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Pests, Poisons, and the Living Law: The Control of Pesticides in California’s Imperial Valley

Harrison C. Dunning*

Farmworkers, growers, and consumers have become increasingly aware of potential environmental hazards posed by intensive and extensive pesticide use. These hazards have been translated into significant external costs, necessitating further examination of present pest control philosophy and governmental controls. In this Article, the author uses the fertile Imperial Valley of California, the source of innovative local programs of pest control, as the basis for such an examination. After describing the Imperial Valley’s experience, Professor Dunning stresses the desirability of an integrated approach to pest control. As a basic construct, this method requires independent decision making and individualized governmental supervision. It excludes sole reliance on chemical, biological, or cultural control unless best suited to solve a particular pest problem.

In the decade since the late Rachel Carson published Silent Spring,¹ there has been repeated and often acrimonious public debate

* Professor of Law, University of California, Davis. A.B. 1960, Dartmouth College; LL.B. 1964, Harvard University. The field research upon which this article is based was made possible by the generous support of the Council on Law-Related Studies, whose assistance is gratefully acknowledged. Very helpful research assistance was provided by Francis E. McGowan, a graduate student at the University of California, Davis. This research could not have been completed without the help of many individuals, both in and out of government, who agreed to discuss their experience in pesticide control with the author. Their aid is greatly appreciated. Particular thanks are due Mr. Claude Finnell, Agricultural Commissioner of Imperial County, and his deputy, Mr. C.R. Waegner. Any errors of fact or interpretation, as well as all opinions expressed, are the sole responsibility of the author.

over the costs and benefits of the use of chemicals to control populations of insects and other forms of life which may reduce agricultural productivity.\(^2\) Rachel Carson acknowledged that in some circumstances the use of chemicals to control pest populations may be necessary,\(^3\) but she warned that a "chemical barrage has been hurled against the fabric of life" with many undesirable consequences.\(^4\) In her view, we have put poisonous and biologically potent chemicals indiscriminately into the hands of persons largely or wholly ignorant of their potentials for harm . . . we have allowed these chemicals to be used with little or no advance investigation of their effect on soil, water, wildlife, and man himself.\(^5\)

Others have sharply questioned these conclusions, and indeed some have seen a concerted effort to elicit "the triumph of superstition over science" in books which, "frequently without authentic experimental evidence," attribute pollution ills to chemicals in the environment.\(^6\)

Part of the recent literature on pesticides consists of the exchange of charges between farmer and urbanite, chemical industry spokesman and defender of wildlife, or establishment nutritionist and health food advocate.\(^7\) The protagonists normally agree on the reality of damage to crops by insects and other pests, and consequently the need for some method for pest control in agriculture. They disagree sharply, however, on the extent to which chemical pesticides are responsible for the significant increases in agricultural productivity in the United States

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3. R. Carson, supra note 1, at 22.
4. Id. at 261.
5. Id. at 22.
6. White-Stevens, supra note 2, at iii.
7. References to several such exchanges appear in F. Graham, supra note 2.
since World War II; on the public health and environmental effects of pesticide residues; on the effects to be expected if there is a substantial cut-back or complete elimination of the use of chemicals as pesticides; and on the present viability of various non-chemical methods of dealing with agricultural pests.

Another, rather slim part of the pesticide literature deals with pesticides and the law. A portion of this treats liability for crop damage brought about by the application of pesticides. The balance is concerned with public law, that is with the system of regulation which the federal and state governments have developed for pesticides. Attention has been directed primarily to the federal system of the registration of pesticides and of the establishment of "tolerances" for the residues of pesticides which are applied to raw agricultural products.

The need for broader regulations, which encompass more than just control over what chemicals may be marketed or the quantity of residue to be permitted on food products, is also occasionally noted.

Wise use, it is asserted, can go far toward easing the problems caused by pesticides, and the law can assist in bringing about wise use. Some even assert that the law can limit users of pesticides to "need," and


10. See, e.g., Rohrman, 17 J. Pub. L., supra note 8, at 364-65, who states that "the greatest short-coming in the field of pesticide law today" is incomplete state control over pesticide use.

11. Id. at 365.

12. Van den Bosch, supra note 8, at 620.
that this limitation alone would substantially reduce the quantity of pesticide sprayed or dusted over the earth each year. Seldom, however, is any detail provided on the mechanisms to be employed in bringing about such use control, and very little has been published by way of empirical study of the complex and overlapping systems of pesticide use control now in operation on the local, state and federal levels.

I

THE SETTING

The actual impact on pesticide users of various kinds of use restrictions, the role of local government in developing and enforcing such use restrictions, and the potential for improvement of various modifications which can be imagined are important aspects of the general problem of pesticides and law. They affect many interests within society: the grower who needs some method to protect crops from extensive pest damage, the pilot or tractor driver called upon to apply pesticides, the farm worker who labors in a field treated by pesticides, the individual who eats food which has been treated with a pesticide or breathes air and drinks water which may contain pesticide residues, and all who depend on the continued viability of natural and biological systems which may be altered by pesticides. They may provide important clues as to how the law can best respond to hazards which are presented by other kinds of chemicals which are now widely released into the environment. And finally, better understanding of these matters may provide those charged with the formulation of pesticide policy with a firmer foundation for moving ahead.

Students with a comparative perspective on pesticide law in the United States have noted that California has the most developed system of pesticide control in the country.\(^\text{13}\) Within California, Imperial County has the most developed system of local control of pesticides. Indeed, in strengthening its state regulatory system, California has twice borrowed from Imperial County ordinances. In order to obtain a pic-

\(^{13}\) A commentator who reviewed state regulation in 1966 concluded that "[b]y far the most extensive program of legal control of the use of pesticides is that of California." Sigler, supra note 9, at 319. More recently, an editor of Audubon magazine stated:

Here and there we find bright spots as a state pursues a sane pesticide program. For some years now, California's agencies, especially its Department of Agriculture and its Department of Fish and Game, have followed a program that should be a model for other states. Graham, supra note 2, at 244. New York has also been a leader in pesticide control, and in 1971 the New York State Commissioner of Environmental Conservation claimed that his state had established the "toughest pesticides regulations in the country." N.Y. Times, June 30, 1971, at 28, col. 2.
ture of pesticide use control in its most advanced form in the United States, therefore, the author has studied the manner in which Imperial County controls agricultural pesticides used in the Imperial Valley.14

In addition to the relative intensity of control found in Imperial County, the compactness and relative isolation of the Imperial Valley has added to its attractiveness as an area for study. The valley is a highly productive agricultural area, in part because of the long growing season of the Southwest. Land planted with cotton, for example, can produce an average of close to four bales an acre.15 This compares with an average of about two bales an acre in California's San Joaquin Valley,16 one for the United States nationwide,17 and just over one half for the world.18 Growers in the Imperial Valley face intense competition for their crop, however, from the insects which flourish in the desert surroundings. To combat insects and other pests,19 heavy reliance is placed upon a variety of poisons. In 1971 an estimated five million pounds of chemical pesticide were applied to the nearly half million acres under cultivation in the Imperial Valley.20 This average of about

14. The "Imperial Valley" is here taken as the area to which water is provided by the Imperial Irrigation District. The district has 974,000 acres within its boundaries, of which about 612,000 are now irrigable and approximately 473,000 are cultivated. T. HENDERSON, IMPERIAL VALLEY 131 (1968). The valley is about three-quarters the size of the State of Delaware and it has a population of about 75,000. STATE OF CALIFORNIA, CALIFORNIA STATISTICAL ABSTRACT 7 (1971). Approximately 95% of the county's population and almost all its cultivated land are within the Imperial Valley. There are also small cultivated areas within Imperial County near the lower portion of the Colorado River. The balance of the county is desert.

15. In 1963, for example, 46,800 harvested acres of cotton in Imperial County produced 176,180 five-hundred pound (gross weight) bales. CALIFORNIA CROP AND LIVESTOCK REPORTING SERVICE, CALIFORNIA COTTON: ACREAGE, YIELD PER ACRE, AND PRODUCTION BY COUNTIES—1963 CROP (1964). Yields in recent years, when pest problems have been severe, have been far lower. In 1971, 31,200 harvested acres of cotton in the county produced only 50,555 four hundred eighty pound (net weight) bales. CALIFORNIA CROP AND LIVESTOCK REPORTING SERVICE, CALIFORNIA COTTON: ACREAGE, YIELD AND PRODUCTION BY COUNTIES—1971 (1972).


18. Id.

19. A "pest" is any form of animal or vegetable life or any infectious plant disease that is "dangerous or detrimental to the agricultural industry of the state." CAL. AGRIC. CODE § 5006 (West 1968). In practice, "a pest is a living organism in a place where it is not wanted at the time," Cohen, Department of Agriculture, in CALIFORNIA ADMINISTRATIVE AGENCY PRACTICE 269, 290 (M. Nestle, J. Brecher & S. Mikels eds. 1970), just as a weed is "any plant which grows where not wanted." CAL. AGRIC. CODE § 12759 (West 1968).

20. 4,995,710 pounds of pesticides were applied in Imperial County in 1971. This includes materials used in some small agricultural areas of the county outside the Imperial Valley, as well as some relatively small quantities used for non-agricultural purposes within the valley. It does not include certain unrestricted pesticides not
ten pounds of pesticide per acre treated compares with an average of about six pounds throughout California, and much less in most other parts of the world. The Imperial Valley is, in fact, an extraordinary pesticide bowl.

Three steps were taken to complete this Article. First, an analysis was made of the California legislation on pesticide use. Selected state officials and private citizens were interviewed to gain a picture of the practicalities of pesticide use control throughout the state. Second, the files of the Imperial County Agricultural Commissioner dealing with agricultural pests and pesticides were reviewed, with occasional forays made to study the files of county departments with related responsibilities. Third, several dozen interviews were conducted with both the regulators and the regulated within the Imperial Valley. In addition, as part of a different project the author has interviewed the agricultural commissioners of the eight counties in the San Joaquin Valley as to their program of pesticide use control, so there has been some opportunity to consider Imperial County's experience in comparative perspective.

II

THE IMPERIAL VALLEY: THE CAST OF CHARACTERS

The objectives of this Article are to identify the major regulatory norms that constrain behavior by the typical agricultural pesticide user in the Imperial Valley, to review the significance of the regulatory system in three situations where agricultural pesticide usage has brought some degree of crisis to the valley, and to consider the significant questions of policy and technocracy which face any who consider the future of agricultural pesticides and law at the user level. Before proceeding with these matters, however, it is useful to provide a brief

subject to use reporting when applied by persons other than licensed pest control operators. Derived from 1971 CAL. DEP'T OF AGRICULTURE PESTICIDE USE REPORT.

The statistic on pesticide "per acre treated" (each acre counted once per year) is to be distinguished from statistics for "acre applications" (each acre counted once for each application) or for "chemical acres" (each acre counted once for each application of each chemical).

21. Id. at 224. Since a greater percentage of agricultural pesticide applications is made by licensed pest control operators in the Imperial Valley than elsewhere in the state, the variation in intensity of pesticide use between this valley and other areas may be somewhat less than is indicated in the text.


introduction to the chief actors in the pesticide world of the Imperial Valley. Several distinct groups can be identified, with some overlap: county regulatory officials, pesticide applicators, pesticide suppliers, consulting entomologists, beekeepers and the growers themselves.

A. The County Agricultural Commissioner

The principal regulatory official with pesticide responsibilities is the Imperial County Agricultural Commissioner, who directs an assistant commissioner, a deputy commissioner in charge of pest control and several agricultural inspectors. No detailed study of the office of agricultural commissioner has ever been made. Yet in rural California the holder of this office has considerable power, for his decisions often go to the heart of important production decisions made in the agricultural economy. The system of county agricultural commissioners is an old one in the state, and over the years the commissioners have been given a wide range of responsibilities. Plant quarantine inspection, nursery inspection, plant pest control, food product standardization, vertebrate pest control, weed control, seed inspection and apiary inspection are all matters for which the county agricultural commissioner has responsibility.

Nearly seven hundred people serve on the staffs of the fifty-three agricultural commissioners in California. Although the commissioner serves under the county board of supervisors, many of the duties he performs are mandated by state law. A portion of the commissioner's salary is consequently provided by a state subvention, and for many tasks his working relationship with the state Department of Agriculture is close. Yet the commissioner is a county rather than a state official—hired and fired by the county board of supervisors, which in rural counties generally is dominated by local growers.

The post of agricultural commissioner has been one of great sta-

24. In 1881 the state legislature provided that a county board of supervisors upon petition could establish a county board of horticultural commissioners to deal with infestations of "scale bug, codling moth, red spider, or other noxious insects . . . injurious to fruit or fruit trees . . . ." Act of March 14, 1881, ch. 75, §§ 1 & 2, [1881] Cal. Stat. 86. This board later evolved into the position of county agricultural commissioner. See 1938 CALIFORNIA BLUE BOOK 109-23.

25. See, e.g., CAL. AGRIC. CODE §§ 2274-76, 2278 & 5101 (pest control); § 5102 (plant quarantine); §§ 27551, 29441 & 42651 (food product standardization); § 29031 (apairy inspection); § 52282 (seed inspection); and § 53361 (nursery stock) (all West 1968).


27. See note 25 supra.

bility throughout California. There is not a great deal of turnover and little intercounty mobility. In Imperial County the present agricultural commissioner has served since 1954, and his predecessor had held the position since 1922. The commissioners view themselves as technical people, uninvolved in politics. In opposition to a recent bill which would have required the election of county agricultural commissioners, a change that was sought "to assure agricultural workers are given as much attention as the growers," a representative of the California Agricultural Commissioners Association stated that the commissioners "are the least politically-oriented group of any, and if we had to start playing politics our office simply would not function as well."

B. Pesticide Applicators

Among the regulated of Imperial Valley's pesticide world, pesticide applicators occupy a key position. These are people in the business of pest control for hire. They are responsible for application of an estimated 90 percent of all the agricultural pesticide used in the valley. About three quarters of this is applied by air, either by the use of fixed-wing aircraft or by helicopter. Half a dozen firms which specialize in aerial work dominate the pesticide application business in the valley, and together they employ about two dozen highly skilled pilots, who earn in the range of $18,000 to $35,000 a year. The pilots are assisted by "swampers," who load the chemicals to be applied and wash out the planes, and by "flagmen," who work on the ground to guide the plane in making its passes over a field.

C. Pesticide Suppliers

Pesticide suppliers can be treated as a third distinct group of significance in the Imperial Valley, although some firms do both supply and application work. There are nearly two dozen pesticide dealers, several of which are local branches of national organizations. Most distribute their material through "field men" who work either as employees of the dealers or as "independent commission agents" for them.

30. State Senator David A. Roberti (the bill's author), quoted in Sacramento Bee, May 13, 1972, California Country Life section, at 12, col. 3.
31. Quoted in id.
32. Interviews with personnel of the Imperial County Dep't of Agriculture, in El Centro, California, August 1971.
33. Percentage derived from CAL. DEP'T OF AGRICULTURE, supra note 20.
34. National organizations represented in the Imperial Valley include Niagara Chemical Division, FMC Corporation, Shell Chemical Company, and Stauffer Chemical Company.
These field men service their grower customers, and customarily this service includes "field checking:" examination of the grower's fields on a periodic basis to determine what pest problems may exist there. The recently formed Imperial County Agricultural Pest Control Advisors Association counts close to one hundred members, but it appears that within the Imperial Valley about one third that number do most of the field work. Association representatives state that over 80 percent of their members have college degrees, with the majority having been trained in agronomy. Chemical company field men are joined in field checking work by a small group of independent consulting entomologists. The latter provide the service of supervising pest control for grower customers, and they are paid on an acreage basis.

