to more frequent applications of more deadly compounds.[62]

Evidence of pest resurgence, secondary pest outbreaks, and acquired resistance makes clear that the long-term effectiveness of pesticides is overrated.[63] There is also evidence that the supposed short-term advantages of pesticide use have been overstated. For example, United States Department of Agriculture (USDA) figures used to calculate loss estimates without pesticide use may be greatly exaggerated. Test plots are generally established in regions where pesticide use is heavy, and pest infestations severe.[64] More significantly, insect, weed, and disease losses are sometimes assessed separately and then combined — yielding incredible figures such as a potential 126% loss of an apple crop in a certain area if pesticides are not used.[65]

In fact, it is not clear whether crop losses due to pests — currently about one-third of the total yield[66] — would increase or decrease over time even if pesticide use were actually terminated.[67] Some pest populations would, of course, increase, while others could be expected to decline as their parasites and predators became re-established. Some scientists contend that this would result in an equilibrium roughly equivalent to that which exists today.[68] Obviously these estimates, like those that purport to quantify pesticides' benefits, are highly speculative and dependent on numerous variables. They are, however, credible challenges to the apocalyptic visions[69] of a world without pesticide chemicals that are frequently conjured up by proponents of pesticide technology.

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62 George P. Georghiou, *The Magnitude of the Resistance Problem*, *in* National Research Council, Pesticide Resistance: Strategies and Tactics for Management 14 (1986); *see also* Integrated Pest Management for the Home and Garden, *supra* note 1, at 2.

63 Unlike the uncertain risks to human health or the environment inherent in widespread pesticide use, this cost is borne directly by farmers.

64 Pimentel et al., *supra* note 45, at 779-80.

65 *Id.*

66 F.L. McEwen, *Food Production — The Challenge for Pesticides*, 28 Biosci. 773, 773 (1978).

67 Pimentel et al., *supra* note 45, at 779-82.

68 *Id.* at 780. One study attempting to ascertain the impact of pesticide restrictions on food prices estimated that total crop losses might increase by up to nine percent, resulting in an increase of twelve percent in retail food costs. *Id.* at 781. This loss would be offset, however, by increased production due to more attractive prices and more careful monitoring of unnecessary losses in harvesting, distribution, and processing, leaving a net human food energy loss of about five percent. *Id.* at 780.

69 *See supra* text accompanying notes 45-46.

B. The Environment

Environmental protection is another important goal of pesticide regulatory policy, but the current regulatory paradigm of a bug, a plant, and a spray frequently places the ecology beyond the farm at risk as well. The problem is understandable, given the basic nature of pesticides and what they are designed to do. After all, "pest" is an economic, not a biological term, and inherent in pesticide use is the human choice to alter the environment by destroying certain components of an ecosystem to benefit human beings. It is therefore somewhat paradoxical to describe pesticides as "friendly" to the non-human environment. The ecological dimension to pesticide use is the idea of limiting pesticides' effects, as much as possible, to their intended purpose.

FIFRA mandates that pesticide policy recognize environmental concerns, requiring a finding that a pesticide chemical will not have "unreasonable adverse effects on the environment" as a prerequisite to registration.[70] FIFRA defines "environment" as "water, air, land, and all plants and man and other animals living therein, and the interrelationships which exist among these."[71] Despite this language, the non-farm, non-human environment has traditionally been a peripheral concern of pesticide regulation.

The EPA's current practice is to waive any requirement for efficacy data on pesticides undergoing registration or re-registration.[72] The assumption is that the manufacturer would not invest the large amount of money required to register and bring a pesticide product to market unless the pesticide were effective.[73] This scheme, however, ignores or underestimates factors such as pest resurgence, secondary pest infestation, and pest resistance development. Furthermore, FIFRA explicitly forbids the EPA from factoring a pesticide's "essentiality" into any evaluation of an application for registration, so the EPA cannot effectively consider whether other available pesticides offer the same effect with less broad-spectrum impact.[74] Thus, once the EPA determines that the pesticide poses no direct, short-term, readily observable risk, the manufacturer is allowed to appraise whether the long-term effects on the insect

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[70] 7 U.S.C. § 136a(c)(5)(C), (D) (1988).

[71] *Id.* § 136(j).

[72] *See id.* § 136a(c)(5); Delaney Paradox, *supra* note 38, at 41,108.

[73] *See* Delaney Paradox, *supra* note 38, at 41,105.

[74] 7 U.S.C. § 136a(c)(5).

ecosystem are acceptable. This strategy is remarkably antithetical to modern environmental thinking.[75]

Most pesticides injure more organisms than they are designed to kill, destroying beneficial insects as well as pests.[76] For example, each year the legal application of registered pesticides in the American Southwest destroys thousands of bee colonies that are essential to many forms of agriculture.[77] More than thirty years after *Silent Spring* demonstrated the role of DDT in the massive poisoning of birds, pesticides are regularly implicated in the destruction of fish, waterfowl, and wildlife.[78] The potential indiscriminancy of some pesticides was dramatically illustrated in 1991 when a derailed tank car filled with a soil fumigant rendered forty-five miles of California's Sacramento River a lifeless moonscape.[79]

Despite these risks, current pesticide regulatory policy fails to encourage manufacturers to target a pesticide at one species of pest, defying the trend in other areas of environmental regulation to require regulated entities to use the "best" (i.e., least destructive) technologies.[80] In fact, the stringency of tests required as a prerequisite to pesticide registration, coupled with the EPA's failure to consider general ecosystem effects, may act as perverse incentives for manufacturers to concentrate on broad-spectrum products in order to attract the larger market needed to cover increased costs. Price increases in the unit costs of pesticide products also make persistent post-application residues desirable, since they offer the pesticide user more protection at lower cost.

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[75] For example, the National Environmental Policy Act, 42 U.S.C. §§ 4321-4370d (1988 & Supp. V 1993), is dedicated to the goal of "creat[ing] and maintain[ing] . . . conditions under which man and nature can exist in productive harmony," *id.* § 4331(a), and requires a "detailed statement" on the environmental impact of proposed government actions. *Id.* § 4332(2)(C).

[76] *See supra* note 61 and accompanying text.

[77] *See, e.g.*, Van Den Bosch, *supra* note 61, at 32. Bees serve an important function in agriculture as pollinators.

[78] *See, e.g.*, *A Pesticide Reform Toolkit*, 13 J. Pesticide Reform 6, 9 (1993) (describing "a million dead fish" in 1991 due to insecticide use on sugar cane in Louisiana's bayou); Van Den Bosch, *supra* note 61, at 29-34 (detailing the poisonings of water buffalo, ducks, and pelicans from pesticides).

[79] *Expert Says Pesticide Killed All Life in River*, N.Y. Times, July 22, 1991, at A10.

[80] *See, e.g.*, the Clean Air Act, requiring emissions limitations for new sources that are achievable through "the best system of continuous emissions reduction," 42 U.S.C. § 7411(a)(1)(C) (1988), the Clean Water Act, requiring "the best available demonstrated control technology" to limit water pollution, 33 U.S.C. § 1316(a)(1) (1988), and the Safe Drinking Water Act, defining "feasible" contaminant removal as "feasible with the use of the best technology." 42 U.S.C. § 300g-1(b)(5) (1988).

Thus, current pesticide policy ignores, and may actually encourage, the clearest environmental desecrator — the persistent, broad spectrum biocide. Without stricter control of these substances, no pesticide policy can ever truly protect the non-human environment.

C. Human Health

The effect of pesticides on human health is one of the most controversial and confusing issues facing pesticide regulation today. An inventory and analysis of the voluminous biological, empirical, and econometric data concerning the "real" risks that pesticides pose to human health are beyond the purview of this Note. What is certain is that the current regulatory scheme permits pervasive human exposure to pesticides through food and the environment. Attempts to quantify the risk posed by this exposure are fraught with uncertainty, since they are often subject to biases and depend on extrapolations.[81]

Pesticide chemicals have many unintended effects. Estimates blame pesticides for hundreds of deaths and thousands of illnesses yearly in the United States.[82] Pesticide labels warn that the products may cause headaches, nausea, dizziness, muscle weakness, and incoordination.[83] The consequences of chronic, low-level exposures also give rise to concerns. Pesticides often leave residues on food and may accumulate and concentrate in the human body.[84] Many pesticides are catalysts for tumors, cancers, and birth defects, at least in laboratory animals.[85] Others have been shown to cause permanent eye injury, kidney damage, lung dysfunction, and low sperm count.[86]

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81 *See, e.g.*, Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 Yale J. on Reg. 89, 91 (1988).

82 Food and Drug Administration data indicates that each year, nationally 80,000 to 90,000 field workers become sick and 800-1000 die as a direct result of exposure to agricultural pesticides. OSHA Field Sanitation Final Rule, 52 Fed. Reg. 16,050, 16,065 (1987).

83 For example, see the label for Malathion, a commonly used insecticide employed extensively in California's Medfly eradication program.

84 *See* Percival et al., *supra* note 6, at 426.

85 Ninety-two of the pesticides EPA has evaluated to date are listed as probable or known carcinogens. *See* U.S. Environmental Protectional Agency, Office of Pesticide Programs, List of Chemicals Evaluated for Carcinogenic Potential (1992).

86 *See A Pesticide Reform Toolkit*, *supra* note 78, at 11.

This evidence has led some to conclude that the current cost/benefit system[87] of pesticide regulation is akin to a game of "hazard roulette," exposing thousands of citizens to dangerous diseases, cancers, and reproductive impairments.[88] Others counter that pesticides are necessary components of the mass production of food in a modern economy and that their benefits, passed on to consumers through lower prices and higher quality, greatly exceed their costs.[89] Interested parties on all sides of the debate collect scientific and statistical data to support their positions. But as a former EPA toxicologist once noted, "[a] good scientist can argue the case either way."[90]

Risk assessment calculations of particular pesticides are undoubtedly complicated and uncertain, and may be incapable of supporting dispositive determinations that the aggregate costs of pesticides outweigh their benefits. If so, risk assessment may simply be too complex and contestable to ever form the basis of an effective and acceptable regulatory policy.

1. *Quantitative Risk Assessment*

Quantitative Risk Assessment (QRA), and its first cousin, Cost/Benefit Analysis, have become the institutional cornerstones for the regulation of pesticides today. FIFRA expressly mandates "taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."[91] QRA is the method employed to give a number to this simple narrative expression. It is widely recognized as the most reasoned and scientifically supportable method for regulating toxics to protect human health.[92]

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[87] The Delaney Clause under the FFDCA achieves the goal of human health protection, but reliance on this provision would be misguided because it is rarely implicated. *See supra* notes 35-39 and accompanying text.

[88] *See, e.g.*, Marina M. Lolley, Comment, *Carcinogen Roulette, The Game Played Under FIFRA*, 49 Md. L. Rev. 975, 976-88 (1990) (tracing the EPA's difficulty in removing pesticides from the market); Janet S. Hathaway, *An Environmentalist's Perspective on the Magnitude of the Health Risk From Pesticide Residues in Food*, 44 Food Drug Cosm. L.J. 659 (1990) (elaborating on shortcomings of FIFRA); Martha McCabe, *Pesticide Law Enforcement: A View From the States*, 4 J. Envtl. L. & Litig. 35 (1989) (same).

[89] *See, e.g.*, Richard Zeckhauser, *Measuring Risks and Benefits of Food Safety Decisions*, 38 Vand. L. Rev. 539, 540 (1985) (noting a recent trend towards a standard of acceptable risk).

[90] Eliot Marshall, *A is for Apple, Alar, and . . . Alarmist?*, 254 Science 4, 20 (1991) (quoting Charles Aldous, a former EPA toxicologist).

[91] 7 U.S.C. § 136(bb) (1988) (defining unreasonable adverse effects on the environment).

[92] *See, e.g.*, Peter B. Hutt, *The Importance of Analytical Chemistry to Food and Drug Regulation*, 38 Vand. L. Rev. 479, 487-88 (1985) (asserting that analytical chemistry and its

QRA calculations are composed of four steps:[93]

a. *Hazard Identification* — deciding whether a specific substance, like a pesticide, can increase the incidence of a disease or malady.

b. *Dose Response* — determining the relationship between various exposure levels and the incidence of adverse health effects.

c. *Exposure Assessment* — estimating human exposure to agents currently or potentially present in the environment.

d. *Risk Characterization* — calculating the magnitude of the risk the substance actually presents by using information gathered in the dose response and exposure assessment phases.[94]

Even a casual examination of these criteria for QRA — expressed in terms of "estimates," "chance," and "might" — reveals that wide gaps remain in the available information. No matter how precise and objective some of the technical data in the equation is, the risk estimator still must fill the gaps with assumptions and inferences.[95] It is somewhat surprising that a methodology based on inferences, and therefore subject to dramatic variations,[96] could come to be identified by so many people as objective "good science."[97] Despite such reservations, QRA is an integral component of most EPA regulatory decisionmaking.[98]

QRA for pesticides is further complicated by problems peculiar to the nature of these particular substances, rendering the results even more suspect. Although pesticide regulation based on risk-benefit analysis is often depicted as a standardized, scientific endeavor, it is fraught with uncertainty, bias, and questionable value judgments. Conclusions about the risks of pesticides are as unreliable as unqualified characterizations of pesticide benefits.[99]

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progeny, risk assessment, occupy a preeminent position in scientific regulation); Zeckhauser, *supra* note 89, at 539; Albert L. Nichols & Richard J. Zeckhauser, *The Perils of Prudence: How Conservative Risk Assessments Distort Regulation*, Regulation, Nov./Dec. 1986, at 13, 13-14.

93 National Research Council, Risk Assessment in the Federal Government: Managing the Process 19 (1983).

94 *Id.* at 19-20.

95 *Id.* at 3.

96 A 1986 study of various estimates of the carcinogenic risk posed by trichloroethylene in drinking water found that risk assessment legitimately could vary by seven to eight orders of magnitude. C. Richard Cothern et al., *Estimating Risk to Human Health: Trichloroethylene in Drinking Water is Used as the Example*, 20 Envtl. Sci. & Tech. 111, 114-15 (1986).

97 *Supra* notes 87-92 and accompanying text.

98 *See* Guidelines for Carcinogen Risk Assessment, 51 Fed. Reg. 33,992, 33,993 (1986).