D. Beekeepers and Growers

Beekeepers and growers are the other two groups of significance for pesticide use in the valley. The nearly three dozen beekeepers are mostly small operators who keep bees solely for their honey production. Their importance stems from the fact that they have provided the main opposition within the valley to the widespread use of pesticides, many of which are toxic to bees. Most have learned to accommodate their beekeeping business to the fact that, as one puts it, it must be carried on "smack in the middle of the gas chamber." The growers producing the crops for the protection of which various pesticides are used tend to have large operations, and in vegetable production there has been a marked increase in corporate farming in the valley in recent years. The chief crops produced, in order of gross quantity of pesticide applied, are cotton, lettuce, alfalfa hay, and sugar beets.

III

MAJOR REGULATORY NORMS

The significance of agricultural pesticide use controls in the Imperial Valley can best be understood by an analysis of the key regulatory norms which constrain user behavior. These norms originate from federal, state, and local levels of government, but all depend for
enforcement primarily upon the Imperial County Agricultural Commissioner. There is some overlap among these behavioral norms, some themselves provide a series of subsidiary norms, and there are occasional exceptions which will be subsequently noted. However, as a group they impose the following prerequisites to pesticide application in the Imperial Valley: First, a use permit must in most cases be obtained from the Agricultural Commissioner. Second, those in the business of making application for hire must obtain a license from the state and register with the Agricultural Commissioner. Third, those making an application on the advice of another must be in possession of his signed, written recommendation of that pesticide. Fourth, particular use instructions found on the product's label must be complied with unless deviation has been authorized by the Director of Agriculture or the Agricultural Commissioner. And fifth, substantial drift to other crops must be avoided.

A. The Use Permit

1. The Development of the Permit System

Imperial County has been a pioneer in the control of agricultural pesticides through use permits. In 1938, prior to the explosion of pesticide use brought on by the research breakthroughs of World War II, a county ordinance was enacted which established permit control of agricultural pesticides. The ordinance was the result of severe control Act of 1972, Pub. L. No. 92-516, 86 Stat. 973, 1972 U.S. CODE CONG. & AD. NEWS 5013, amending Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§ 135-35k (1970). The 1972 Act substantially revised federal controls over the manufacture, sale, and use of pesticides. Federal control over pesticide use will in large part be exercised by the promulgation of standards for the certification of pesticide applicators and by allowing certain pesticides to be applied only by certified applicators. Id. § 2, subsecs. 3(d), 4. States may devise plans which reflect federal standards for applicator certification and, if these plans are approved by the federal government, the states may proceed with implementation. Four years are provided for applicator certification. Id. § 4(b). Consequently those states which can pass federal muster will continue to have direct control over pesticide use within their boundaries. References to the new federal legislation as it affects particular regulatory norms are found infra.

39. See note 45 infra.
40. CAL. AGRIC. CODE § 11701 (West 1968).
41. Id. § 11732.
42. See id. § 12003 (West Supp. 1972).
43. Id. § 12976; 3 CAL. ADMIN. CODE §§ 3091-92, 3110-14 (1972). See also note 163 infra.
45. Imperial County, Cal., Ordinance 141, March 21, 1938. The scope of this control has varied over the years. The 1938 ordinance required a permit for "any person, firm, corporation or association desiring or intending to apply insecticide of any kind or character whatsoever to any agricultural crop or crops in the County of
conflict between beekeepers and pesticide users. Arsenic was commonly used at the time, and its high toxicity to bees caused heavy losses to the beekeepers. Although this situation was a common one throughout California's agricultural valleys, other counties did not move to a system of permit control. The unique effort in Imperial County apparently occurred because the county had an unusually strong Agricultural Commissioner, whose sympathy was in some measure won by a well organized and persistent beekeepers' organization.

At the time Imperial County enacted this early ordinance for permit control of pesticides, the state role in pesticide regulation was limited primarily to control of manufacture and marketing. The initial provision was altered in 1956, by an amendment excepting from the provisions of Ordinance 141 those in the business of farming who made application of insecticides to their own crops. Imperial County, Cal., Ordinance 220, March 19, 1956. When the 1938 ordinance was rewritten in 1962, the more limited coverage of persons included was retained, although "pesticide" was substituted for "insecticide." Imperial County, Cal., Ordinance 257, May 7, 1962. Currently county permit control is imposed for all pesticides other than those pesticides determined by the Director of Agriculture to be injurious, and it extends to those engaged for hire in the business of agricultural pest control in Imperial County. Imperial County, Cal., Code § 62300 (1972).

El Centro, Cal. Post-Press, April 24, 1938, at 12, col. 6. Since spraying with calcium arsenate first was begun in Imperial Valley in 1929, 1000 colonies per year have been killed from the 20,000 in the valley. Since that time, the average production per hive of commercial beekeepers has dropped 40 percent, caused mostly by the loss of field bees during the honey flow.

W. Moffatt, Poisoning of Bees by Application of Insecticides 1 (1938) (Speech to the Forty-Ninth Convention of the California State Beekeepers' Ass'n). Cattle also were killed through consumption of feed with arsenic on it. Id. at 2.

J. Eckert, Poisoning of Bees by Application of Insecticides passim (1938) (Speech to the Forty-Ninth Convention of the California State Beekeepers' Ass'n).

Several counties in California did enact other types of ordinances. Thus in 1937 one northern county restricted aerial application to situations of "wet ground from natural causes" or "unexpected migration" of insect pests. Colusa County, Cal., Ordinance of March 15, 1937, § 1. See also H. Whitcombe, Bees Are My Business 131-45 (1955), for an account of conflict between beekeepers and tomato growers in the Central Valley of California. Control over arsenic materials "made it necessary to push through [DDT] research in far shorter time." Id. at 144. Beekeepers generally fared better during the late 1940s and 1950s, when DDT was the favored pesticide, than in the earlier arsenic period or the contemporary era of the organic phosphates. See Act of Feb. 7, 1933, ch. 25, [1933] Cal. Stat. 237. Historically California has regulated "economic poisons." This term is broadly defined to include any spray adjuvant or any substance or mixture of substances intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any and all insects, fungi, bacteria, weeds, rodents, or predatory animals or any other form of plant or animal life which is, or which the director may declare to be, a pest, which may infect or be detrimental to vegetation, man, animals, or households, or be present in any environment whatsoever.

Cal. Agric. Code § 12753 (West 1968). There has also been state regulation of "material" found to be injurious. Id. § 14005. Recently legislation has begun to refer to "pesticide" rather than "economic poison." See, e.g., id. § 11408 (West Supp.
tive on use controls was left to the counties. Some counties had a certification system for pesticide applicators, and in general the counties were jealous of their prerogatives.

The balance of authority between the state and the counties change sharply after World War II. At that time many new pesticides came into use, and the proportion of agricultural pesticide applied by air greatly increased. Surplus planes from the war were used by pilots fresh from the war to begin in earnest the business of aerial application, a business which today has grown to include over 800 planes and 600 pilots throughout California. Synthetic organic herbicides were being widely used for the first time, and, particularly in the San Joaquin Valley, serious crop damage was caused by the drift of these herbicides onto non-target crops. The counties were unable to control this new situation, and as a result sweeping new state legislation was passed in 1949. The state took over the licensing of pesticide applicators and copied, on a limited basis, Imperial County's idea of use permits.

The 1949 legislation made agricultural pesticides subject to regulation if, after investigation and hearing, they were found by the Director

1972). "Pesticide" and "economic poison" are synonymous. Id. § 11404 (West 1968). The term "pesticide" will be used here. This study deals with "agricultural" pesticides, that is those used in connection with the commercial production of an animal or plant crop. Cf. id. § 11408 (West Supp. 1972). Other major categories of pesticides, all regulated by California, are for structural pest control, such as control of termites in homes; for vector control, such as mosquito abatement; and for home and garden use.

51. Although authority to prescribe rules for the qualification of those in the pest control business for hire and to carry out certifications was delegated to the county agricultural commissioners, the state Director of Agriculture had the authority to "make rules and regulations governing the conduct of, and application of methods of control or eradication used in, the business of eradicating or controlling pests for hire within the State." Act of July 15, 1935, ch. 496, [1935] Cal. Stat. 1566.

52. 37 CALIFORNIA DEP'T OF AGRICULTURE BULLETIN 240 (1948) (29th annual report).

53. CALIFORNIA DEP'T OF AGRICULTURE, AGRICULTURAL AIRCRAFT PILOTS (1971). Just over 20 percent are apprentice pilots. The statistic on planes was derived by F. McGowan from unpublished Federal Aviation Administration data on agricultural aircraft.

54. CALIFORNIA DEP'T OF AGRICULTURE, supra note 52, at 304. Misuse involved unseasonal applications, airplane applications in diversified farming areas, promiscuous use, lack of knowledge on the part of the users as well as the applicators concerning the properties of 2, 4-D, and ignorance of the degree to which atmospheric and weather conditions would affect the outcome.

Id.


56. Interview with E. Johnson, in Pomona, California, August 9, 1971. Mr. Johnson is a former official of the Department of Agriculture and has had extensive experience in pesticide control.
of Agriculture to be "injurious to persons, animals, or crops, other than the pest or vegetation which [they were] intended to destroy."\(^5\) The regulations on injurious materials have become increasingly stringent since 1949. These materials now must be "substantially confined" to the property to be treated;\(^6\) neither the material nor the emptied container may be left unattended where they may present a hazard;\(^7\) and all persons known to be on property to be treated must be warned, before application, of the nature of the material and the precautions to be observed.\(^8\) Regulations on injurious materials require further that adequate protective devices be provided to employees engaged in handling or applying the materials;\(^9\) that notification be made to the owner of animals on property to be treated and in certain cases to beekeepers with bees on the property, or within one mile of it;\(^10\) that for some materials worker reentry into the treated property be restricted for a period of time;\(^11\) and that some properties treated with given quantities of certain organic phosphate compounds be posted with warning notices.\(^12\)

In 1971 this regulatory system for injurious materials was modified by a change in nomenclature and by the introduction of a three-category system.\(^13\) The most closely controlled materials, which will be largely those previously treated as "injurious" materials, are now known as "restricted" materials.\(^14\) For the first time statutory criteria for classification of these materials exist. The list of restricted materials is to be established by the Director of Agriculture based on six non-exhaustive criteria: danger of impairment of public health; hazards to applicators and farmworkers; hazards to domestic animals, including honeybees, or to crops from direct application or drift; hazards to the environment from drift onto streams, lakes, and wildlife sanctuaries;


\(^{59}\) Id. § 2462(c).
\(^{60}\) Id. § 2462(d).
\(^{61}\) Id. § 2462(f).
\(^{62}\) Id. §§ 2462(g), (h).
\(^{63}\) Id. § 2475 (1971).
\(^{64}\) Id. § 2462(e) (1970).
hazards related to persistent residues in the soil resulting ultimately in contamination of the air, waterways, estuaries or lakes, with consequent damage to fish, wild birds, and other wildlife; and hazards to subsequent crops through persistent soil residues. At the other end of the spectrum there is a new category of "exempt" materials that are to be designated by regulation where the Director of Agriculture finds that restrictions beyond registration and labeling are unnecessary. Pesticides on neither the restricted materials list nor the exempt materials list are subject to permit regulation by the county agricultural commissioner, unless he determines that the pesticide "may be used under local conditions without undue hazard."

Administration of the permit system for pesticides classified by the state as restricted materials is delegated to the county agricultural commissioners, who also have responsibility for enforcement of the special statewide use rules for these materials. Protection, however, depends initially upon a determination by the Director of Agriculture that a particular pesticide is subject to the closer regulation. Despite the breadth of the 1949 directive, the list of "injurious materials" grew slowly. No regulations were ever published by the Director of Agriculture for use in determining what would be classified as injurious, and observers have found it difficult to discern consistent standards.

67. Id.
68. Id. § 14006.7.
69. Id. § 14006.6. Draft proposed regulations prepared pursuant to the 1971 legislation state, however, that a permit is required for the agricultural use of all pesticides, other than those on the exempt list. California Dep't of Agriculture, Proposed Regulations Concerning Restricted Materials § 2463(e) (Draft of May 8, 1972).
70. CAL. AGRIC. CODE § 14006 (West Supp. 1972). This section provides that restricted materials may be regulation limited to use only under permit of the commissioner or under the direct supervision of the commissioner. In past years almost all materials classified as injurious have been placed under permit control. See 3 CAL. ADMIN. CODE § 2463 (1971). See also id. § 2451 (injurious herbicides). Two materials used for vertebrate pest control, compound 1080 and thallium, can be used agriculturally only by or under the immediate supervision of a government official. CAL. AGRIC. CODE §§ 14062-63 (West 1968) (compound 1080); id. §§ 14092-93 (thallium).
71. Id. § 14004 (West Supp. 1972).
72. According to one of the responsible officials in the Department of Agriculture, the injurious materials designations have been developed on the basis of "high toxicity or special hazards." Lemmon, supra note 26, at 29. But recently the state's Legislative Analyst pointed out the inconsistency of not placing some chemicals on the injurious materials list, while at the same time placing on the list chemicals of similar or lower toxicity or hazard. . . . There are many pesticide materials classified as non-injurious which are higher in toxicity and other hazards that [sic] those on the injurious materials list.

CALIFORNIA LEGISLATIVE ANALYST, REPORT TO LEGISLATIVE BUDGET COMMITTEE: ANALYSIS OF THE BUDGET BILL OF THE STATE OF CALIFORNIA FOR THE FISCAL YEAR, JULY 1, 1972, TO JUNE 30, 1973, 221 (1972). This inconsistency was seen as a demon-
The injurious list in fact may simply have grown haphazardly as problems arose over the years. It now includes some 51 pesticides of the approximately 200 in common use in agriculture within the state.\textsuperscript{73}

Thus today most agricultural pesticides used in Imperial County are subject to permit control by the county Agricultural Commissioner,\textsuperscript{74} although for some materials the commissioner is acting as the delegate of the State Director of Agriculture rather than on local authority as the 1938 county ordinance had anticipated. Variations in the source of authority or in the particular use rules found in the state regulations or the county ordinance, however, seem to make little difference in the operation of the permit control system within the county. Different forms are used and the restrictive language varies somewhat between them, but for most purposes the system can be treated as an integrated one.

2. Utility of the Permit System

In considering the value of a permit control system, one might consider a priori that its utility lies in the opportunity it presents for advance review by regulatory officials, before a particular kind of action is taken. Some counties in California have engaged in a process of approval of permits for individual applications of injurious materials or herbicides,\textsuperscript{75} and at one time Imperial County operated a significant

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\textsuperscript{73} There are 42 chemicals on the restricted materials list: 4 arsenic compounds, 13 organic phosphate compounds, chloropirin (tear gas), a carbamate compound, 14 mercury compounds, 6 chlorinated hydrocarbons, and 3 other materials. 3 CAL. ADMIN. CODE §§ 2461-61.1 (1970). The last two groups have been subject to somewhat less stringent use restrictions. Id. §§ 2463.3-63.4 (1971). The restricted materials list also contains certain pesticide-treated seeds, which are not themselves pesticides. Id. § 2461(f) (1970). Nine chemicals are on the restricted herbicides list. Id. § 2448 (1972). These administrative designations of restricted materials were made pursuant to the pre-1971 legislation on injurious materials and injurious herbicides. Draft proposed regulations prepared pursuant to the 1971 legislation would considerably expand the list of restricted materials. California Dep't of Agriculture, supra note 69, at § 2461.