99 *Supra* notes 55-69 and accompanying text.

2. *Problems in Applying QRA to Pesticides*

a. *Hazard Identification*

Cancer and reproductive health effects are the most commonly discussed chronic health risks of pesticides.[100] However, these compounds may be manufactured to be acutely toxic through other mechanisms — affecting the nervous (carbamates), circulatory (organophosphates), or digestive systems (chlorinated hydrocarbons) of insects.[101] If respiratory disorders, liver and kidney damage, and immune system effects are not part of the QRA model, it is misleading to characterize a pesticide as "safe,"[102] simply because tests have indicated a low, or even non-existent, risk of cancer.

Furthermore, pesticide QRA generally neglects "inert"[103] ingredients in pesticide compounds[104] on the theory that these are not biologically active for the purposes of killing pests.[105] But some of these numerous preservatives, solvents, and emulsifiers can cause skin, eye, nose, and throat irritation, impaired memory, and liver and kidney damage in humans.[106] For example, the EPA does not require that xylene, an inert ingredient used in almost two thousand pesticide products, be included in QRAs to estimate pesticide risks to human health, even though it causes many of the above-listed health problems.[107]

Finally, conventional QRAs generally do not even consider possible cumulative effects of assorted pesticides. QRA focuses on the toxicity of individual chemical active ingredients, despite evidence that the combination of certain pesticides, particularly those in the

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100 7 U.S.C. § 136a-1(e)(1)(C) (1988) calls for the submission of data concerning "chronic dosing, oncogenicity, reproductive effects, mutagenicity, neurotoxicity, teratogenicity, or residue chemistry . . ." for the reregistration of pesticides.

101 Pesticide Applicator Training Manual, *supra* note 8, at 30, 98-99, 110 (listing examples of compounds in each chemical family of pesticides).

102 21 U.S.C. § 348(c)(3)(A) (1988).

103 7 U.S.C. § 136(m) ("The term 'inert ingredient' means an ingredient which is not active.").

104 *Id.* § 136a-1(e)(1)(A) ("summary of each study concerning the active ingredient . . ."); *see also* U.S. Environmental Protection Agency, Pesticide Registration (700-K92-004) 3 (1992) (reregistration provisions of FIFRA require "review of each registered product containing any active ingredient").

105 Inert Ingredients in Pesticide Products; Policy Statement, 52 Fed. Reg. 13,305 (1987) (offering notice of policy favoring least toxic inert ingredient and outlining proposed reporting requirements).

106 Caroline Cox & Norma Grier, *Is EPA Registration a Guarantee of Pesticide Safety?*, 12 J. Pesticide Reform 6, 8 (1992).

107 Pesticide Registration, *supra* note 104 and accompanying text.

same chemical "family" that share mechanisms of action, can be more deadly when used together.[108] Even if this type of synergistic effect is not generally "added into" a QRA, any additional risk posed by these effects could be significant.[109]

b. Dose Response

The assumptions in formulating dose response patterns in pesticide QRAs can overlook particularly sensitive sub-groups such as children. Children have lower dose tolerances for some pesticide chemicals because of their lower gross body weight.[110] To illustrate this problem, the Natural Resources Defense Council in 1989 employed government guidelines for QRA, but used a different dose response model based on preschool children to quantify the health risk posed by the chemical Alar.[111] The result was a risk characterization that was twenty-five times higher than the EPA's most extreme calculations.[112] Additional complications concerning the dose response model include the uncertainty of the basic causal mechanisms for many cancers, the uncertainty of the relationships between high and low doses, and the lack of knowledge about the latency periods and latent effects of many substances.[113]

c. Exposure Assessment

Exposure to pesticides obviously varies depending upon whether a person is a farm-worker, who applies pesticides every day, or an office-worker, who only comes into contact with pesticides through food residues and residential pest control efforts. However, as the National Academy of Sciences report on pesticides and children emphasized,[114] various age-related, cultural, or geographical char-

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[108] Cox & Grier, *supra* note 106, at 9.

[109] In this context, it is sobering to note the gravity of the risks posed by some of these compounds. If every legal pesticide's maximum permitted residue were left on crops (admittedly a worst case assumption), QRAs could yield risks for cancer as high as 1 in 1200 for tomatoes, 1 in 2000 for potatoes, and 1 in 3000 for oranges. These results do not even take into account any potential synergistic effects of these compounds. *Minimizing the Risk From Nature's Bounty*, Newsweek, Jan. 30, 1989, at 75.

[110] *See* National Academy of Sciences, *Report on Pesticides and Children: Hearing Before the Senate Comm. on Agriculture, Nutrition, and Forestry*, 103d Cong., 1st Sess. 47-48 (1993) [hereinafter NAS, *Hearings*].

[111] Natural Resources Defense Council, Intolerable Risk: Pesticides in Our Children's Food (1989) (analyzing children's exposure to pesticides in food and determining the potential hazards the residues pose).

[112] *Id.* at 2.

[113] Latin, *supra* note 81, at 91.

[114] *See* NAS, *Hearings*, *supra* note 110.

acteristics can also have a dramatic effect on the actual rates of exposure. For example, children consume far more fruits and vegetables than adults, and these foods are the primary sources of pesticide residues.[115] Fruit comprises thirty-four percent of the average pre-schooler's diet, compared to just twenty percent of her mother's.[116] Adjusted for differences in body weight, the average preschooler eats seven times as many apples, and drinks eighteen times more apple juice than an adult woman aged twenty-two to thirty.[117] Any QRA based on adult tolerances, as most pesticide assessments have been until recently, could seriously underestimate the health risks these chemicals might pose to children.

In addition, any regulatory regime that relies on the establishment of tolerances for potentially toxic substances is only as effective as the government's ability to monitor the residues.[118] In 1985, hundreds of people became ill when they ate watermelons containing residues of Aldicarb (Temik), a pesticide that is approved for use on soybeans, potatoes, and sugar beets, but not on watermelons. Threats from California's Department of Food and Agriculture Director Clare Berryhill to find the culprits and "nail them to the cross"[119] did little except highlight the practical and theoretical limits of accurately estimating exposure levels to pesticides.

d. Risk Characterization

The uncertainties inherent in QRA highlight the obvious pitfalls in attempting to calculate precisely the risks pesticides pose to human health. Yet the singular seduction of mathematics causes many to defend QRA as objective, rational, and scientific, despite the subjective assumptions, estimates, and guesses that are made throughout the process. The valid criticisms of QRA do not necessarily suggest that the technique is fraudulent, or undertaken in bad faith. Nor do they necessarily indicate that specific pesticide chemicals are significantly more or less hazardous to human health than QRAs indicate. The critiques of QRA do call into question claims that pesticide QRAs can reliably certify substances as "safe"

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115 *Id.* at 19.

116 Leslie Roberts, *Pesticides and Kids; NRDC Report*, 243 Science 1280, 1281 (1989).

117 *Id.*

118 Richard A. Merrill, *Regulating Carcinogens in Food: A Legislator's Guide to the Food Safety Provisions of the Federal Food, Drug and Cosmetic Act*, 77 Mich. L. Rev. 171, 241 (1979).

119 *A $6 Million Bash*, Time, July 22, 1985, at 33.

and beyond reproach. QRA is a useful method for comparing various risks and establishing regulatory priorities, but because of its inherent uncertainty and subjectivity, it fails to provide an absolute basis for making decisions about human health.[120]

In summary, current pesticide law fails to provide adequate protection for human health because it regulates toxic substances exclusively through a method that is highly uncertain and depends on too many subjective assumptions, despite increasing sophistication in technology for gathering and analyzing data.[121] QRA also ignores the argument that economic efficiency and human health are fundamentally incomparable currencies.[122]

It is apparent that most citizens view the abundant production of wholesome agricultural products, protection of the environment, and protection of human health as the most important goals of any pesticide policy. Since there are certainly risks associated with pesticide use, although they may be difficult to quantify, controlling public exposure to these biocidal substances should be the cornerstone of pesticide regulation. The law should affirmatively seek to reduce the need for, and use of, persistent, broad-spectrum chemical pesticides by promoting pest control technologies that reduce pesticide use without significantly decreasing crop yields and farmer income, or increasing pest infestations. The law should not try to meet this goal by attempting to calculate and manage maximum endurable exposure rates.

IV. The IPM Solution: A Framework for Use Reduction

Many parties involved in pesticide regulation agree that some type of pesticide reform is necessary. Several concrete proposals for regulatory reform currently exist. Any reform proposal that merely tinkers with regulations, however, will be ineffective in achieving any substantial reduction in the use of pesticides. Only reform that strives to achieve use reduction will maximize the efficient use of pesticides. One approach that would achieve this reduction is Integrated Pest Management (IPM).[123] IPM is an agricultural technique that takes into account the numerous factors in

120 *See* Robert Ginsburg, *Quantitative Risk Assessment and the Illusion of Safety*, New Solutions, Winter 1993, at 8, 17.

121 The EPA has recently implemented a new Tolerance Assessment System with updated information on toxicology and food consumption. Delaney Paradox, *supra* note 38, at 41,104.

122 Doniger, *supra* note 6, at 10,222.

123 *See infra* part IV.B.

the agricultural process and helps to reduce the need for pesticide use in crop production. The IPM approach promises a more significant reduction in the risks from pesticides than any of the current reform proposals.

A. *Current Proposals for Reform*

Farmers, environmentalists, the chemical industry, and the Clinton Administration all agree that changes are needed in pesticide policy. A public opinion poll commissioned by the Public Voice for Food and Health Policy in 1993 indicates that there is also widespread public concern about pesticide use.[124] Ninety-one percent of Americans worry about the effects of agrichemicals on health and the environment, and nearly sixty percent do not think the government adequately protects them against health hazards of chemicals in food.[125] Moreover, eighty-four percent think that the government should be actively involved in encouraging significant reduction in the use of pesticides, and nearly two-thirds believe it is very important for the federal government to adopt stronger policies to reduce the use of agrichemicals in food production.[126]

Reform proposals for the pesticide regulatory system in the United States, principally the Clinton Administration's Food Safety Plan and the Food Quality Protection Act,[127] have focused on various techniques to "modernize" pesticide law by abandoning the blanket prohibitions of the Delaney Clause and adjusting the risk assessment tolerance levels for pesticide residues on food products.[128] Both plans call for an end to the disparate treatment of residue tolerances for fresh and processed foods created by conflicting standards in the current FIFRA and FFDCA regulatory regimes.[129] The Clinton plan seeks to replace these with a comprehensive "reasonable certainty of no harm" standard that would

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124 Public Voice for Food and Health Policy, New Federal Government Must Make Good on Pledge to Help Reduce Farmer's Reliance on Agrichemicals (1993).

125 *Id.*

126 *Id.*

127 H.R. 1627, 103d Cong., 1st Sess. (1993).

128 *See, e.g.*, Letter from Carol M. Browner, EPA Administrator, to Sen. Patrick Leahy, Chairman, Comm. on Agriculture, Nutrition and Forestry, U.S. Senate (Jan. 11, 1994) (comparing the Clinton Administration's Food Safety proposals to the Food Quality Protection Act, H.R. 1627) [hereinafter *Browner Letter*].

129 *Id.* Browner, the EPA Administrator, has described the Delaney Clause as a "scientific anachronism[ ]" that needs to be revisited in light of the scientific advancement that has occurred since 1959. Glenn Hess, *The Heat Is On: The New Administration is Under Pressure to Reform the Nation's Food Safety Policy*, Chemical Marketing Rep., May 17, 1993, at SR8.

limit the upper bound cancer risk from a particular pesticide residue on food to approximately one in a million over a lifetime.[130] In formulating this tolerance, the EPA would be required to consider the unique aspects of children's metabolisms and diets and to issue specific findings that the tolerance levels selected were protective of infants and children.[131]

The Food Quality Protection Act also proposes marrying the two statutes governing pesticide use and food safety, FIFRA and the FFDCA, but would set new residue tolerances at a more flexible level that the EPA determines "is adequate to protect the public health."[132] Supporters of this Act argue that the Clinton plan perpetuates the same legislative inflexibility of the Delaney Clause by absolutely fixing the maximum risk for carcinogenic residues at one in a million instead of zero. Proponents of the Food Quality Protection Act also want to preserve the EPA's authority to find that the benefits of a pesticide — in terms of food production and the agricultural economy — exceed the costs of a carcinogenic risk level that is higher than one in a million.[133]

The fatal flaw in the current reform proposals, however, is their continuing fixation on merely managing the risk of chemical pesticides instead of reducing the overall use of these biological toxins. Regulations focusing on attempts to assess and achieve consensus on "acceptable" risks to human health run counter to the current trend in environmental law and policy that seeks to achieve pollution prevention and total risk reduction.[134] Pesticide regulations dominated by the search for "bright-line" determinations of the tolerable human health risks of particular toxic substances will fail if they are developed without regard to their interaction with each other, the environment, and social and cultural values. Such regu-

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130 *Browner Letter*, *supra* note 128.

131 *Id.*

132 *Id.*

133 Letter from John Aguirre, National Association of Food Processors, responding to *Browner Letter*, *supra* note 128.

134 *See, e.g.*, the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901-6992k (1988 & Supp. IV 1992) (providing for "cradle-to-grave" management of hazardous waste, requiring phaseout of land disposal for certain untreated and hazardous waste, and imposing new technology-based standards for landfills); the Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j-26 (1988) (limiting maximum allowable levels of contamination in public drinking water systems); the Clean Air Act, 42 U.S.C. §§ 7401-7671q (1988 & Supp. IV 1992) (requiring the EPA to establish national ambient air quality standards to be implemented by the states and setting national emission standards for hazardous air pollutants and auto emissions); the Clean Water Act, 33 U.S.C. §§ 1251-1387 (1988 & Supp. V 1993) (banning the unpermitted discharge of pollutants into surface waters and requiring the application of technology-based controls on discharges).

lations cannot gain the public trust, protect agricultural economies, preserve ecosystems, or adequately address the human health concerns associated with pesticide use.

The best way to accomplish these fundamental goals of pesticide policy is to promote regulation that steadily decreases the volume of pesticide use and the exposure of both people and the environment to pesticides, while sustaining, or even improving, pest management efficacy. A technology-forcing model for regulation, one that "encourages the rest to follow the best," can work for pesticides as it does for other environmental protection regulation. Shifting the emphasis from pesticide products to crop production and pest management can promote the health of America's citizens, agriculture, and environment. The pest management technology that can form the basis of this next generation of regulation already exists and enjoys widespread approval.