Pesticides "in common use in agriculture" as here defined are those pesticides of which more than 5,000 pounds were used in 1971, according to California Department of Agriculture use report data, and which were used primarily for agricultural purposes.

\textsuperscript{74} Exceptions will occur once the Director of Agriculture establishes the state's exempt materials list, for state law now appears to preempt control over materials on this list. Since exempt materials "may be used without a permit provided that such use shall conform with the registered label or printed instructions" [CAL. AGRIC. CODE § 14006.7 (West Supp. 1972)], counties are no longer able to provide their own regulation of these materials.

\textsuperscript{75} \textit{E.g.}, Madera County.
part of its permit system in this "job-by-job" fashion. A job permit system of this sort, however, is highly cumbersome. Where agricultural activity is intensive and pesticide use widespread, approval quickly becomes routine. With the manpower available, this is inevitable, for the quantity of applications forbids meaningful individual review within the time available. Furthermore, there is insufficient information upon which to base a decision. Permit applications presently show only the pesticide(s), location of the area to be treated, grower's name and address, total acres to be treated, commodity, pest(s), type of material (dust, spray, or other) and method of application. This enables one to determine some basics on label compliance, but little else. If pesticide use were to be limited to "need," for example, and if the permit system were to be looked to for the enforcement of that concept, then the regulatory officials engaged in review of permit applications would have to have far more information in order to make intelligent decisions. In fact, given the complexity of pest control, it would probably be necessary for an official to visit the field to be treated under the permit for which application is made.

This is not to suggest that careful individual review of each contemplated pesticide treatment is not important, nor that there is no place for a concept of need in our system for regulating pesticide use. Rather, the point is that historically the Imperial County system of use permits has not brought such review and that if used for the majority of pesticides there are practical reasons why it is unlikely ever to do so. Ultimately the most serious contemporary need in pesticide use is sound judgment exercised by decision makers with ecological awareness, and this need will not be met simply by insistence upon the filling out and review of forms.

Counties with intensive agricultural activity such as Imperial are likely to find that a comprehensive permit system for agricultural pesticides must be administered largely on a "seasonal" basis rather than on a "job" basis. Even though a permit may be written to allow use of all locally desired materials for a full season, the control established over these materials can be used to respond to a particular problem in a specific fashion. Experience in Imperial County indicates that this has been done in three different ways. Most important has been the use of permit conditions restricting the time of application, place of application, and form of material (dust or spray). Two examples of this kind of permit control, aimed at cutting bee losses and eliminating DDT residues on forage crops, will be examined below. Second,
permit control of pesticides can be used to achieve related objectives, such as regulation of non-chemical measures aimed at reducing pest problems. And third, in some instances resort has been had to control by a "special" or job permit. This has only been possible for non-restricted materials because of the control established by Imperial's county ordinance.

B. Licensure I: The Pest Control Operator

Where insects or other pests exist in a field, three steps will ordinarily be taken if a pesticide is to be used for control. A decision to use a pesticide will be made, the material will be purchased, and an application will be made. With limited but important exceptions, all three phases of this decision making are now under some sort of license control in California.78 The historical development of these licensing controls, however, has been very different for the various phases of the business.

1. Legislative Standards

Application is the aspect which has been the most closely controlled, first through county requirements,79 then since 1949 by a state licensing requirement.80 This aspect has historically been defined as the "pest control business."81 California law provides that no one may engage for hire in the business of pest control, e.g., act as a "pest control operator," without an agricultural pest control license.82 To obtain such a license, an applicant must satisfy the Director of Agriculture as to his equipment and facilities, financial ability and qualifications to perform the work authorized, and personal responsibility to conduct the business.83 An examination must be passed to obtain the license,84 which may be limited to certain types of pest control.85 Weed

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78. See text accompanying notes 79-129 infra.
79. See note 51 and accompanying text supra.
80. See note 55 and accompanying text supra.
81. CAL. AGRIC. CODE §§ 11701, 11402-03 (West 1968).
82. Id. § 11701. Licensees must register with the agricultural commissioner in each county in which business is to be done. Id. § 11732.
83. Id. § 11702 (West Supp. 1972).
84. Interim Hearings, supra note 9, at 13. This examination is required by administrative practice, rather than a statute or regulation, and apparently it is not particularly rigorous. One legislator reported that pest control operators in his constituency found it to be "an insult to their intelligence." Id.
85. CAL. AGRIC. CODE § 11705 (West Supp. 1972); 3 CAL. ADMIN. CODE § 3077 (1970). The regulations and licenses issued under them distinguish, by type of pest, among 8 types of pest control. They also distinguish between air and ground applications and among use of spray, dust, and fumigation. For the year 1971 over 1,300 Agricultural Pest Control Operators licenses were issued. California Dep't of Agriculture, Agricultural Pest Control Operators (periodic reports).
control, defoliation and control of pests other than weeds in commercial plantings are among the categories within which a particular licensee may be authorized to work.86

Two major exceptions to this licensing requirement exist. First, one need not be licensed to apply agricultural pesticides to his own property, since the statute covers only those who apply “for hire.”87 Second, there is an exemption of one who operates only in the vicinity of his own property “for the accommodation of his neighbors” and is not regularly engaged in the business of pest control.88 Even so, persons in the latter category must obtain a permit from the Director of Agriculture and, like licensed pest control operators, register with the county agricultural commissioner.89

State officials administer the licensing examination given to pest control operators,90 and they also issue certificates of qualification which are required of pilots engaged in the aerial application of pesticides as part of the pest control business.91 Otherwise, regulation of licensed pest control operators is left to the agricultural commissioners. Close contact is maintained by the Imperial County Agricultural Commissioner’s office with all licensed pest control operators in the county: their records are audited,92 their equipment is inspected,93 and their application operations are periodically observed by agricultural inspectors who have the authority to order an immediate shutdown of equipment operated by an incompetent person or in violation of certain state or local regulations.94

In addition, pest control operators are required to submit reports

86. 3 CAL. ADMIN. CODE § 3077 (1970).
87. CAL. AGRIC. CODE § 11701 (West 1968).
88. Id. § 11709.
89. Id. The federal requirements for applicator certification to be developed and complied with by 1976 [see note 38 supra] will apply to all applicators of pesticides classified for restricted use. Federal Environmental Pesticide Control Act of 1972, Pub. L. No. 92-516, § 2, subsec. 2(e), 86 Stat. 973, 1972 U.S. CODE CONG. & AD. NEWS 5013. The federal law distinguishes, however, between “commercial” and “private” certified applicators, and separate federal standards are to be established for each group. Id. § 2, subsec. 11(b). The Administrator of the Environmental Protection Agency is expressly barred, in prescribing regulations for implementation of the new legislation, from requiring any private certified applicator to “maintain any records or file any reports or other documents.” Id. § 2, subsec. 11(a).
90. See note 84 supra.
91. CAL. AGRIC. CODE § 11901 (West 1968). State certificates of qualification are not required of those engaged in ground application of pesticides as part of the pest control business. Agricultural commissioners are authorized to provide for the qualification of such persons [id. § 11738(c)], but this authority is not generally employed.
92. See 3 CAL. ADMIN. CODE § 3090(g) (1971).
93. See id. § 3090(a).
to the agricultural commissioner on all pesticide work done.\textsuperscript{95} For many years in Imperial County a weekly consolidated report was required showing all jobs done, material used for each job, and dosage. For the past two years, however, the state has required pest control operators to file individual use reports for each job done.\textsuperscript{96} These reports are fed to a computer and form the basis for quarterly reports now issued by the Department of Agriculture on pesticide use throughout the state. Occasionally this computer review of the use reports submitted will indicate a possible violation, for example of a dosage limitation imposed by the label restrictions. In this event, the matter is referred to the Agricultural Commissioner’s office for a follow-up investigation.

2. \textit{Sanctions for Violators}

The nature of the pesticide application business in the Imperial Valley lends itself to effective monitoring. The valley is flat, with few obstacles, so that aerial application is in most situations more efficient than ground application. Half a dozen aerial operators do a very large proportion of the application work, and as much of the work is done at night there is generally little difficulty in locating an operation. The pilots and owners are well known to the inspection personnel. Interviews with owners, pilots, inspectors, and others familiar with the pesticide application business in the Imperial Valley indicated that inspection personnel have a very detailed picture of what the applicators do: the chemicals they use, the time and place of application, and the pests they are seeking to control. County personnel annually devote several hundred man days to checking on pest control operators.\textsuperscript{97}

When violations do occur, however, the sanctioning system in use in Imperial Valley is less satisfactory. A criminal sanction is one possibility for many types of violations,\textsuperscript{98} but the criminal process has almost never been used to punish pest control operators. Regulatory officials regard the criminal complaint as a drastic measure, and even when one is sought district attorneys throughout California have been reluctant to comply. Criminal actions generally have been limited to charges of operating without a state license, without the required state pilot’s certificate, or without county registration.

Instead of seeking a criminal complaint against pest control operators who violate the various statutes or regulations dealing with

\textsuperscript{95} \textit{Id.} \textsuperscript{96} § 11733.  
\textsuperscript{96} 3 \textit{Cal. Admin. Code} § 3090(g) (1971).  
\textsuperscript{97} \textit{California Dep’t of Agriculture, Agricultural Pest Control Business Report by California Counties} (1971).  
\textsuperscript{98} \textit{Cal. Agric. Code} § 9 (West 1968).
pesticide use, regulatory officials normally take administrative action. Typically this consists of a "notice of warning" which is issued in the field by an agricultural inspector, often for operating in a "faulty, careless, or negligent manner." This can cover a wide variety of actions, from operation with a poorly adjusted nozzle to use of a material highly toxic to man while workers are in the field. These warnings, however, have no financial or other direct impact upon the violator.

In rare cases, regulatory officials seek an administrative sanction. Agricultural commissioners have the power to cancel a pest control operator's county registration for cause, and action can be taken under the State's Administrative Procedure Act against the state license. Such sanctions have been imposed very infrequently in Imperial County in recent years, possibly because the pesticide application work done within the county is highly professional in nature and there is rarely good reason for any kind of administrative procedure to be invoked. There are some indications, however, that in past years some problems have been dealt with by mass appeals to pest control operators from the Agricultural Commissioner, rather than by the available administrative sanctions. For example, pest control operators have been asked to avoid spraying fields with workers in them; to take precautions against the drift of sulphur, an irritant to the eyes, onto residential properties; and to avoid applications which do not conform to the product's registration, unless special authorization is obtained. All the acts cautioned against are unlawful, and the warnings suggest that the Agricultural Commissioner's office has had reason to believe they were taking place with some frequency. A general warning may be helpful in curbing such violations, but the use of this technique also seems to reflect the present lack of any "middle level" sanction for violations by pest control operators. On the one hand, there is the notice of warning which has little direct impact; on the other, there exist administrative channels which if used would put the pest control operator out of business for a period of time. There is a need to develop in the field some

99. Id. § 11791(b).
100. From July 1, 1970 through June 30, 1971, some 43 notices of warning were issued in Imperial County.
102. Id. § 11708.
103. See CALIFORNIA DEP'T OF AGRICULTURE, supra note 97, and reports for earlier years.
104. Letter from Agricultural Commissioner of Imperial County "to all pest control operators and pilots," November 5, 1969.
105. Letter from Agricultural Commissioner of Imperial County "to all pest control operators who may have an occasion to use the Brawley municipal airfield," May 12, 1965.
106. Letter from Agricultural Commissioner of Imperial County "to all Imperial County pest control operators," April 24, 1969.
system of "direct citation" similar to that now in use for violators of traffic laws. Under such a system agricultural inspectors could simply "write a ticket" for a violator, who could settle by mail by payment of a fine in accordance with a fixed schedule.107

C. Licensure II: The Pest Control Adviser

The relatively tight control that state and county officials have maintained for over twenty years over those in the business of agricultural pest control for hire has not been duplicated for others of importance in the pesticide world. Only in 1970, for example, did the state begin to require that dealers in agricultural pesticides be licensed.108 More importantly, it is only recently that any sort of control has been obtained over those who advise others on the use of pesticides. Licensing of the pest control adviser is a second Imperial County innovation which has been copied by the state, although the state system will not be fully implemented until 1974.109

Growers in California receive pest control advice from a myriad of sources. Farm magazines, University of California Agricultural Extension Service farm advisers, farm organizations, neighbors, county agricultural personnel, and agricultural chemical company salesmen all may recommend one approach or another to a given pest problem. Among these various sources, however, it is the chemical company field man who presently has the greatest influence. He has a business relationship with the grower customer which often is of long standing, he is on the job week in and week out, and his advice is based on the "free" field checking that chemical companies offer to their customers. Chemical company field men in the Imperial Valley now outnumber other individual sources of pest control advice, such as consulting entomologists or University of California Agricultural Extension Service farm advisers, by a ratio of at least five to one.110

107. Citations are now used to a limited extent in pesticide enforcement work in three northern counties in California, and the state Department of Agriculture intends to begin a pilot citation program in Fresno County in 1972-73 "to work out the problems of implementing the citation system throughout the state in pesticide use regulation." CALIFORNIA LEGISLATIVE ANALYST, BUDGET REPORT, supra note 72, at 225.

108. See CAL. AGRIC. CODE § 12101 (West Supp. 1972). "Pesticide dealer" is defined to include all who sell pesticides to users for an agricultural use. Id. § 11407. Although since 1921 manufacturers, importers, and dealers in pesticides have been required to be registered (1921-1933) or licensed (1933-present) as part of the pesticide registration process, dealers who sell only pesticides registered by the manufacturer or wholesaler have been excepted. Id. § 12811 (West 1968).


110. This estimate is based upon California Department of Agriculture statistics on pest control agents (advisers) and interviews with those in the pesticide business in Imperial County.
In studying pesticide control problems, a comparison with the system we employ to control the use of powerful chemicals for human medication is a useful one. The comparison points up a curious anomaly of pesticide regulation: for many years relatively tight control of applicators has been maintained, at least in some states, while there has been no control of those who advise on the use of pesticides. Diagnosis of the pest problem and prescription of the pesticide cure has been open for all to engage in, regardless of training and free of any restriction. In the pesticide world, it has been the pharmacist and not the doctor who has been regulated through our licensure laws. The costs one can impose on others through faulty application—for example, crop damage as a result of pesticide drift—have been recognized through regulation of applicators, while the social costs of adding to the pesticide burden of the environment have gone unacknowledged.

1. Imperial County Regulation

Imperial County's breakthrough in 1970, by adoption of a county ordinance requiring the licensing of agricultural pest control advisers,111 was not the result of any sudden burst of environmental conscience on the part of those in control of the county. Rather, three forces converged. First, there are individuals in the pesticide distribution business in Imperial County who for many years have urged upgrading the business by creation of a private certification system for pest control advisers. They have, for example, repeatedly urged the Entomological Society of America, a private association of research and applied entomologists, to adopt such a system.112 The objective seems to have been primarily to increase public confidence by a "professionalization" of the sales force. Second, there were competitive pressures which made licensing appear to offer advantages to those presently in the business of providing pest control advice within Imperial County. Licensing historically has been sought by occupational groups to meet competitive threats, and the licensing of pest control advisers in Imperial County is no exception to this principle. The pressures brought by repeated instances of salesmen from Arizona and Texas entering the Imperial Valley market to dump surplus pesticides at low prices toward the end of the season had an effect in leading those in the valley to seek a licensing requirement. And third, there was considerable apprehension created by the introduction in the state legislature of a measure...