B. Integrated Pest Management

Integrated Pest Management (IPM) is an approach to pest management that relies on a combination of common sense techniques to control pest damage and infestation.[135] IPM "is optimization of pest control in an economically and ecologically sound manner, accomplished by the coordinated use of multiple tactics to assure stable crop production and to maintain pest damage below the economic injury level while minimizing hazards to humans, animals, plants, and the environment."[136] In addition to the use of chemical pesticides, IPM also employs other techniques that effectively manage pests, including crop rotations, mechanical cultivation, timed crop plantings, physical controls (such as traps and barriers), biological controls (such as the introduction and encouragement of predatory and parasitic insects and microbial agents), and the use of more selective herbicides.[137] IPM concentrates on natural resource management — whether forest, farm, or human habitation — and long-term biological relationships, rather than solely on pest eradication. The system is based on sound scientific principles

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135 *See* William & Helga Olkowski, John Muir Institute for Environmental Studies, Understanding Integrated Pest Management: Some Basic Concepts for Plant Maintenance Personnel 1 (1980).

136 Office of Technology Assessment, U.S. Congress, Pest Management Strategies in Crop Protection 5 (1979).

137 Dover, *supra* note 60, at 43-52.

that emphasize understanding both the resource being treated, and the pests that threaten it, to optimize control measures.[138]

In a sense, disputing IPM's effectiveness is akin to holding that a "take that, whatever you are"[139] approach to pest problems is superior to the science and field observations that form the basis of IPM; IPM does not preclude any particular pest management tactic, including pesticide use. In fact, agricultural scientists and entomologists developed IPM techniques to deal with the collapse of conventional chemical pest management programs due to increased insect resistance and the scarcity of natural controls.[140] IPM stabilizes pest management by reducing fluctuations in pest populations, improving the predictability of control measures, and enhancing the reliability of pest management programs over time.[141]

Field tests have demonstrated the superiority of IPM to pest control methods that rely on scheduled chemical applications to eradicate pests.[142] IPM tests on nine crops in ten states show, in every case, higher average yield per acre for IPM users compared to nonusers growing the same crops in the same states, despite reduced pesticide use and reduced production costs. In fact, the federal government itself now uses IPM techniques to manage pests at federal facilities.[143]

Obstacles to the implementation of IPM are not usually expressed as lack of effectiveness, since IPM is a decision-making system designed to use all suitable pest control techniques, including chemicals.[144] Some critics question the feasibility of educating farmers and pest control professionals in the method, the cost of making the data necessary for IPM widely available, and the likelihood that the cost of individual pesticide products would rise as broad-spectrum products, with inherently large markets to spread

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138 *Id.* at 44-45.

139 Radio advertisement for Orthene, a broad-spectrum yard and garden insecticide (WCHV, Charlottesville, Va., 1994).

140 Dover, *supra* note 60, at 44-45.

141 *Id.*

142 *See, e.g.*, Comm. on the Role of Alternative Farming Methods in Modern Agricultural Production, National Research Council, Alternative Agriculture 208-14 (1989).

143 *See, e.g.*, Memorandum from A. Greene, NCR Regional Entomologist, U.S. General Services Administration, *Recommended Standards for Pest Control Operations in Occupied Space* (Aug. 19, 1993).

144 Publications explaining how to implement IPM programs are widely available today. *See, e.g.*, U.S. Environmental Protection Agency, Pest Control in the School Environment: Adopting Integrated Pest Management (735-F-93-012) (1993).

costs, disappear.[145] These objections are at best debatable and will be answered in the balance of this Section.

In addition, some critics bemoan the fact that IPM systems impair the "autonomy" of pesticide users.[146] But characterizing environmental problems in terms of the "freedom" to pollute is at once ludicrous and counterproductive. It is far more constructive to focus on increasing the efficiency of pest management to reduce pesticide use than to debate the individual's "liberty" interest in using a specific pesticide. Limiting the external costs of human activity is one of the primary functions of a large body of environmental law; pesticides are as much a part of these costs as auto emissions or solid waste facilities. Autonomy arguments are, therefore, not a serious challenge to the practicality of IPM.

Because IPM reduces the use of persistent, broad-spectrum pesticides by replacing them with the most productive and prudent pest control method available in each situation, its benefits, in terms of economy and efficiency, are shared by society at large. The increased efficiency of IPM helps farmers and the agricultural economy. IPM's grounding in ecology also serves to protect the environment. And since it results in overall reductions in chemical pesticide use, it reduces the risks that these substances can pose to human health. The federal government employs IPM to control pest infestations at federal facilities.[147] Given that endorsement, the only question that remains is how to integrate IPM into a system of pesticide policy for the rest of the country.

C. *Implementation of an IPM Program*

The key concepts that underlie IPM are: 1) that natural and chemical methods of pest control can be integrated to create a maximally effective pest control system; 2) that control methods should be economically justified; and 3) that because pest populations interact with other organisms in complex associations, techniques for pest control should be grounded in an understanding of

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145 Donald T. Hornstein, *Lessons from Federal Pesticide Regulation of the Paradigms and Politics of Environmental Law Reform*, 10 Yale J. on Reg. 369, 401-02 (1993).

146 Former Secretary of Agriculture Clayton Yeutter said that proposals to require farmers to undertake IPM plans were "another regulatory kind of modus operandi for this whole question of usage of agricultural fertilizers and chemicals, and I don't . . . think that regulatory demands are the best way to go about dealing with these issues." *Environmental Coalition Proposes Changes in New Farm Bill to Protect Water, Foods*, 13 Chem. Reg. Rep. (BNA) 1419, 1419 (Feb. 9, 1990).

147 *See, e.g.*, Greene, *supra* note 143.

the larger ecosystem involved.[148] These criteria must inform the substance of any regulatory reform implementing IPM.

The Clinton Administration's pesticide policy reform plan establishes a goal of developing and implementing IPM strategies on seventy-five percent of the cultivated acreage in the United States by the year 2000.[149] The proposed Food Quality Protection Act also directs the EPA and USDA to research and disseminate IPM techniques.[150] Both plans express support for IPM and its purposes, but neither affirmatively mandates the implementation of IPM to reduce pesticide use. Also, the plans' focus on pesticides as almost exclusively a food safety issue ignores the significant danger posed to pesticide applicators and to non-agricultural pesticide users.[151] IPM could reduce pesticide use in all sectors of the economy, thus protecting human health, agriculture, and the environment. Pesticide use reduction policies must explore the reasons for inefficient pesticide use and create incentives to decrease pesticide use. If necessary, policies should provide disincentives to the use of the most hazardous pesticide products. The following subsections detail the appropriate framework for an IPM-based pesticide policy.

1. *Government-funded Research and Demonstration Projects to Encourage IPM and Less Chemically Intensive Farming.*

In 1993 the USDA spent $134 million on pest management projects, "85% of which was directed at either reducing or replacing the use of chemical pesticides."[152] However, a 1990 General Accounting Office study found that one of the most significant obstacles to innovative pesticide practices is reluctance of farmers to try new practices due both to fears of increased pest and weed problems and decreased yields and profits.[153]

Government funding should therefore begin to emphasize to farmers and pesticide users the effectiveness and profitability of

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148 Dover, *supra* note 60, at 44.