111. IMPERIAL COUNTY, CAL., CODE § 62605 (1972).
which provided for state licensing of pest control advisers and their separation from the sale of pesticides.\textsuperscript{113}

As a result of these forces, the salesmen themselves proposed a county ordinance.\textsuperscript{114} Enacted in 1970, it established the requirements for an agricultural pest control adviser's license: registration, successful completion of a qualifying examination, and payment of a license fee.\textsuperscript{115} Significantly, the examination specified refers to knowledge of pesticides,\textsuperscript{116} not pest control, as well as the rules, regulations, and laws governing their agricultural use.

Virtually no one in Imperial County who had been engaged full time in the pesticide business has been excluded as a result of this licensing requirement. No "grandfather" clause is included in the ordinance, but all who made a sustained effort passed the examination and received a license.\textsuperscript{117} Many failed the first time, primarily through low scores on the law portion of the examination,\textsuperscript{118} but these individuals generally passed on the second try. Success the second time was doubtless facilitated by the fact that many of the same questions appeared on both the first and second examinations.

2. \textit{Recent State Regulation}

This painless adoption of salesmen licensing by Imperial County paved the way for adoption of a similar system by the State.\textsuperscript{119} In 1969 legislation requiring the registration of agricultural pest control "agents" had been adopted,\textsuperscript{120} so the State had begun to obtain firm information on who was in the field. In 1971 the Department of Agriculture obtained passage of legislation which requires a full system of pest control adviser licensing by July 1, 1974.\textsuperscript{121} Meanwhile salesmen and

\textsuperscript{114} \textit{House Hearings, supra} note 9, at 592 (statement of Bailey Santistevan, Vice President, California Agriculture Pest Control Advisors Ass'n). "The Imperial County board of supervisors were stunned, as they could not remember when a group has ever asked that legislation be imposed upon themselves. We explained we wanted the public to know that capable, educated people were handling and recommending pesticides on our farms."\textit{Id.}
\textsuperscript{115} \textit{IMPERIAL COUNTY, CAL., CODE} § 62605 (1972).
\textsuperscript{116} \textit{Id.} § 62607.
\textsuperscript{117} \textit{Licensing of Pesticide Salesmen: Will it Work?} 134 \textit{FARM CHEMICALS AND CROPLIFE} 20, 83 (1971). Those who failed the examination initially and did not take it again were typically individuals whose main interest was another activity.\textit{Id.}
\textsuperscript{118} \textit{Id.}
\textsuperscript{119} M. Barnes, C. Finnell & A. Deal, Pesticides: Education, Regulation and Use 4 (undated California Dept' of Agriculture report).
others giving pest control advice or recommendations are being licensed on a provisional basis. 122

D. Written Recommendations: The "Prescription"

A key objective of a sound regulatory scheme for agricultural pesticides must be to fix responsibility for particular decisions made or actions taken. Responsibility must be clearly established both to lay the basis for any sanction to be imposed for past actions and to allow corrections to avoid future errors. Clearly established responsibility may also assist individuals who engage in private litigation to seek recovery for losses caused by agricultural pesticides.

Between the use permit required in advance of application and the use report required following application, 123 it has normally been possible in the Imperial Valley in past years to establish responsibility for the physical application of pesticides. It has been far more difficult to know, however, upon whose responsibility the decision to treat with a given material was taken. In a sense, of course, whatever is applied is the responsibility of the landowner. Yet in practice in many situations the landowner plays only a marginal role in the pesticide use decision making, for reliance on the advice of another is often close to automatic.

Licensing of pest control advisers provides a measure of control over the actual pesticide use decision makers, but the licensing scheme itself does not pin down the responsibility for any particular use decision. Therefore, as part of the 1970 pest control adviser licensing ordinance of Imperial County, an additional requirement was imposed. All recommendations concerning the agricultural use of pesticides by an adviser must be put in writing. 124 Further, a signed and dated copy of the recommendation prescribed for the pest problem diagnosed must be provided to the grower, the pesticide dealer, and the pesticide applicator. 125 The adviser himself must retain a copy for one year from the date of the recommendation, and a copy must be furnished to the Agricultural Commissioner upon his request. 126

Implementation of the written recommendation requirement has

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122. Id. § 12024.
123. Id. § 11733; 3 Cal. Admin. Code §§ 2465, 3090(g) (1971).
been smooth in the Imperial Valley. Those in the business claim the requirement forces a field man to think about what he is doing and has cut down on "wheeling and dealing" by salesmen.\textsuperscript{127} Most of the information on a typical recommendation form also appears on the pest control operator's state use report,\textsuperscript{128} which can be correlated with the recommendation. Despite these advantages, use of the writing requirement as a control mechanism has several flaws which hamper its effectiveness.

The first two problems relate to the contents of the recommendation itself. This shows what was recommended, and by whom, but fails to record the rationale for the recommendation. Nor does it ensure that the adviser has personally inspected the field in question. Levels of infestation are not indicated, making it impossible to judge the economic necessity of the particular advice given.

A third problem involves recommendations that violate the spirit of the label restrictions on the pesticide. Although pesticide salesmen interviewed seemed well aware of their self interest in assuring that written application recommendations conform to label restrictions, yet in some situations it is possible to "write for the label," that is, to obtain a desired but technically excluded use of a pesticide, but without expressly violating label restrictions. For example, the adviser might recommend a material registered for control of pest $A$, even though pest $A$ constitutes an insignificant problem and the real intent is to control pest $B$, for which the pesticide is not registered. So long as the field has some damage from pest $A$, advisers believe this practice is permissible, although contrary to the spirit of the registration restrictions.\textsuperscript{129}

E. "Stop. Read the Label"

The motto of the National Agricultural Chemicals Association, a trade group which represents manufacturers and others from the pesticide industry, is "Stop. Read the Label." This motto appears in prominent position on many pesticide product labels and on much of the literature supplied by pesticide manufacturers. Many of the bureaucratic battles which have taken place between manufacturers and regulatory officials have been over the language to be placed on the registered label. While critics have attacked the entire label approval pro-

\begin{itemize}
\item\textsuperscript{127} Interviews with various fieldmen, in Imperial County, California, August 1971.
\item\textsuperscript{128} \textit{CAL. AGRIC. CODE} § 11733 (West Supp. 1972); \textit{3 CAL. ADMIN. CODE} § 3090(g) (1971).
\item\textsuperscript{129} Interviews with various fieldmen, in Imperial County, California, August 1971.
\end{itemize}
procedure as merely a "paper screen," industry representatives often seem to contend that labeling alone can provide adequate use controls for agricultural pesticides.

1. The Development of Controls on Labeling

To understand the tremendous importance which has been given to pesticide labeling, one must understand something of the origins of pesticide regulation in this country. California's first pesticide legislation, enacted in 1901, dealt with a single pesticide: Paris green, an arsenic material used on potatoes, vines, and fruit trees. Prior to its sale this act required Paris green manufacturers and, in some cases, dealers to submit samples to the director of the University of California Agricultural Experiment Station at Berkeley, together with a statement setting forth information on the product. The director would then analyze the material for content. The statute required that all Paris green sold within the state contain at least 50 percent arsenious oxide, with no more than four percent of it in an uncombined state. If the material submitted was found satisfactory, the applicant would be provided with a certificate of compliance which authorized dealing in Paris green within the state.

This early California act, like the series of similar state and federal measures to be enacted in the half century to follow, was aimed at the prevention of fraud. Consumer protection was the issue, not environmental protection. The consumer was the pesticide purchaser, who was by law being assured that he received the degree of pesticidal deadliness for which he paid.

The federal government entered the field with the Insecticide Act of 1910, a comprehensive measure covering all insecticides and fungicides. Manufacture within any territory or the District of Columbia or shipment in interstate or foreign commerce of any adulterated or misbranded insecticide or fungicide was prohibited, and provision

130. H. Wellford, supra note 2, at XV-1 et seq.
131. See, e.g., House Hearings, supra note 9, at 346 (testimony of Parke C. Brinkley, President, National Agricultural Chemicals Ass'n): "[P]rimary reliance in avoiding or reducing unwanted effects from the use of pesticides should be placed on selective registration, adequate labeling, and making it an offense to use or sell a pesticide contrary to its labeling."
133. Id. § 1.
134. Id. § 3.
135. Id. § 2.
136. See text accompanying notes 137-48 infra.
138. Id. §§ 1, 2.
was made for the examination of specimens by the United States Department of Agriculture.\footnote{139} Federal registration of pesticides prior to marketing was, however, to await the Federal Insecticide, Fungicide and Rodenticide Act of 1947 (FIFRA).\footnote{140}

The federal Insecticide Act of 1910, followed in substantial measure by the California legislation of 1911,\footnote{141} protected the pesticide purchaser by control of adulteration and misbranding. Product standards were provided as a measure of adulteration: specific standards for two materials, Paris green and lead arsenate,\footnote{142} and general standards for other insecticides and fungicides.\footnote{143} The federal act treated insecticides or fungicides with any false or misleading statements on the package or label as misbranded, gave some specific examples of misleading statements, and required certain statements on the label as to product ingredients.\footnote{144} The somewhat more elaborate language of the California act required each package of commercial insecticide or fungicide offered for sale within the state to have a "plainly printed label" stating the name, brand, and any trade mark for the material; the name and address of the manufacturer, importer, or dealer; the place of manufacture; and a chemical analysis, stating "the percentages claimed to be therein, of the substance or substances alleged to have insecticidal properties, specifying the form or forms in which each is present, and the materials from which all constituents of the insecticides are derived."\footnote{145}

Labeling was given vastly greater significance by the federal law with the passage of FIFRA in 1947. The concept of labeling in FIFRA is broad, including written, printed, or graphic matter on or attached to the pesticide or its immediate container.\footnote{146} Further, mandatory label contents are expanded considerably beyond the product ingredient statements of earlier years. Labels under FIFRA must

\begin{footnotes}
\footnote{139}{Id. § 4.}
\footnote{141}{Act of May 1, 1911, ch. 653, [1911] Cal. Stat. 1248 (repealed 1921).}
\footnote{142}{Act of April 26, 1910, ch. 191, § 7, 36 Stat. 331 (repealed 1947).}
\footnote{143}{Id.}
\footnote{144}{Id. § 8.}
\footnote{145}{Act of May 1, 1911, ch. 653, § 11, [1911] Cal. Stat. 1248 (repealed 1921). These label requirements, except for the chemical analysis, were continued by the California Economic Poison Act of 1921. Act of June 3, 1921, ch. 729, § 9, [1921] Cal. Stat. 1259 (repealed 1933). Certain ingredient statements were ordinarily required, however, to avoid misbranding. Id. § 7.}
\footnote{146}{Also covered is matter which accompanies the material, such as pamphlets with directions for use and, with some exceptions, any such matter to which reference is made on the label proper, or in literature accompanying the pesticide. Ch. 125, § 2 (s), 61 Stat. 163 (1947), as amended Pub. L. No. 92-516, § 2, subsec. 2(p), 86 Stat. 973, 1972 U.S. CODE CONG. & AD. NEWS 5018.}
\end{footnotes}
contain necessary directions for use of the product, as well as necessary warnings or caution statements. A product without this label content is misbranded.  

Finally, the FIFRA language on labeling goes beyond mere disclosure of product ingredients, use directions, and so forth, to use "misbranding" as a tool for screening products. Some pesticides may not be registered no matter what statements are included on the label.  

2. Reading the Label  

Critics of the emphasis which federal and state governments have placed upon pesticide labeling as a control measure have expressed doubt as to whether the average user in fact reads the label and whether the average label can be understood by all users in any event. A recent study of the communication adequacy of pesticide labels indicates that although the level of comprehensibility of pesticide label terminology is high, the average pesticide label is fairly difficult to read. According to the readability formula used, the average label is suitable only for those with at least 10 to 12.9 years of formal education. In the Imperial Valley, those who plan and direct most agricultural pesticide applications—pest control advisers, pest control operators, and pilots—have this level of education and there seems to be little problem among these groups in understanding the labels. Difficulty arises more from lack of label standardization. Although there are...
only about 800 basic chemicals used in pesticides in California today, there are in the neighborhood of 12,000 registered product labels. A pesticide commonly used in agriculture is often made by several different manufacturers; each product has its own label; and each label must be consulted for variations in detail.

A point of significance for label control of agricultural pesticide use patterns is the variation in precision of direction provided by different aspects of the label. Parts of the label, such as the pre-harvest interval to be allowed for specific crops, are very precise. These intervals are established on the basis of data which manufacturers must supply in order to obtain the residue tolerance necessary to register a pesticide for use on a raw agricultural product. The safety warnings and use precautions on the label are more general, although compliance is probably aided by the fact that the interest being protected is that of the persons engaged in the application work. Yet these persons include many who do not plan the operation and who do not have the level of education of the pest control adviser, pest control operator or pilot. In the Imperial Valley, the loader and flagman are likely to have little formal education and to be Spanish speaking. Consequently safety precautions and antidotes printed in English on the label may be of little assistance. The environmental warnings, however, are so general as to be of doubtful utility to anyone. Some labels, for example, indicate toxicity to fish and wildlife and direct the user not to contaminate any body of water. Users of agricultural pesticides, however, have little knowledge of the routes by which these materials reach the aquatic environment or levels which would constitute “contamination,” so it seems doubtful that these general label directives have much effect.

Although California has its own pesticide registration system,

152. CALIFORNIA DEPT OF AGRICULTURE, PESTICIDE REGISTRATION NUMBERS (2d) (1972). This figure includes all registered pesticide labels, less than half of which are for agricultural pesticides.


154. The California Department of Agriculture has refused to comply with requests that it require pesticide labels to be written in Spanish as well as English. See California Rural Legal Assistance, Administrative Complaint to the Director, State Department of Agriculture 6-7 (1970).

155. CAL. AGRIC. CODE §§ 12751-994 (West 1968). The Federal Environmental Pesticide Control Act of 1972 provides for the federal registration of all pesticides,
which includes the approval of a label,\footnote{158} in most instances reliance is
placed on federal label requirements where they have been estab-
lished.\footnote{157} Federal registration is a long and complex process, which
has been increasingly expensive for manufacturers in recent years. Reg-
istration of a new insecticide is estimated to cost a manufacturer from
four to twelve million dollars,\footnote{158} and many in the industry have ex-
pressed the fear that the cost and complexity of new pesticide registra-
tion is causing a drying up of research and development of new prod-
not simply those to be shipped in interstate commerce as was the law previously. See
5021. The 1972 federal legislation also provides, however, that
a State may provide registration for pesticides formulated for distribution and
use within that State to meet special local needs if that State is certified by
the Administrator as capable of exercising adequate controls to assure that
such registration will be in accord with the purposes of this Act and if regis-
ration for such use has not previously been denied, disapproved, or cancelled
by the Administrator. Such registration shall be deemed registration . . . for
all purposes of this Act, but shall authorize distribution and use only within
such State and shall not be effective for more than 90 days if disapproved by
the Administrator within that period.
\footnote{156} Id. § 2, subsec. 24(c).
\footnote{157} CAL. AGRIC. CODE § 12815 (West 1968); 3 CAL. ADMIN. CODE § 2402(b)
(1971). The 1972 federal act provides, however, that a state “shall not impose or con-
tinue in effect any requirements for labeling and packaging in addition to or different
from those required pursuant to this Act.” Pub. L. No. 92-516, § 2, subsec. 24(b),
\footnote{158} See Cohen, supra note 19, at 292.
\footnote{159} House Hearings, supra note 9, at 332 (testimony of Richard H. Wellman,
Vice President and General Manager, Process Chemicals Division of Union Carbide
Corp.).
\footnote{160} See Rohrman, supra note 153, at 364. The Federal Environmental
Pesticide Control Act of 1972 now makes it unlawful “to use any registered pesticide
in a manner inconsistent with its labeling.” Pub. L. No. 92-516, § 2, subsec. 12(a)(2)
(G), 86 Stat. 973, 1972 U.S. CODE CONG. & AD. NEWS 5034. Federal Aviation Ad-
mnistration regulations governing agricultural aircraft operations have, however, pro-
vided that a federally registered pesticide may not be dispensed from an aircraft for a
use other than that for which it is registered or contrary to any safety instructions or
use limitations on the label. 14 C.F.R. § 137.39 (1972). Despite this provision, it
appears that in California such pesticides have been regularly applied by air contrary
to label restrictions if an authorization for deviation has been issued by the state or
\footnote{161} County. See notes 164-65 and accompanying text infra.
\footnote{161} H. WELLFORD, supra note 2, at XVI-32.
ing the pesticide as used on each crop covered, labels frequently do not provide for use on minor crops which may experience pest problems for which the material is useful. California law requires a user to conform to the label's use recommendations, but allows the authorization of special pest control operations not in conformity with the label. The Director of Agriculture regularly issues such authorizations, as do the county agricultural commissioners.

F. Drift

Drift is the atmospheric spread of chemicals away from the parcel toward which the material is directed. Many pesticide applications by conventional equipment involve some drift, for the majority of applications consist of the release of pesticides in a spray or dust form into the air above or around the infested crop. A large percentage of the material released never hits either the target organism or the infested crop—this material is either deposited on the soil, from which it may later rise by volitilization to move elsewhere, or is immediately transported elsewhere atmospherically until it falls out or is washed out of the air.

Administrators and lawyers concerned with the administrative process may worry over the intricacies of our pesticide labeling sys-

163. Id.; 3 CAL. ADMIN. CODE §§ 3091-92, 3110-14 (1972). Such authorizations appear to be prohibited by the Federal Environmental Pesticide Control Act of 1972, which provides that states may regulate the sale and use of pesticides “only if and to the extent the regulation does not permit any sale or use prohibited by this Act.” Pub. L. No. 92-516, § 2, subsec. 24(a), 86 Stat. 973, 1972 U.S. CODE CONG. & AD. NEWS 5042. The 1972 act prohibits use inconsistent with the label. See note 160 supra.
164. Departmental figures indicate 40 such authorizations were issued in 1971, 46 in 1970, and 37 in 1969. “An authorization should be issued only when there is clear and urgent need for a specific usage of a pesticide and only when no registered alternate material is available.” California Dep't of Agriculture, Statement on Authorizations (February 20, 1970).
165. Departmental figures indicate 258 such authorizations were issued from July 1, 1970, through June 30, 1971; 360 from July 1, 1969, through June 30, 1970; and 355 from July 1, 1968, through June 30, 1969. California Dep't of Agriculture, supra note 103. Agricultural commissioners presently cannot issue label deviation authorizations for restricted materials. CAL. AGRIC. CODE § 14006.5 (West Supp. 1972).
166. Figures on spray applications show drift ranges from 1 to 85 percent of the material applied, depending mainly upon the fineness of the particles. Barnes, Controlling Pesticide Spray Drift, IMPLEMENT & TRACTOR, April 7, 1972, at 18. Dust generally drifts even more than spray. Unfortunately, thoroughness of coverage is incompatible with drift control, for thorough coverage requires fine particles while drift control requires large particles. Id. Although drift is the major method by which pesticides travel away from the area of application, they also can move by other means such as leaching or surface run-off with water.
tern or the significance of the paperwork surrounding the issuance of various kinds of licenses and permits. Professional applicators and the lawyers who represent them, however, are chiefly concerned with drift. The potential for drift plays havoc with the scheduling of pesticide applications, for its seriousness depends on weather patterns and microweather patterns are highly variable. And despite the care that most applicators take to avoid drift, enough crop damage is caused by pesticide drift to result in a considerable number of claims.\textsuperscript{167}

The fundamental norm on drift found in California law is stated simply: the use of any pesticide by any person in pest control operations shall be in such a manner as to “prevent any substantial drift to other crops.”\textsuperscript{168} Three observations with regard to this norm are pertinent. First, drift on to non-crop areas—wildlife habitat, for example—is not within the purview of the prohibition. Although other provisions of law provide a way of dealing with hazards from drift generally, the basic norm of the Agricultural Code is quite limited. Second, it is only “substantial” drift which is prohibited, yet nowhere in the law or regulations on agricultural pesticides is there any indication as to what constitutes substantial drift. Third, although violation of this norm is a misdemeanor,\textsuperscript{169} the criminal process is not regularly used for enforcement. Even administrative warnings issued are normally based on the law and regulations covering pesticide use by pest control operators or on that covering injurious materials use by permittees, rather than the broad statutory directive aimed at “any person.” Where drift causes crop damage, the expectation seems to be that the law will operate primarily to allow redress through a claim made by the injured party. Where such claims go to court, liability is predicated on the basis of conventional private law principles of negligence, trespass, and strict liability.\textsuperscript{170}

IV

THREE PESTICIDE CRISSES

Understanding of the practical utility of the various norms for agricultural pesticide use can be facilitated by a consideration of three pesticide crises which have occurred in the Imperial Valley. These in-

\textsuperscript{167} Herbicides have been a particular problem. One chemical widely used on rice in California has caused damage as far away as ten miles from the target area and has produced symptoms as far away as twenty miles. Hoffman, \textit{Herbicides and Litigation}, in \textsc{Davis Law School Associates, Agricultural Crop Damage Litigation} 80 (1971).

\textsuperscript{168} \textsc{Cal. Agric. Code} § 12976 (West Supp. 1972).

\textsuperscript{169} \textsc{Id.} § 9 (West 1968).

\textsuperscript{170} See note 8 \textit{supra}.
volve bee losses, DDT residues on alfalfa hay, and the "pesticide treadmill" brought on by the pink bollworm.

A. Bees

Agriculturists have been slow to recognize the enormous significance of bees as pollinators of many crops. For centuries beekeeping has been an honored agricultural pursuit, but bees have been kept only for their honey production. In recent decades some beekeepers, however, have come to regard their primary objective as providing pollination service. At some seasons today in California, in fact, bees for pollination are in short supply. Their presence is important for the production of melons, almonds, seed alfalfa, and many other crops.

Tension over pesticides has existed between beekeepers and other elements of farming communities ever since pesticides began to be widely used, so the bee crisis has been a recurring one. Arsenic, which occupied a position of great favor as a pesticide between the two world wars, is one of the materials most toxic to bees and has been responsible for the loss of many bee colonies. Among materials in common use today in California agriculture, at least two dozen are classified as highly toxic to bees.

Bee losses in California from pesticides have been increasing since 1964. The collection of nectar and pollen by bees requires them to enter various fields to forage. If injured or killed while foraging, their owners may be able to recover damages. The existence of private law remedies is in practice of little comfort to beekeepers, for losses tend to be small but repetitious, and causation is frequently difficult to establish. Further, beekeepers are often inhibited about making claims against growers upon whom they depend for contracts to provide pollination service.

Accommodation between the interests of beekeepers and the interests of those using various pesticides in crop production can take many forms. The California Administrative Code makes detailed pro-

171. California beekeepers operate 565,000 honey bee colonies, which represent a capital investment of 20 million dollars. H. Foote, Bee-Pesticide Problems in California 2 (Memorandum to the California Director of Agriculture from the Chairman of the Director's Bee-Pesticide Advisory Comm.) (August 29, 1969).


173. L. Anderson & E. Atkins, Toxicity of Pesticides and Other Agricultural Chemicals to Honey Bees—Field Study 3 (1967).


175. Interviews with various beekeepers in Imperial County, California, August 1971.
vision for beekeeper notification, so that bees at locations at or near a
field where a material toxic to bees is to be applied can be moved or
covered. These provisions are used in Imperial Valley, although bees
there are less easy to move than in some parts of the state. Moreover, a
beekeeper may find, during the heavy application seasons, that there is
nowhere in the cultivated portion of the valley removed from danger.
Public schemes for the indemnification of bee losses caused by pesticides
can be developed, as presently is being done by the federal govern-
ment. Another means of accommodation, however, has been used
with considerable success in Imperial County: the modification of pesti-
cide use controls so as to minimize the damage to bees caused by pesti-
cide applications.

Manipulation of agricultural pesticide use patterns in Imperial
County in order to protect bees has taken place through the use of con-
ditions written into the mandatory pesticide use permits. These con-
ditions have varied over the years, but the most significant of them has
been the prohibition of application of specified pesticides to crops in
bloom during the daylight hours. Application thus cannot legally
take place on crops in which bees are actually foraging. Furthermore,
any drift will occur during the night hours when the bees are in their
hives and relatively protected against injury. Through the use of this
permit condition, the pesticides application pattern in Imperial County
over the years has been radically transformed, so that a substantial per-
centage of all applications now takes place at night.

Protection of bees is bought at the cost of greater hazard to pilots
from night flying and greater expense to growers who must pay more
for night applications. The sight of a crop dusting plane, equipped
with enormous lights, dipping down across a telephone line at mid-
night to cross a field at a height of a few feet, is a vivid testimonial to
the effect of using legal constraints to minimize the economic and envi-
ronmental harm which can be caused by pesticide applications. Al-
though no figures are available which show the extent to which this
changed application pattern has resulted in the saving of bees, it is the
opinion of experienced beekeepers in the Imperial Valley that the
savings have been substantial.

176. 3 CAL. ADMIN. CODE §§ 2462(h) (restricted materials), 3096 (agricul-
tural pest control operators) (1970). These provisions provide no protection where unre-
stricted materials are classified as highly toxic to bees.


178. Repeated applications of Sevin [in the Imperial Valley] under State
contract to suppress pink bollworm caused heavy loss of bee colonies in
1967 . . . . Bee losses were less in 1968 as pink bollworm treatments were
made under county controls.

H. FOOTE, supra note 171, at 4.
B. DDT, Alfalfa Hay, and Milk

The crisis from pesticide damage to bees in the Imperial Valley has been a recurring one, and the solution has been an accommodation of conflicting interests rather than a ban of materials toxic to bees. The second pesticide crisis to be examined here was different in nature, for the immediate stakes were much higher and there was but one offending pesticide.

DDT was first synthesized in 1874, but the material was not used as an insecticide until 1939 in Switzerland. During the last half of World War II DDT was widely used to combat malaria and other vector-borne diseases, and it has continued to be used around the world for malaria eradication. Following the war, DDT became a major agricultural pesticide. The material's popularity has been attributed to its persistence and broad spectrum effects on insects, its relatively low acute toxicity to man, and its cheap price.

DDT was popular with growers in the Imperial Valley as elsewhere: figures compiled by the Imperial County Agricultural Commissioner show that ten to fifteen years ago in Imperial County an average of over 200,000 acre applications of DDT was made each year. Extremely serious difficulties, however, developed with DDT early in the 1960's, prior to the time environmental warnings about the material were being sounded nationally.

Imperial Valley produces a substantial amount of alfalfa hay, which is sold for the most part to dairies in the Los Angeles milkshed for feeding to dairy cows. The alfalfa fields are scattered throughout the valley, and often are adjacent to fields planted with cotton. In about 1960 the state began an intensified residue sampling program pursuant to its spray residue law, which establishes tolerances for pesticide residues on raw agricultural products. This intensified

179. Keane, supra note 2, at 389.
180. Id. at 389-90.
181. World Health Organization, The Present Place of DDT in World Operations for Public Health in Selected Statements from State of Washington DDT Hearings Held in Seattle, October 14, 15, 16, 1969, at 264 (M. Sobelman ed. 1970). DDT "still provides the most effective, cheapest and safest means of abating and eradicating malaria, and this remains true despite the development of a DDT-resistance which is not insuperable." Id. at 267.
182. MRAK COMMISSION REPORT, supra note 2, at 48-49. "As DDT came into wide use and its extraordinary insecticidal effects were recognized there were predictions that all major insect pests would be eradicated." Id. at 46.
183. CAL. AGRIC. CODE §§ 12501 et seq. (West 1968).
184. 50 CALIFORNIA DEP'T OF AGRICULTURE BULLETIN 123 (1960) (41st annual report).

Public attention to pesticide residues in foods was stimulated by the seizure of cranberries with illegal residues of weed killer by the Federal Food and
program brought great loss to Imperial Valley alfalfa hay growers: during the crop year of 1961, approximately 25 percent of the samples of alfalfa hay drawn from valley production were rejected because of an excess of DDT.\(^1\)

Reaction in Imperial County was swift. The use permit authority was employed to impose strict conditions on the use of DDT.\(^2\) The most important of these was a condition prohibiting the use of DDT within one quarter mile of any alfalfa hay. Since the alfalfa is scattered so close to the crops on which DDT has been used, this restriction meant the practical elimination of that pesticide from the county. In 1962 only 41,255 acre-treatments of DDT were made within the county,\(^3\) and in subsequent years DDT use in the Imperial Valley has been minor.

The permit system was also used in other California counties to deal with the problem of DDT residues on alfalfa hay. Such use was cited recently by an official of the state Department of Agriculture as one of five major successes which can be credited to the state permit control system.\(^4\) Significantly, however, other counties which lacked comprehensive permit control had to wait for classification of DDT by the state as an injurious material, a process which was not completed until October 1963.\(^5\) There was thus considerable delay, with continued problems with DDT residues in some parts of the state during the interim.\(^6\) By virtue of its more comprehensive permit control system, which included DDT even though prior to 1960 the material was generally considered unusually safe, Imperial County was able to act much more expeditiously than otherwise would have been the case.

C. The Pink Bollworm

Pesticide damage to bees and to alfalfa hay crops have been serious matters in the Imperial Valley, and the partial or complete resolu-

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\(^1\) Drug Administration in 1959. More intensive interest developed also with regard to the significance of pesticide residues in milk and milk products. \textit{Id.} at 125.

\(^2\) Statement of C. Finnell, Imperial County Agricultural Commissioner, to Hearing Officer (California Dep't of Agriculture DDT hearing), in El Centro, California, Sept. 13, 1963.

\(^3\) \textit{Hearings on the Application and Use of Pesticides Before the California Senate Comm. on Agriculture} 61-62, Cal. Leg. Reg. Sess. (June 16-17, 1964) [hereinafter cited as \textit{California Senate Hearings}].

\(^4\) \textit{Id.} at 528 (Oct. 23, 1963).

\(^5\) Letter from John C. Hillis to Dr. Terry Davies, April 1, 1971, \textit{reprinted at Senate Hearings, supra} note 2, at 186-87. Others pertain to control of 2, 4-D, chloropicrin, parathion, and sodium arsenite.

\(^6\) \textit{See} \textit{3 CAL. ADMIN. CODE} § 2461.1 (1970).

\(^7\) \textit{California Senate Hearings, supra} note 186, at 106.
tion of these problems through use controls is indicative of the utility a permit control system can have. Neither problem, however, has approached in seriousness that brought on by the pink bollworm. "Pinky," as this insect is known to the valley's growers, has caused great upheaval among Imperial Valley cotton producers, and measures taken to combat pink bollworm infestations have led to increased pest problems for growers of other crops. One noted entomologist, in fact, has concluded that the effort to control the pink bollworm chemically has brought the Imperial Valley "economic and ecological chaos." This section will explore the concept of "integrated control" that was in use for the suppression of cotton pests in the Imperial Valley prior to the advent of the pink bollworm; the largely non-chemical strategy that had been developed prior to 1965 for dealing with invasions of the pink bollworm; and the pressures that led to a shift in policy and an all-out chemical attack on this pest by public agencies in later years.