149 *See* Browner, *supra* note 128, at 5.

150 *Id.*

151 More than one-fifth of all pesticides applied in America in 1991 were for non-agricultural use. Over 69 million pounds of pesticide were applied in homes and gardens — representing some of the most intensive and riskiest pesticide utilization. Pesticide Industry Sales and Usage, *supra* note 1, at 9-10.

152 Leonard Gianessi, *The Quixotic Quest for Chemical-Free Farming*, Issues in Sci. & Tech., Fall 1993, at 29-30.

153 *Use of Alternative Farming Practices Requires Government Leadership, GAO Says*, 20 Env't Rep. (BNA) 1892 (Mar. 23, 1990).

IPM and alternative pest management projects. At this point, documenting IPM and advertising its advantages is probably more meaningful than elementary research in facilitating the nationwide adoption of IPM strategies. Some, like Mike Moeller, Deputy Commissioner of the Texas Department of Agriculture, advocate a "demonstration IPM farm," with farmers working with USDA extension agents in each agricultural county in the United States.[154] These demonstration projects would focus farmers' attention by allowing them to observe for themselves which alternative practices might prove profitable in their own operations. Further, such projects would add "immeasurably to our body of knowledge about environmentally sound agricultural practices."[155]

Besides political opposition from chemical manufacturers, the major impediment to such research initiatives is lack of money. One possible source of funding for USDA demonstration projects would be increased fees for certain pesticide products.[156] In addition, the government could pay premiums to farmers who participate in programs promoting practices compatible with environmental protection and sustainable agriculture, as has been undertaken in the United Kingdom.[157] If funding could be procured, such programs could be an effective means to introduce IPM techniques to farmers.

2. *Government Subsidies and Incentives to Discourage Pesticide Use.*

Despite recent budgetary reductions, agricultural production in the United States is still heavily subsidized.[158] The subsidy system can be used to encourage the implementation of IPM practices by acting as a source of incentives to farmers. Some subsidies are already conditioned upon farmers' behavior.

In 1985, Congress passed the Food Security Act (FSA),[159] requiring farmers on highly erodible lands to adopt conservation programs employing "best management practices" to control runoff

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154 *Id.*

155 *Id.*

156 *See infra* notes 181-83 and accompanying text.

157 *Agri-Environment Programmes in Germany, U.K. and the Netherlands*, Eur. Env't, Oct. 26, 1993, *available in* LEXIS, News Library, Curnws File.

158 In 1990, farm price support spending in the federal budget totalled more than $1.2 billion. *See U.S. Farm Policy: Proposals for Budget Saving: Hearings Before the Task Force on Urgent Fiscal Issues of the House Comm. on the Budget*, 101st Cong., 2d Sess. 51 (1990) (chart submitted by Rep. Dan Glickman).

159 16 U.S.C. §§ 3801-3845 (1988).

and erosion by 1995 or risk losing federal farm subsidies.[160] The FSA is a good model for pesticide use reduction legislation. Farm subsidies could be tied to the adoption and implementation of approved IPM programs, perhaps with definite pesticide use reduction targets loosely tied to the performance of local or regional demonstration farms.

Subsidies and incentives can also help to reassure farmers who fear that short-term dislocations might occur with a shift to an IPM production system from their traditional scheduled pest eradication program.[161] Farmers will see that, over the long term, IPM would reduce production costs, help overcome resistance to chemical pest control methods, reduce the contamination of farm water supplies with pesticide chemicals, and diminish the financial risk of large crop failures.

Unfortunately, the present subsidy approach creates an incentive system that actually discourages IPM strategies. First, subsidy programs are structured to encourage monoculture and discourage crop rotation — cornerstones of IPM approaches to pest management.[162] Current subsidy programs also distort natural market forces by subsidizing crops in areas where pest control costs would otherwise be too high,[163] since payments are for enrolled crops, regardless of where they are grown.[164] IPM advocates that farmers plant crops which are appropriate to local conditions. Finally, acreage restrictions are currently a precondition for price supports, discouraging diversification and creating an incentive to farm intensively the remaining acres with chemical inputs.[165] Not surprisingly, the overall result is excessive pesticide use, with all the hazards inherent in such practices. Any serious attempt to introduce IPM methods must therefore be accompanied by meaningful reform of the farm subsidy system to ensure that the incentives of the two systems dovetail more closely than they do today.

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160 *Id.* § 3811.

161 *See* L. Alenna Bolin, *An Ounce of Prevention: The Need for Source Reduction in Agriculture*, 8 Pace Envtl. L. Rev. 63, 80-88 (1990) (offering a proposal for subsidized "organic crop insurance").

162 Hornstein, *supra* note 145, at 399-400.

163 *Id.* at 400.

164 Vast differences exist between regions with regard to potential for loss from pests. For example, the apple maggot is a serious problem in New York, but not in the Pacific Northwest. Late blight of potatoes is a more serious problem in the Northeast than in the West. McEwen, *supra* note 66, at 773.

165 *See* Clayton W. Ogg, *Farm Price Distortions, Chemical Use, and the Environment*, 45 J. Soil & Water Conservation 45 (1990).

3. Food Labeling.

In a recent poll, ninety percent of those surveyed said they believed that farmers should change their practices and farm primarily with natural methods, using chemicals only as a last resort; eighty percent indicated they were willing to pay higher prices for food to support a reduction in the use of pesticides.[166] Sales of organically grown produce in the United States now total over $1.5 billion a year.[167] Switching the spotlight of regulation from pesticide product labeling to food product labeling could help accelerate the trend toward explicit consumer demand focused on food products with lower pesticide residues. This would reduce the use of pesticides in agriculture.

One context in which the labeling issue arises is in the certification of foods as "organic" or "pesticide-free." Current standards, both private and governmental, vary from state to state, so a nationwide federal standard will go a long way toward making these labels more reliable and more popular with consumers.[168] Increased demand for pesticide-free foods would give farmers an incentive to grow such products and could reduce nationwide pesticide use.

Similarly, government regulations could utilize labeling laws to give consumers the information they need to make decisions about pesticide residues on the foods they purchase. For example, labeling regulations could require that all produce that is treated with a restricted-use pesticide[169] or with chemicals whose QRA for certain maladies falls below a certain tolerance level must be sold under a warning label. Such a rule would respect consumers' autonomy to make their own decisions about the risks they are willing to bear with their food and the amount of money they are willing to spend to enjoy their food preferences. The burden of justifying a pesticide's use thus would fall on food producers and

[166] Public Voice for Food and Health Policy, Press Release, *Report Confirms Consumers' Concerns about Pesticides* (June 28, 1993).

[167] Stuart Steers, *Organic Producers Reap Growing Harvest: Demand Outpaces Supply at Many Colorado Farms*, Denv. Bus. J., Dec. 31, 1993, at 3.

[168] In 1990 Congress passed the Organic Foods Production Act, which requires all organic farmers and food handlers to meet specific national standards. 7 U.S.C. § 6504 (Supp. V 1994).