1. Non-Chemical Control Strategies

In principle, there are many ways to control agricultural pests besides using chemical pesticides. Indeed, at the same time Paris green and other early insecticides were being introduced into California agriculture, there were successful attempts at the "biological control" of insects. Biological control relies on the use of "life to control life," and in earlier years it generally referred to the introduction of an exotic (foreign) predator to keep down populations of a given pest. The predator normally would be located in the area from which the pest had come to the United States. Native pests ordinarily would be kept in check by "local" biological controls, i.e., predators or other "beneficial" insects and other natural checks on explosions of the pest populations.

In addition to various methods for the chemical or biological control of pests, another major possibility is "cultural" control. Such

193. Id. at 274-384.
194. As a biological phenomenon biological control is "the action of parasites, predators, or pathogens in maintaining another organism's population at a lower average density than would occur in their absence," but as an entomological practice it is "the study and utilization of parasites, predators, and pathogens for the regulation of population densities of pests." Doutt, Biological Control, in Pest Control: Biological, Physical, and Selected Chemical Methods 3, 4 (W. Kilgore & R. Doutt eds. 1967) [hereinafter cited as Pest Control]. See generally Biological Control (C. Huffaker ed. 1971); Biological Control of Insect Pests and Weeds (P. DeBach ed. 1964).
control depends on the manipulation of agronomic practices—timing of the sowing and harvest of the crops, spatial pattern of crops, methods of cultivation and treatment of field debris, and so forth—in order to suppress pest populations. In addition to the major chemical, biological, and cultural methods for controlling different pests there are now a series of more exotic techniques, many of them mainly in the research stage. These include the use of sterilized males, which are released in large numbers in the hope of substantially cutting the reproduction of the females with whom they will mate; the use of techniques for interfering with the behavior patterns of insects, for example, materials to attract insects to a device where they can be destroyed; and the use of pathogens, a microbial form of pesticide.

Out of these various technical possibilities for the control or management of pest populations, entomologists in recent decades have developed the concept of "integrated" control. Used loosely, the term suggests simply the "best of all worlds," in which one picks and chooses from all methods without placing exclusive reliance on any single approach. Under a more rigorous definition, the concept of integrated control requires "harmonizing techniques in an organized way, by making the techniques compatible, and by blending them into a multifaceted, flexible system" for pest management. This pest management occurs within the various agro-ecosystems which man has developed, and although there is an ecological basis to the concept it does not necessarily have as a goal the preservation and maintenance of a particular agro-ecosystem without change. Rather, "the goal of integrated control is the manipulation of the agro-ecosystem to hold pests below economic levels and to avoid disruption of the system with its ensuing chaos." Elimination of a pest is ordinarily not an aim of integrated control. What is sought instead is manipulation of populations to keep them below the "economic threshold," i.e., the levels at which they cause significant economic injury to a grower.

195. LaChance, Schmidt & Bushland, Radiation-Induced Sterilization, in PEST CONTROL, supra note 194, at 147-49.
196. Shorley & Gaston, Pheromones, in id., at 241, 257.
197. Tanada, Microbial Pesticides, in id., at 31.
198. Certain nuances have developed about the terms "pest control" and "pest management." The former is the more traditional term and the one favored by most of those in the application business. Those with a biological control orientation, including many research entomologists and "applied insect ecologists," prefer the term "pest management." To them it suggests less emphasis on the kill potential of a given method and more emphasis on an ecological approach to dealing with pests.
199. Smith & van den Bosch, Integrated Control, in PEST CONTROL, supra note 194, at 295, 297.
200. Id. at 300.
201. Id. at 315-18.
2. **Controlling the Pink Bollworm**

Throughout the late 1950s and early 1960s cotton growers and agricultural officials in the Imperial Valley were aware of the threat posed by the pink bollworm. This destructive cotton pest had been found in Texas in 1917 and in eastern Arizona in 1926.\(^{202}\) Subsequently it was "eradicated" at least twice in central Arizona.\(^ {203}\) Both in Texas and in Arizona control was sought through quarantine programs and cultural controls.\(^ {204}\) The latter consisted primarily of late planting and early harvest and plow-up of the cotton crop, as well as systematic destruction of cotton debris in the fields and at cotton gins. These measures were taken to obtain a maximum "host-free period," *i.e.*, a period with no cotton available to serve as a host for the pink bollworm.

Pink bollworm larvae "diapause" or hibernate over the winter in cotton seed, cotton trash or the soil, and then emerge the following season to begin a new cycle. The basic theory of cultural controls for pink bollworm is to reduce the hibernating populations by early harvest and destruction of hibernation habitat, then to delay the planting of cotton the next year to the latest practical date. Moths from the overwintering larvae will then emerge before any sites for laying eggs in cotton are available.\(^ {205}\) The aim is to break the insect's life cycle, and success obviously requires cooperation and uniform action by all who grow or handle cotton in a given area.

In 1958 the pink bollworm made its first appearance in western Arizona, just across the Colorado River from Imperial County.\(^ {206}\) Control efforts in Arizona broke down in 1962,\(^ {207}\) for Arizona cotton growers refused to give up perennial cotton, which cannot be grown if there is to be a host-free period.\(^ {208}\) By 1965 this insect had been found in Imperial County, and during the 1966 cotton season it caused severe damage throughout the cotton areas of Southern California.\(^ {209}\)

Many organizations and individuals were involved in the research and planning efforts dealing with pink bollworm on cotton. The United States Department of Agriculture (USDA) had been carrying out research on this insect for decades. It also had exercised regulatory

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203. Id.
204. Id.
205. Id. at 11.
206. Id. at 3.
207. Id.
208. Id. at 11.
209. Id. at 3.
power, primarily through the imposition of quarantines on the movement of various materials out of infested areas. The California Department of Agriculture had not done intensive research on the pink bollworm, but it had imposed its own quarantines. An international organization had brought together officials from Mexico and the United States to consider the problems posed by the pink bollworm, and various organizations of cotton producers were also concerned.

In December 1965 the Plant Pest Control Division of USDA’s Agricultural Research Service sponsored a conference on the pink bollworm. This was attended by state and university personnel from Arizona, Mexico, and California, and it was called to review the pink bollworm problem and to recommend a uniform plan of action. A representative of USDA presented the view that the key to pink bollworm suppression or eradication is cultural control and that insecticide is not effective for pink bollworm control. A researcher from the University of Arizona reported that his studies of pink bollworm on desert cotton showed that September 15th would be the optimum crop destruction date, but since that date was impractically early for cotton production he suggested a date of November 1st. This date for plow-up, a late planting, and insecticidal supplementation of these cultural practices was suggested as the appropriate approach. The Agricultural Commissioner of Imperial County reported that cotton growers in his area were opposed to insecticide treatments which would eliminate beneficial predators and parasites. These were regarded as necessary to control other cotton pests, and consequently to avoid their early destruction the conferees agreed that any insecticide

210. See 7 C.F.R. § 301.52 (1972).
211. 3 CAL. ADMIN. CODE § 3409 (1971).
213. Id.
214. Id. at 13.
215. Id.
216. Id. at 27. These growers apparently had been influenced by an orientation toward integrated control on the part of members of the Agricultural Extension Service of the University of California. In 1963, for example, an “entomology short course” was held in Imperial County in which great progress in developing an integrated control program for cotton in the Imperial Valley was noted and in which the virtues of this approach were extolled. Reynolds, Insect Pest Population Studies Leading to Integrated Control in Imperial County Cotton, in PRINCIPLES & PROBLEMS OF PEST CONTROL 35-39 (University of California Agricultural Extension Service 1963) [hereinafter cited as PRINCIPLES OF PEST CONTROL]. Important problems arising from insecticides were identified as rapid resurgence of pest species for the control of which the insecticide was applied; outbreaks of “secondary” pests, i.e., pests other than those for which the treatment was originally intended; and the development of pest resistance to insecticides through genetic selection. Id. at 35.
treatment would have to be limited to the latter part of the cotton season.\textsuperscript{217}

At the end of this one-day conference, an action program to suppress pink bollworm populations and to prevent spread of the insect to noninfested areas was agreed upon. Cotton was not to be planted until April 1st. Intensified surveys were to be conducted throughout the cotton season to detect the pink bollworm. To reduce overwintering populations, three to five applications of insecticide were to be made in the fall, and the plow-up date with stalk destruction was to be February 10th. The financing for the program was to be shared by the federal and state governments.\textsuperscript{218}

Priorities changed over the next two years. What had been planned as a program dependent upon cultural controls with some supplementation by insecticides became a program chiefly dependent upon chemical controls. The initiative was taken by the state Department of Agriculture, and opposition from cotton growers to a massive area-wide spray program was overcome. Contracts were let to an aerial applicator from outside the valley, and enormous doses of pesticide were applied with no local control. Instead of the three to five supplemental treatments which had been anticipated, treatments numbered more than twice that.\textsuperscript{219}

The cultural control measures which had been planned lagged badly.\textsuperscript{220} Technical people in the State Department of Agriculture and

\textsuperscript{217}. Although some conferees apparently expected that cotton producers in Southern California would have to learn to live with the pink bollworm [AGRICULTURAL RESEARCH SERVICE, supra note 212, at 28], this was not the attitude of those from the Bureau of Entomology in the California Department of Agriculture. They supported measures to suppress populations and prevent continued spread of the pink bollworm until research efforts were “ready with a sterile male or mile annihilation program to supply the final eradication tool.” \textit{Id.} at 30. They noted that it “has always been the policy of the [Department] that it would not live with pink bollworm.” \textit{Id.} at 25.

\textsuperscript{218}. \textit{Id.} at 33.

\textsuperscript{219}. The 1967 program covered desert cotton growing areas throughout Southern California. The department reported that in one case a parcel was treated 22 times with carbaryl at 2\% pounds actual toxicant per acre per application. [1967-1968 CAL. DEPT' OF AGRICULTURE BIENNIAL REPORT 26. This was in an area where applications “were based on beginning and ending dates chosen to provide optimum early season suppression.” \textit{Id.} But in the Imperial Valley, “start of control activity was, at grower insistence, predicated on a 10 percent infestation in the individual field.” \textit{Id.}

\textsuperscript{220}. Host-free districts and dates and cultural regulations established by law for reduction of spring populations of pink bollworm have been in some cases difficult to comply with. Delayed harvest due to weather forced extensions of plow-up dates in both years. Differing soil conditions in all areas limited the growers’ ability to completely cover post harvest debris, although in many instances a sincere effort was made to do so. County Agricultural Commissioners worked diligently to enforce regulations and in the majority of cases were able to do so without resort to court proceedings.

\textit{Id.} at 27. On host-free periods and districts for the pink bollworm, see 3 CAL. ADMIN. CODE § 3595 (1972).
in the university's Agricultural Extension Service parted company: at the very time that the state was managing the spray program, an Agricultural Extension Service circular warned in boldface type that

the prospect of repeated applications of insecticides . . . on California cotton is viewed with great concern. Not only is such insecticidal control of pink bollworm imperfect, but production costs will increase greatly. Other pest species . . . could develop resistance faster.\textsuperscript{221}

Cotton production costs indeed went up as anticipated.\textsuperscript{222} Secondary effects were severe, with the most serious being a major outbreak of a previously minor cotton pest, the leaf perforator.\textsuperscript{223} Sugar beet growers in subsequent years suffered heavy damage from beet armyworm whose strength has been attributed to the spray program which was used for the pink bollworm.\textsuperscript{224}

The situation has been so critical in recent years that Imperial Valley cotton producers have proposed a moratorium on cotton production.\textsuperscript{225} Only a failure to obtain an adjustment in federal subsidies, so that a moratorium could occur without a loss in subsidy payments or a break in a grower's yield history, prevented a cotton moratorium which seemed probable for 1970.\textsuperscript{226}

It is difficult to sort out from the morass of public documents and the memories of many different participants just why the priorities for dealing with the pink bollworm in the Imperial Valley changed so markedly. The change occurred despite clear advance warnings that insecticides are not a solution to pink bollworm infestations and that their use in heavy quantities can bring many unwanted secondary consequences. Two factors seem to have played a crucial part. First, there was an intense desire on the part of state officials to keep the pink bollworm out of the San Joaquin Valley. This valley lies north of the Tehachapi Mountains, in the central part of California, and it contains ten times the cotton acreage of the Imperial Valley. In a sense, Imperial Valley has had to pay the consequences of an effort to suppress its pink bollworm populations in order to reduce the chances that the infestation would spread further north.

\begin{thebibliography}{1}
\bibitem{} H. \textsc{Reynolds} \& T. \textsc{Leigh}, \textit{supra} note 202, at 15.
\bibitem{} \textit{Senate Hearings}, \textit{supra} note 9, at 617 (statement of R. van den Bosch).
\bibitem{} Van den Bosch, \textit{supra} note 191, at 5.
\bibitem{} \textit{Id.}
\bibitem{} \textit{Preliminary Report of Special Investigation of Cotton Pest Problems in Imperial County Made to the State Board of Agriculture} 5 (October 2, 1969).
\bibitem{} Letter from Clifford M. Hardin, U.S. Secretary of Agriculture, to Jerry Fielder, California Director of Agriculture, November 13, 1969. Amendments to the federal legislation have since removed this obstacle to a moratorium. 7 \textsc{U.S.C.} \textsection 1350 (e)(2) (1970); \textit{Under New Federal Farm Law, Cotton Moratorium Now Possible, California Farmer}, Jan. 16, 1971, at 4.
\end{thebibliography}
Second, there was a shared feeling that cultural controls could not or should not be imposed on cotton growers to any greater extent than the growers themselves wished. Statutory authority for the imposition of such controls was available, and additional authority could probably have been obtained if necessary. But there was reluctance to use this authority beyond what the cotton industry would approve, and the growers themselves were indecisive. Many did not wish a massive spray program, but at the same time many did not support strict cultural controls of the sort which might have been used. A long host-free period means a shorter growing season with a consequent decrease in yield per acre. In this situation, given the perceived necessity to "do something" of major proportions quickly, the state backed an insecticidal approach.

V

OF PESTICIDE POLICY AND TECHNOCRACY

The basics of integrated control ideology have been described above. The philosophy is an ambitious one, for it requires those making the pest management decisions to have a detailed and sophisticated understanding of extraordinarily complex pest population dynamics. Further, to be useful in the field, these pest management decisions must be made with understanding of the economic and other practical aspects of farming. Yet the ecological sensitivity of integrated control suggests that it provides a workable method for allowing the advantages of modern chemical or other technical breakthroughs to be used in a way which will not bring repeated disasters.

A. The California Response

The California Legislature has never directly adopted integrated control as official public policy for dealing with agricultural pests, although recent statutory reforms which deal with "environmentally hazardous materials" are somewhat suggestive of integrated control philosophy. The State's Director of Agriculture, on the advice of his Pesticide Advisory Committee, determined in 1971 that integrated control would be officially supported as the best method for dealing with agricultural pest problems, but this decision was taken informally

229. California Dep't of Agriculture, Pesticide Policy Statement (undated). "The Department promotes the concept of supervised pest management, stressing use of both biological and cultural control methods blended with selective pesticides to achieve acceptable levels of control with the least possible harm to nontarget organisms and to the environment as a whole." Id. at 1.
and has not been widely publicized.236 Both within the Department of Agriculture and elsewhere there seems generally to have been a failure to consider carefully the institutional implications of integrated control. But such consideration is essential if the sound tenets of integrated control are to be translated into alterations of the present regulatory and institutional framework for agricultural pesticides.

Three principles of pest management by integrated control are of paramount importance in working out an appropriate legal system to regulate the pest controllers. First, every pest management decision must be taken on the basis of a good knowledge of conditions in the particular field or area with the present or potential pest problem. Second, pest management decision making must consider to the greatest extent possible the ecological consequences of any action taken—how that action will affect the balance of insect and other life in infested and nearby areas. And third, any particular control technique, chemical or otherwise, must be used judiciously. The less judicious the approach, the more likely the prospect of massive ecological upset and unanticipated, unwanted consequences.

Implementation of these principles can be considered at several different levels in our present system. Manipulation of the controls “at the top”—registration and labeling—is an obvious possibility. Controls exercised at the local level by agricultural commissioners could be changed in an attempt to bring about the integrated control approach. Or, finally, new measures could be taken structurally to alter the means by which private persons reach their pest control decisions. Some change at each of these levels has occurred in recent years in California, although so far with little perceptible field impact.

1. Top Level Controls: The State Department of Agriculture

The most notable change at the top occurred in 1969. At that time public interest in environmental problems peaked in California as in the nation generally, and the California Legislature enacted a measure on “environmentally harmful materials.”231 This was aimed partly at pesticide registration, and it provided a sweeping mandate to the Director of Agriculture for the evaluation of all registered pesticides. The Director is to “develop an orderly program for the continuous evaluation of all economic poisons [pesticides] actually regis-
tered" in order to "endeavor to eliminate from use in the state any economic poison which endangers the agricultural or nonagricultural environment, is not beneficial for the purposes for which it is sold, or is misrepresented." Refusal of registration or cancellation of registration is authorized for any pesticide:

(a) Which has demonstrated serious uncontrollable adverse effects either within or outside the agricultural environment.

(b) The use of which is of less public value or greater detriment to the environment than the benefit received by its use.

(c) For which there is a reasonably effective and practicable alternative material or procedure which is demonstrably less destructive to the environment.

(d) Which, when properly used, is detrimental to vegetation, except weeds, to domestic animals, or to the public health and safety.

(e) Which is of little or no value for the purpose for which it is intended.

(f) Concerning which any false or misleading statement is made or implied by the registrant or his agent, either verbally or in writing, or in the form of any advertising literature.

In 1969 considerable urgency over environmental pollution was felt in state government, and it then appeared that this broad directive to the Director of Agriculture might lead to significant changes. The Agricultural Commissioner of Imperial County, for example, reported to cotton growers at the end of the year as follows:

After spending a week in Sacramento studying the pesticide and environmental problem on a very intense basis, I am convinced that whether or not we like the fact, pesticide usage as we have known it for the past twenty years is rapidly coming to an end. Whether or not pesticides are in fact causing health problems and whether or not pesticides present a major factor in an environmental pollution is only a matter of academic interest. The fact that we have been able to use pesticides in a certain way for twenty years is also of no value to the present situation. In order to prolong the use of pesticides, each user will have to take some uncommon precautions against (1) misuse, (2) overuse, (3) drift, and (4) control of all pesticide containers.

Such a change has not occurred to date. The Department of Agriculture has cancelled some registrations, notably of materials—such as

233. Id. § 12825. The last three criteria were based on earlier legislation.
234. Letter from Agricultural Commissioner of Imperial County "to all cotton growers," December 16, 1969.
DDT, 2, 4, 5-T, and mercury—which have attracted public attention. But no "orderly program" for the evaluation of all registered pesticides has been developed. Officials of the Department of Agriculture as early as 1970 simply stated that they lacked staff for such work, and that has been that. Apparently no consideration was given to a moratorium on new registrations until the orderly evaluation program could be established, a measure which doubtless would quickly have brought great pressure from the agricultural chemicals industry and might well have led to a decision to provide the Department of Agriculture with the financial resources to conduct both new registration work and an orderly evaluation of present registrations.

Two general points about the environmental criteria in this largely unnoticed registration evaluation mandate are important. First, the teaching of integrated control suggests that in many if not most cases the delicate judgments required by criteria (b) and (c) cannot be made in the abstract. The judgment that environmental detriment

235. 3 CAL. ADMIN. CODE §§ 2408-2411.1 (1972). Other cancellations are reported in California Dep't of Agriculture, Report to the California Legislature from the California Department of Agriculture in Accordance with Chapter 3.5, Division 7, Agricultural Code, Environmental [sic] Harmful Materials 2 (undated report covering 1971). For the more important pesticides only a portion of the use registrations have been cancelled, so these actions do not constitute a full ban of these materials. Thus although DDT cancellations were begun in 1969, 3 CAL. ADMIN. CODE § 2409 (1972), in 1971 over 100,000 pounds of DDT were applied within the state. 1971 CAL. DEP'T OF AGRICULTURE PESTICIDE USE REPORT 55.

Federal registrations of DDT for most agricultural uses have been cancelled as of December 31, 1972. U.S. Environmental Protection Agency, Consolidated DDT Hearings—Opinion and Order of Administrator, 37 Fed. Reg. 13369 (1972). Appeals from this decision are currently before the courts. 3 ENV. RPTR.—CURR. DEV. 179 (1972).

236. See, e.g., Interim Hearings, supra note 9, at 3. The lack of staff was attributed to a lack of funds. Id. An assessment to raise additional funds from those who register pesticides was approved in 1971, CAL. AGRIC. CODE § 12841 (West Supp. 1972), although over half this money is to be paid to the counties as reimbursement for costs incurred by them in pesticide enforcement work. Id. § 12844.

237. CALIFORNIA LEGISLATIVE ANALYST, supra note 72, at 219. The department's most recent annual report on environmentally harmful materials makes no mention of any program for the evaluation of all registered pesticides. California Dept' of Agriculture, supra note 235. Recently the state's Legislative Analyst severely criticized the department's pesticide registration activities:

One reason the registration workload is not handled on a timely basis is because the registration staff spends a large portion of its time correcting errors in the applications for registration or requesting copies of the proposed label. This time-consuming and expensive practice of correcting errors should be curtailed. It is the responsibility of the registrant prior to submitting the application to assure that it is correct. The department now permits itself to be used as a service arm of the industry which it is to regulate. Much of the time which should be spent implementing new statutory policies is diverted to performing a service for the most inefficient registrants of economic poisons.

238. See text accompanying note 233 supra.
does or does not exceed benefit from the use of a given pesticide depends upon knowledge of the agricultural pest problem and the nature of the local environment in a particular situation. Similarly, judgment about the effectiveness and practicableness of an "alternate material or procedure" or its environmental destructiveness in most instances requires reference to a particular situation. Thus, if the Director of Agriculture does in fact determine that the "orderly program" mandated by the California Legislature should be begun, the criteria laid down may prove difficult to work with.

A second general point about the criteria is based on the first standard, which authorizes restriction of pesticides with "serious uncontrollable adverse effects" in the environment. This seems aimed at the so-called persistent or "hard" pesticides of the chlorinated hydrocarbon group. Nationally and at the state level pressure is mounting to cancel the registrations of many of these materials, and there may prove to be good reasons to do so. There seems to be inadequate public recognition, however, of the fact that when chlorinated hydrocarbons are eliminated, pesticides from a group which is generally far more toxic to man are being substituted. Considerable study is now going into the effects of these organic phosphate pesticides on those who must handle them in the application process or come in contact with their residues in the field, but public awareness of their effects seems to be limited. A Silent Spring for the farm workers affected by organic phosphate pesticides is yet to be written. Even from an environmental point of view, it may be that a switch from chlorinated hydrocarbon to organic phosphate pesticides is sometimes disadvantageous. Scientists have pointed out that the very distinction between persistent and non-persistent pesticides may be misleading and that little is known of the environmental fate of the supposedly non-persistent materials. One has remarked:

Just because under a certain set of conditions a chemical is unstable does not necessarily mean that it will always be unstable. Even under unstable conditions a chemical does not just vanish into 'nothingness.' It is simply converted to another or even several other chemicals. It is well established that the nonpersistent organic phosphate insecticide Demeton . . . when released into the environment does disappear. But in the process, several other chemicals are formed—one is 100 times more toxic and another is 1,000 times more toxic than Demeton itself.239

These comments are not meant to suggest that an orderly evaluation of presently registered pesticides would not be worthwhile. At a minimum, such an evaluation could lead to incorporation in pesticide

labels of warnings about the secondary effects various pesticides may have, thus serving the traditional label function of warning the purchaser about what he is buying. Rather, the intent here is to point out the difficulty of using "least cost solution" criteria in the abstract where the specifics of the agricultural pest problem are not known, and to suggest that these criteria may be easier to employ at a level closer to the field decision.

2. Local Level Controls: The County Agricultural Commissioners

Another control level which could be utilized to bring implementation of a decision to adopt integrated control philosophy as official public policy for California is that of the agricultural commissioners. There is now no direct legislative mandate to agricultural commissioners to require growers in their counties to use integrated control methods whenever possible in dealing with agricultural pest problems, but some statutory reforms point in that direction. The most sweeping of these was buried in the 1969 legislation on environmentally harmful materials. The 1969 statute amended the provisions requiring the regulation of injurious (restricted) materials to provide that no permit for such materials shall be granted if the agricultural commissioner determines that the provisions of the environmental criteria of the registration evaluation mandate would be applicable to the proposed use. Thus, for example, agricultural commissioners were in effect directed by the legislature to turn down applications for injurious materials permits where the use of the material is of greater detriment to the environment than the benefit received by its use.

No attempt was made in Imperial County to engage in the environmental review of injurious materials permit applications contemplated by the statutory changes of 1969. In principle this would require a careful analysis of environmental impact and possible alternative courses of action similar to the review now required in many cases by the California Environmental Quality Act of 1970 (CEQA).
Further detail was provided by the legislature in 1971, at the time State licensing for agricultural pest control advisers was adopted.\textsuperscript{243} The provisions on restricted materials permits still require denial of a permit application where any of the environmental criteria are determined by the agricultural commissioner to be applicable.\textsuperscript{244} They now add, however, that before issuing a permit for any pesticide the commissioner shall consider local conditions, including the following:

a) Use in vicinity of schools, dwellings, hospitals, recreational areas, and livestock enclosures.

b) Problems related to heterogeneous planting of crops.

c) Application of materials known to create severe resurgence or secondary pest problems without compensating control of pest species.

d) Meteorological conditions for use.

e) Timing of applications in relation to bee activity.

by government agencies, often on a large scale as in certain vertebrate pest control programs, environmental impact reports were not generally prepared.

In a recent opinion of major statewide significance the Supreme Court of California held in a land use case that “project” as used in the CEQA “includes the issuance of permits, leases and other entitlements.” Friends of Mammoth v. Board of Supervisors of Mono County, 8 Cal. 3d 247, 262, 502 P.2d 1049, 1059, 104 Cal. Rptr. 761, 771, 4 ERC 1593, 1598 (1972). In the pesticide arena such “entitlements” include inter alia restricted materials use permits, and hence an environmental impact report is required whenever such permit allows activity which “may have a significant effect on the environment.” \textsc{Cal. Pub. Res. Code} § 21151 (West Supp. 1972). In its initial opinion the court stated that the term “significant effect” “must be interpreted broadly to include those activities which have any nontrivial effect on the environment.” 8 Cal. 3d 1, 24 n.10 [adv. sheets], 500 P.2d 1360, 1376 n.10 [adv. sheets], 104 Cal. Rptr. 16, 32 n.10 [adv. sheets], 4 ERC 1593, 1603 n.10. In a subsequent modification of the opinion the court dropped the “nontrivial” language, however, and instead pointed out that common sense tells us that the majority of private projects for which a government permit or similar entitlement is necessary are minor in scope . . . and hence, in the absence of unusual circumstances, have little or no effect on the public environment.

8 Cal. 3d 247, 272, 502 P.2d 1049, 1065, 104 Cal. Rptr. 761, 777, 4 ERC 1705, modifying 8 Cal. 3d 1 [adv. sheets], 500 P.2d 1360 [adv. sheets], 104 Cal. Rptr. 16 [adv. sheets], 4 ERC 1593.

Post-Friends of Mammoth legislation intended to clarify the law on environmental impact reports provides a partial moratorium on the report requirement for 120 days. \textsc{Act of Dec. 5, 1972, ch. 1154, § 15, [1972] Cal. Stat.} — (to be codified at \textsc{Cal. Pub. Res. Code} § 21171). This legislation includes a detailed definition of “project,” [\textit{id.} § 1 (to be codified at § 21065)], and makes provision for administrative exemption from the CEQA of “classes of projects” determined not to have a significant effect on the environment. \textit{Id.} § 2.3 (table codified at § 21084). Ministerial projects are also exempted. \textit{Id.} § — (to be codified at § 21080(b)). The legislation requires all public agencies to adopt “objectives, criteria and procedures” for the evaluation of projects and the preparation of environmental impact reports within 60 days after the adoption of guidelines on this matter by the Secretary of Resources. \textit{Id.} § 1, (to be codified at § 21082).

\textsuperscript{243} \textsc{Cal. Agric. Code} § 12001 (West Supp. 1972).

\textsuperscript{244} \textit{Id.} § 14006.5.
f) Provision for proper storage of pesticides and disposal of containers.\(^\text{246}\)

Consideration of the factors added by the legislature in 1971 should present no problem for agricultural commissioners in the issuance of restricted materials permits. These factors are in practice already taken into account in many instances, and the policy directives of the 1971 changes are so unclear that challenge of a decision to issue a permit would be very difficult. It is no doubt implicit in the list of factors to be considered that a restricted materials permit should not be granted where there is no provision for proper storage of pesticides and disposal of containers, but similar inferences as to policy regarding the other “local conditions” are difficult to draw. Assume, for example, that there is “heterogeneous planting of crops” in an area, as is true throughout most of California’s agricultural areas. The statute requires that this fact be considered, but there is no policy guidance as to how this consideration should weigh in the decision making. Thus in principle as in past practice the discretion of the commissioners is left unfettered. And these more recent provisions tend to obscure the 1969 mandate which is so different in character. That mandate not only specifies factors for consideration, but directs that where certain conditions exist the restricted materials permit is not to be issued.\(^\text{246}\) Unlike the more general California environmental impact legislation,\(^\text{247}\) however, it does not require an articulation of the environmental impacts and alternative courses of action. Given the absence of any direction to agricultural commissioners from the State Director of Agriculture on compliance with the 1969 environmental mandate, the more detailed but less stringent provisions of the 1971 amendments to the restricted materials legislation, and the absence of any judicial challenge of the failure of agricultural commissioners to make the environmental determinations required by the law, these may remain a dead letter. In any event, they point only indirectly toward the goal of agricultural pest management through integrated control, and they place the key decision-making power one step above the level which is probably optimal.

3. The Private Sector

At the core of integrated control is the notion that pest problems depend on many complex variables, so that solutions should not

\(^{245}\) Id.

\(^{246}\) Id. This section provides that no restricted materials permit shall be granted if the agricultural commissioner determines that the provisions of id. § 12825(a), (b), or (c) would be applicable to the proposed use. See text accompanying note 233 supra.

\(^{247}\) See note 242 supra.
be reached on a mass basis. In most instances, "area wide control" and "eradication" of a particular species of insect are antithetical to integrated control. Given the fineness with which judgments must be made, it is doubtful that a public policy of use of integrated control can best be implemented either by label controls at the state or federal level or by permit controls operated at the local level. These may be helpful, and permit controls in particular may serve as a check on field judgments, but public officials cannot do the main job except on a field-by-field basis. This would involve a major change in the current pattern of allocation of responsibility for agricultural production decisions, and it is therefore unlikely at present. Local lawmakers and administrators such as agricultural commissioners are not now in a position to make all judgments on pest control and what technology, if any, should be employed to deal with pest problems. In a broad sense, the law now channels pesticide technology through prohibiting the marketing of some chemicals and by limiting the uses which may be made of others. In the future, the most promising path for law is to structure the way in which the technological decisions associated with pesticides and pest control are made by those in the private sector. Such structuring, combined with a strongly stated public policy in favor of integrated control, could bring considerable change.