[169] 7 U.S.C. § 136a(d)(1)(C) (1988). Restricted use pesticides are substances that "[m]ay generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment . . . ." *Id.* Such restrictions usually include confining the chemical to specific situations, requiring that the substance only be applied under direct supervision of certified applicators, or other special restrictions. *Id.* § 136a(d)(1)(C)(ii).

marketers, and the risks of the most hazardous pesticides would be limited to those consumers who voluntarily assume them. Consumer willingness to pay more for lower residue foods could provide a market subsidy to cushion any short-term dislocations that result from a shift to an IPM program. Of course, a cornerstone of any food label-based strategies for pesticide reduction would be to educate consumers about how to use the new food labels to choose more wholesome, healthier foods.[170]

Revised labeling standards for food products may initially cause market disruptions. Even fresh fruits and vegetables that bear pesticide residues are probably more wholesome and healthful than high fat, heavily salted processed foods that might be residue-free. A shift in dietary preferences away from fresh produce prompted by pesticide warning labels could actually be counterproductive to preserving human health.[171] Therefore, perhaps any labeling regulations beyond organic certification should be implemented gradually, over the course of five or ten years, beginning with only the most hazardous chemical pesticides for which effective substitutes are available.[172] This gradual phase-in will allow more time to educate the public.

4. Food Grading.

In addition to labeling foods according to their pesticide exposure, a comprehensive pesticide regulatory system would require reexamination of the current food grading system. As Senator Wyche Fowler (D-Ga.) asked: "Is it what's inside of the fruit or outside that matters?"[173]

It seems almost intuitive that the physical appearance of produce has some effect on consumer willingness to pay for it. Some contend that USDA grade labeling, which emphasizes weight, size, and blemishes, rather than the nutritional value (admittedly a much harder quality to gauge), inhibits food producers' willingness to

170 *See, e.g.*, Public Voice for Food and Health Policy, *Smart Selections for Healthy Eating* (1993). This pamphlet was produced to inform consumers how to use the new nutritional food labeling system promulgated by the USDA.

171 *Cf.* Merrill, *supra* note 118, at 249 (advocating the need to "recognize the special role that food plays in our society").

172 Even very constricted concentration on only the most hazardous pesticide products can yield more benefits than might be commonly thought. For example, nearly 60% of all oncogenic pesticide risks in food are from fungicides, "and fungicides comprise only about 10 percent of all pesticides applied to food crops." Delaney Paradox, *supra* note 38, table 3-16, at 74-75 (1987).

173 *Senate Panel Calls on USDA to Carry Out Study on Produce Quality and Chemical Use*, 16 Chem. Reg. Rep. (BNA) 805 (July 31, 1992).

shift to less intensive pest-management methods.[174] This seems borne out, at least anecdotally, by the fact that the agricultural industries that have undergone the most dramatic shift to IPM techniques are those like wine vineyards, where the physical appearance of the produce is less critical to the final product.[175] Others, however, dispute whether federal grading standards or minimum cosmetic quality standards in federal marketing orders for fresh fruits and vegetables result in increased pesticide use for purely cosmetic, non-nutritional reasons.[176]

At one point, Congress authorized $4 million to study the relation between fruit and vegetable grading and cosmetic standards, but it never appropriated the funds.[177] Finally undertaking this study — a move which has the support of the United Fresh Fruit and Vegetable Associations — would be a good place to begin to explore the potential for pesticide use reduction that might be brought about by changes in these standards.[178]

Much like labeling reform, re-educating consumers to revised cosmetic standards for fresh produce is also best done incrementally. Changes in the food grading regulations could be tailored to remove some of the real or perceived market disincentives that currently work against pesticide use reduction. In addition to actual regulatory changes, a consumer education program could enhance the appeal of less visually attractive foods.

5. *Pesticide Registration.*

In addition to specific labeling requirements, pesticide regulatory policy today relies on the licensing of pesticide products as a tool for controlling the risks associated with pesticide use.[179] Pesticide registration is therefore a logical place to apply affirmative IPM-based use-reduction strategies.

Some countries that have initiated definite pesticide use-reduction programs, like the Netherlands and Sweden, have relied on steep registration fees to raise the price of chemical pesticide prod-

174 Roy Popkin, *A Future For Pesticide-Free Foods?*, EPA J., May/June 1990, at 3 (quoting Rod Leonard, Head of the Community Nutrition Institute).

175 *See* Matt Damsker, *Golden State Goes Organic*, Organic Gardening Mag., Jan. 1994, at 18-19. The entire 2800-acre vineyard owned by Gallo Brothers in Madera County, California, "has not had to spray a single pesticide in four years." *Id.* at 19.

176 *Senate Panel Calls on USDA*, *supra* note 173, at 805.

177 *Id.*

178 *Id.*

179 7 U.S.C. § 136a(a) (1988) ("No person in any state may distribute or sell to any person any pesticide that is not registered under this subchapter.").

ucts and thus discourage their use and encourage exploration for safer non-chemical alternatives.[180]

In the United States, pesticide registration could perhaps be used less heavy-handedly, so as not to place an undue burden on farmers and other pesticide users, but still to express a definite regulatory preference for selective pesticide products and IPM methods over the more risky and persistent broad-spectrum chemicals. For example, fees could be increased for restricted use pesticides.[181] Alternatively, QRA could be used to rank pesticide products according to distinct risk characteristics, like acute toxicity, chronic toxicity, and environmental effects, such as persistence and effects on other organisms and the ecosystem. Currently, registration fees are set at approximately $100,000 for most pesticides,[182] and license maintenance fees are set at $650 for the first registration and $1300 for each additional registration.[183] Registration fees and license maintenance fees could, however, be set on a sliding scale. The adjustment of fees to selected percentiles of pesticide products representing the highest risk in each category would create an incentive to innovate lower risk pesticides. Ideally, this incentive would result in a voluntary phasing out of more dangerous pesticides due to their higher costs. Such a system could even reflect a preference among different risk categories, for instance, favoring products that pose more easily managed acute toxic risks over those that pose potential chronic risks. The resulting pesticide market should lead to significant reductions in the use of the riskiest pesticide products, with product prices better reflecting some of the external costs of pesticide use.

Use reduction could also be realized by specific consideration of data on the effects of pesticide products on the ecosystem. Data analysis revealing a product's creation of "unreasonable adverse effects on the environment"[184] should result in the refusal to grant registration or the cancellation of an existing registration. Correspondingly, FIFRA's prohibition against the consideration of the "essentiality" of a pesticide product[185] should be eliminated, permitting the EPA to consider the necessity of a pesticide product in

[180] *See, e.g.*, Lucas Bergkemp, *Dutch Environmental Law: An Overview of Recent Trends*, 16 Int'l Envtl. Rep. (BNA) 144 (Feb. 24, 1993) (describing the General Environmental Provisions Act).

[181] *See* 7 U.S.C. § 136a(d) (discussing restricted use pesticides).

[182] *Id.* § 136a-1(i)(2)(A).

[183] *Id.* § 136a-1(i)(5).

[184] *Id.* § 136a(a).

[185] *Id.* § 136a(c)(5).

the context of alternative pesticides or pest management techniques.

Finally, pesticide registration could be made conditional upon the manufacturer's satisfaction of certain criteria, such as underwriting IPM. In fact, the EPA recently issued a conditional registration for the herbicide Acetochlor, taking a tentative step towards an unprecedented new model for pesticide regulation.[186] Like many other herbicides used in corn production, Acetochlor is classified as a possible human carcinogen.[187] The EPA nevertheless approved its final registration as a food product pesticide because it required lower doses than existing herbicides and therefore presented a lower overall risk.[188] This case illustrates a distinctive IPM-type analysis.

The condition for Acetochlor's approval is that the use of the other corn herbicides, particularly Alachlor and Metolachlor, must decline by sixty-six million pounds over the next five years, ensuring actual realization of the theoretical benefits of the new product.[189] The companies sponsoring Acetochlor also agreed to undertake continuous groundwater monitoring in the areas where the product is applied. If the compound exceeds EPA-specified levels, the product's registration will be automatically canceled.[190]

Using the recent Acetochlor registration as a model, pesticide use-reduction regulations can seek to impose comparable conditions on licensees, such as phase-outs of similar, more hazardous products in the manufacturer's line, design and implementation of IPM programs and recommendations for the product's use, and applicator support mechanisms. All of these tactics could lead to meaningful reductions in the use of chemical pesticides. This type of "negotiated regulation" worked with Acetochlor because the companies manufacturing the product were willing to agree to conditions in exchange for registration. The only authority the EPA actually had, however, was the implicit threat of denying registration. Legislative reform should explicitly grant the EPA significant discretion to engage in negotiated rulemakings.[191]

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[186] Elizabeth S. Kiesche, *Acetochlor Approval Defines a New Model*, Chemical Wk., Mar. 23, 1994, at 9.

[187] *Id.*

[188] *Id.*

[189] *Id.*

[190] *Id.*

[191] The Negotiated Rulemaking Sourcebook of the Administrative Conference of the United States defines negotiated rulemaking, or "neg reg," as an attempt to bring together representatives of the agency and various interest groups to negotiate rules through a pro-

6. Pesticide Applicators.

FIFRA requires states to certify pesticide applicators to use restricted use[192] pesticides, and commercially to sell, distribute, or apply pesticide products.[193] If a state fails to devise an approved plan for applicator certification, the EPA, in consultation with the state's governor, implements a program for applicator certification.[194]

Standards for certification require that an individual be deemed "competent with respect to the use and handling of the pesticides."[195] However, the EPA is explicitly forbidden from requiring any type of examination — written, oral, or practical — to determine competency.[196] Thus, the statute merely requires an affirmation of some sort that the applicator is competent, or that the applicator has attended some kind of training program. The statute forbids any attempt to test the applicator's knowledge or abilities.[197]

This kind of laxity in regulating those who are licensed to handle and release the most hazardous pesticide substances into the environment is inexcusable. Furthermore, it is an anathema to reducing unnecessary pesticide chemical use. The absence of a requirement for a written exam is illogical, since FIFRA specifically relies on pesticide labeling to communicate pesticide risks and to instruct users in safe handling and application.[198] This inconsistency also exposes applicators themselves to unnecessary risks from mishandling of the pesticide products.

The current statutory requirements also undermine safety by permitting a person under the certified applicator's "direct supervision" to apply restricted use pesticides.[199] In the field, the "direct supervision" standard is interpreted to require the certified applicator to be present for the operation, but not necessarily at the

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cess of tradeoffs and compromise to achieve an acceptable outcome on issues of greatest importance. Administrative Conference of the United States, Negotiated Rulemaking Sourcebook 1 (1990).

192 7 U.S.C. § 136i(a)(1) (1988).

193 *Id.*

194 *Id.*

195 *Id.*

196 *Id.*

197 *Id.*

198 *Id.* § 136(q).

199 *Id.* § 136(e)(4).

particular job site.[200] Incidentally, FIFRA allows but does not require the EPA to make IPM materials available to certified applicators.[201]

Applicator certification is intended to control the use of the most hazardous pesticide chemicals, but it is a useless regulatory exercise given the careless nature of applicator training. Training should be required and should include lessons in IPM, basic entomology, and issues of health and environmental safety related to pesticide use. If labels continue to be another important means of communicating information about pesticides, certified applicators should have to pass an exam demonstrating their ability to read a pesticide label and follow instructions for application. Periodic retraining should also be required to teach updated material on alternative pest management techniques and innovative application technologies. Finally, the authority to apply restricted-use pesticides should reside in the certified applicators alone, not in untrained, uninformed workers under their general supervision.

A system for certifying and licensing "IPM experts" who have undergone advanced training in pest management technologies could also help encourage pesticide use reduction. Licensed IPM consultants could serve as an effective counterweight to pesticide manufacturer advisors/salespeople, who naturally seek to encourage chemical pesticide use.[202]

7. *Prescriptive Application.*

Taken to its logical conclusion, use-reduction regulation could actually mandate prescriptive requirements for any pesticide products that are restricted, or that fall within the highest percentiles of acute, chronic, or environmental toxicity risk. Prescriptive use would not only limit actual application to certified and trained practitioners but also require them to receive a sort of "prescription" from a certified IPM expert. The certified IPM expert would operate like a trained physician, with the power to diagnose and prescribe whether a high-risk pesticide product is necessary to control an infestation. This system would admittedly be a severe restriction on pesticide use, but when analogized to the use of prescriptions in medicine, it is not so far-fetched. A consumer has a choice among a wide range of both "over-the-counter" remedies

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200 Tnis is how the process works based on the author's own experience in the field, although there is no statutory support either way.

201 *Id.* § 136i(c).

202 *See* Van Den Bosch, *supra* note 61, at 93-97.

and alternative health strategies for a multitude of afflictions. The most powerful drugs must be prescribed by highly trained physicians, even though the effect of misuse of these drugs is, by and large, confined to individuals. In pest control situations, many people and organisms are potentially at risk from reckless or misinformed pesticide use — a good reason to control access to the most hazardous substances unless absolutely necessary. The point would not be to restrict the ability to manage pest infestations or save crops, but to limit an individual's ability needlessly to load the environment with the riskiest pesticide products. Nevertheless, such a monumental change in how agricultural production decisions are made in the United States would no doubt encounter fierce resistance. This move could probably only be implemented after other types of market-based incentives and registration restrictions reduce the use level of the most hazardous pesticide substances significantly.

V. Conclusion

Pesticide use reduction should be the cornerstone for the next generation of pesticide regulations. Technology-based use reduction tactics are more understandable, logical, and beneficial to agriculture and the environment than either risk-benefit balancing or exclusively health-based regulatory regimes that do not consider the necessity of a productive, efficient agricultural economy. Use reduction is consistent with the traditional risk-benefit balancing of United States pesticide law. It also preserves an individual citizen's autonomy to make choices about his or her own health, and avoids some of the socially and politically divisive issues that dominate pesticide policy today. Use reduction through IPM can also protect farmers and the agricultural economy by reducing production costs, reducing the risk from total pest destruction, and offering food producers a wider choice of pesticide products and pest control methods from which to choose. An explicit use reduction regulatory regime can help us more effectively manage our environment by addressing the causes — not the toleration of — the problems of pesticide chemicals.

The challenge for regulations to reduce pesticide use is not to engineer a return to a primitive, non-chemical agricultural idyll, but to overcome irrational resistance to modern techniques of scientific pest control.