B. Private Pesticide Use Decision Making: Suggestions for Change

Undoubtedly a first and important step in bringing about a re-structuring of the methods by which private pesticide use decisions are now made is to engage in the kind of pest control adviser licensing scheme upon which Imperial County embarked in 1970 and which the State of California has now copied. Such licensing at least establishes who is in the business. Unfortunately the present licensing schemes may do little more, since very few individuals are being screened out as unqualified and the existence of licensing has little perceptible impact on the behavior of pest control advisers. In looking to the future, two changes which could bring substantial improvement deserve consideration.

248. Significantly, in the instances where Imperial County officials have found it necessary to allow agricultural pesticide applications only on a job permit basis, they have made an inspection of the location and surrounding premises. If it is ascertained that such an application can be made without damage or contamination of surrounding persons, animals, bees, crops or properties, a permit may be issued. Such a permit may include conditions for application such as rate of application, wind velocity, and direction or any other conditions which may be necessary for the safe application of a material. Finnell, Regulations Affecting Pest Control Operations in Imperial County, in PRINCIPLES OF PEST CONTROL, supra note 216, at 120.

249. See text accompanying notes 111-22 supra.
1. More Adequate Testing

First, examinations should be developed with a somewhat different orientation. It is incongruous to determine that a person is competent to be an adviser on "pest control" by testing only knowledge of pesticides, since pesticides are but one method of pest control. Yet that is just what Imperial County did in its 1971 examinations. The examination for a pest control adviser license had four parts: law, insecticides, herbicides, and fumigation. The law examination dealt almost entirely with pesticides. Questions covered registration, labeling, residues, tolerances, use control, and other matters pertaining to pesticides. The three other examinations were made up of technical questions on the various types of pesticide covered. To test adequately an individual's competence for pest control work, however, an examination should go far beyond knowledge of pesticides. At a minimum it seems candidates should also be thoroughly tested on their understanding of pest population dynamics, the economic threshold for pest damage in different crops and viable methods of non-chemical pest control.

2. Increased Independence for Pest Control Advisers

A second and crucially important change has to do with development of independent judgments on pesticide use. Technical competence regarding various aspects of pest control does little to assure that the fundamental value of integrated control will be accepted and acted upon by the technical decision maker. It is necessary to shape the framework for private pesticide use decision making to facilitate implementation of integrated control. This requires that the decision maker be entirely independent of a particular technological approach to a given pest problem.

Growers today are subject to many pressures to use chemicals as the solution for pest problems. Pesticides have had the air of the "scientific" answer to a problem. They are relatively easy to use, despite the immediate danger to the applicator. Many crops must meet extremely high food quality standards, and this is difficult without the intensive use of chemicals. For other crops there are government subsidies which depend on existence of a given yield or acreage history, so if one is "farming the government" it may pay to spray even where the cost of the chemical is greater than the market value of the yield added by spraying. But the most intense pressure of all comes from the fact that those doing most of the field diagnosis of pest prob-

250. See CAL. AGRIC. CODE §§ 42501 et seq. (West 1968).
lems are employed by chemical companies. It is not generally a matter of these field men “loading” their customers with unnecessary applications—the salesman depends on repeat business and the grower is alert to being gouged, so this is unlikely to happen often. Nor is the problem primarily one of unethical field men who know there is some non-chemical solution to a problem but refuse to disclose it. Rather, the central problem is that the chemical company field man thoroughly knows but one technological approach to pest problems. That is the chemical one. Chemicals are his product, and it is to the resources of the chemical company that he turns if he has a special problem. Even absent the pressure put on growers by advertising and that put on field men through financial rewards tied to their sales record, it is entirely natural that chemical company field men will view pest problems from the vantage point of a single technology.

a. Broadened industrial perspective

One solution to this problem might be for the chemical companies themselves to broaden their horizons. They could become suppliers of pest control rather than pesticide. This development seems rather unlikely, however, for the companies are keyed to manufacture of a product that can be sold each season. The 3,000 chemical company field men throughout California constitute a service arm for an essentially manufacturing industry and one that requires the continued existence of a market for the manufactured product. Integrated pest control, however, offers the promise that eventually sufficient ecologic stability may be obtained to dispense with the application of more than an occasional dose of chemicals. Biological control aims at permanent population regulation, whereas chemical control “almost invariably involves temporary destruction of localized populations.”

Consequently it appears that chemical companies equipped to provide manufactured products to established markets on a regular basis would be unattracted to conversion of their pesticide operations to pest control operations.

b. Professional pest control advisers

Another solution is to take steps to improve the professional capacity of the licensed pest control advisers and to require after a transition period that they operate entirely independently of the suppliers of pesticides. This solution in fact appeared in one legislative pro-

252. Smith & van den Bosch, supra note 199, at 321.
posal in California two years ago. It was quickly dropped, and one can expect in the future that this solution will meet with opposition from both the chemical companies and from many pest control advisers. For the former, an independent force of pest control advisers mandated by the legislature to use integrated control techniques whenever possible would mean a loss of business. Since pesticides and indeed all agricultural chemicals constitute but a small part of the business of many chemical companies, however, perhaps this opposition could be overcome. As to the pest control advisers, opposition might be met by pointing out that by upgrading the profession of pest control adviser its financial attractiveness could be increased considerably. A well trained pest control adviser, in the delicate and complex business of making pest management decisions for growers, ought to expect compensation comparable to that of the pilots who now form the elite of the pesticide use world.

Technically, but two steps seem necessary to implement a separation of pest control advisers from chemical companies. First, it must be provided that no licensed pest control adviser can be employed by or have a direct financial interest in a company engaged in the manufacture or distribution of pesticides. For the sake of equity this norm should be broadly stated to cover all introduced technologies for pest control. Thus a licensed pest control adviser should no more be an employee of an insectary, which supplies beneficial insects for biological control, than an employee of a chemical company. Second, it must be provided that most decisions to use a pest control technology such as a pesticide must come via a written recommendation from a pest control adviser. Certain exceptions might be made for mild materials that are very widely used and cause no known damage, but these should be limited. It is of major importance to assure that decisions made by a grower as well as by others be regulated. Presently there is control only of those who give pest control advice, not of all who make pest control decisions which involve the use of pesticides. A major weakness of the present California regulatory system, in fact, is its failure to provide sufficient control over growers in the use of unrestricted materials on their own property.

254. See House Hearings, supra note 9, at 384 (statement of J.G. Copeland, General Manager, Synthetics Department, Hercules, Inc.). "[If all chemical companies dropped their agricultural lines, only a few would have an appreciable loss in earnings." Id.
255. Interview data suggest in the Imperial Valley pest control advisers now earn in the range of $7,000 to $18,000 per year, compared with $18,000 to $35,000 per year for agricultural aircraft pilots.
256. See text accompanying notes 119-22 supra.
VI

ALTERNATIVES IN PESTICIDE USE POLICY FORMATION

Support has been offered here for a strong public policy in favor of integrated control of agricultural pests, with policy implementation to come primarily through the use of law to restructure the means by which private pesticide use decisions are made. The concept supported is that of pesticides used "by prescription only," a notion some entomologists have advanced in recent years, with the important caveat that to be useful the prescribers must be an independent group not beholden to those who market a particular technological means for dealing with pest problems. In studying the experience of the Imperial Valley with agricultural pesticide use control, the author also has considered the possible utility of two other major means of influencing pesticide use decision making. These are the development of special districts which would reflect existing community interdependence in pesticide use decision making and the influencing of prices through the imposition of some sort of tax or charge on some or all pesticides. Neither of these alternatives seems particularly attractive at the present time, for reasons which will be summarized.

A. Special Districts

Special districts of various kinds are a familiar phenomenon of government in California. Districts handle water, drainage, and many other community problems. Thousands of special districts exist in the state, and their supposed invisibility to the average voter has led to substantial criticism of them by some. Special districts for agricultural pest control have been used most frequently in the citrus areas of Southern California. See Citrus Pest District Control Law, CAL. AGRIC. CODE §§ 8401-759 (West 1968). In 1968 at the instigation of Imperial Valley cotton producers, legislation was enacted which authorizes the establishment of cotton pests abatement districts [id. §§ 6051-84 (West Supp. 1972)], but apparently no such district has been established. However, some growers in the Imperial Valley in past years formed informal private associations to negotiate spray contracts on a group basis.

257. See generally ADVISORY COMM’N ON INTERGOVERNMENTAL RELATIONS, THE PROBLEM OF SPECIAL DISTRICTS IN AMERICAN GOVERNMENT (1964).

258. Special districts for agricultural pest control have been used most frequently in the citrus areas of Southern California. See Citrus Pest District Control Law, CAL. AGRIC. CODE §§ 8401-759 (West 1968). In 1968 at the instigation of Imperial Valley cotton producers, legislation was enacted which authorizes the establishment of cotton pests abatement districts [id. §§ 6051-84 (West Supp. 1972)], but apparently no such district has been established. However, some growers in the Imperial Valley in past years formed informal private associations to negotiate spray contracts on a group basis.
pests. Occasionally one of these organizations has turned with great success to biological control, which is easier to implement in an area where there is no spraying of chemicals which can interfere with the biological control program. As often, however, a district or comparable private organization has been used to enable growers to get together to bargain for a good price on chemicals, which with an organization are likely to be contracted for on an area wide, fixed schedule application basis. Districts for agricultural pest control purposes would thus be as able to coerce a minority into participation in a chemical control program as some other kind.\textsuperscript{259}

There are two principal attractions of special districts as a mechanism for agricultural pesticide use policy formation. One is their potential for serving as a means of propagating in the agricultural sector the philosophy of integrated control. The other is their potential for bringing together in one organization all those within a given region who are affected by pesticide use—cotton producers who historically have had some of the most serious pest problems, produce growers who must keep a clean field to market an unblemished crop, beekeepers, farm workers and conservationists—so that they can thrash out their differences within a common framework.

Experience with districts of other types indicates that they develop primarily as "users" organizations. The ends are utilitarian, not reformist, and there is little doubt that an agricultural pest control district in an area such as the Imperial Valley would be dominated by growers. These individuals might well be interested in integrated control philosophy, but their view of costs and benefits is likely to be short-term and confined to the agricultural sector alone. Important as integrated control may be for the growers with a short-term problem, a part of the reason for adopting this philosophy of pest management is to avoid ecological catastrophes which have an impact throughout society. Thus if there is to be a strong push to adopt integrated control as public policy, it should come at the state level through a clear legislative declaration, rather than at the level of special districts.

One might nonetheless support agricultural pest control districts as a good mechanism for implementation of policy directives issued at a higher level. A forum for groups with conflicting interests could be useful, although as it is these views generally become known through the newspapers and today in a sense the county agricultural commis-

\textsuperscript{259} It is noteworthy that since World War II mosquito abatement districts in California have relied heavily on insecticides, to the point where genetic resistance has now produced a state of crisis which would be less serious if proper irrigation practices had been used comprehensively. Garcia, \textit{The Control of Malaria}, \textit{Environment}, June 1972, at 5.
sioner acts as a kind of arbiter of conflict. Basically, however, districts would be useful for implementation only if there is some function important to integrated control which they could carry out. Deciding on how a pest problem should be handled would, in most instances, not be such a function. Officials of a district would be in no better position than an agricultural commissioner to decide just what solution for a pest problem is appropriate for a particular field, and it must be remembered that a central tenet of integrated control is field-by-field examination and decision.

This is not to say that districts have no place in agricultural pesticide use policy formation, but simply that they probably should be given a low priority until there is a clear decision on a function useful to integrated control which can best be carried out by a district mechanism. One such function which might be developed in the future is that of management of an insurance program. It may be in some situations that an insurance principle can be used in dealing with pest problems: instead of spending for chemical control, in some cases growers could contribute to a common pool which would be used to pay for predictable losses to a few of their number, who would experience disproportionate crop damage in the absence of control measures. Such schemes depend, however, on the development of adequate actuarial principles. They cannot be regarded as a solution likely to be available in the near future.260

B. Economic Incentives

Another major possibility is the use of taxes or charges in an attempt to modify user behavior. For several years there has been considerable interest in the United States in the development of "effluent charges" in order to manipulate economic incentives to bring about new patterns of behavior by those now engaged in activities which create pollution. The central idea is that polluters enjoy the free use of various resources, such as water or air into which wastes are dumped, and that a charge on this use will provide incentive for these polluters to reduce such waste disposal.261

Another means of dealing with pollution through economic incentives is to tax materials which cause particularly serious pollution problems. Thus a tax on the sulfur content of fuels can be used to provide an incentive for fuel users to switch to fuel with a lower sulfur content. Both charges and taxes have the advantage of being to some

260. *But see van den Bosch, supra* note 191, at 7.
extent "self-executing," for the users decide in each case just when it will be economically advantageous to adopt a new pattern of behavior so as to minimize the amount of money paid as charge or tax. Bureaucracy is not entirely eliminated, however, for some public apparatus is needed to collect the sums due.

At present an effluent charge system is out of the question for pesticide use. Any effluent charge system depends on knowing at least the approximate quantity of the effluent which is being released to the environment. With ordinary water or air pollutants, monitoring of pipe or stack discharges is possible. Agricultural pesticides, however, are broadcast to the environment. There is ordinarily no "point source" where they leave the field to which they have been applied. Although it is known in a crude way that an enormous percentage of agricultural pesticide does leave the area of application by some means, the present state of knowledge of the environmental routes of travel and ultimate fate of particular materials used is primitive. The empirical basis for establishment of an effluent charge system for agricultural pesticides does not presently exist.

Taxes could, however, be used as a means of attempting to influence agricultural pesticide use patterns. Those who advocate integrated control note that the "broad-spectrum" pesticides, i.e., those that kill many different kinds of pests, are the most disruptive ecologically, and that if chemicals are to be used they should be as "selective" or specific to a given pest as possible. This runs counter to the tendency imposed on the chemical manufacturer by market pressures, for sales will be best given present grower perceptions if one offers a chemical that will control several pests rather than just one. A tax on broad-spectrum chemicals could alter somewhat the economic calculation of the user deciding among various kinds of chemical for pest control.

For two reasons the use of taxes on agricultural pesticides to influence user behavior patterns seems unlikely to achieve important change. First, unlike the typical case of air or water pollution, users of agricultural pesticides already have considerable economic incentive to do without the substance causing the pollution. A fuel burner moving away from higher sulphur content fuel must pay a higher fuel bill. A grower moving away from chemicals for pest control, however, will pay a much lower pest control bill. Leading entomologists

262. To begin to remedy this situation, the California Department of Agriculture is now participating in a multi-agency Monterey Bay Pilot Project, which is to investigate the feasibility of monitoring environmentally harmful chemicals. California Dep't of Agriculture, supra note 235, at 2.

263. See Senate Hearings, supra note 9, at 157 (statement of Everett Dietrick, President, Rincon-Vitova Insectaries).
stress that the internal costs of pesticide use are likely to be more significant than the external costs, so the situation is not a model for the use of taxes for cost internalization. In cotton production in the Imperial Valley in some years growers have paid close to a quarter of their production costs for pesticides. A tax of the magnitude which would be possible politically seems unlikely to alter these use patterns. Heavy reliance on chemicals will be eliminated only when some other viable means for controlling agricultural pests is employed, and a pesticide tax does not deal with that central problem. A tax to raise funds for research on integrated control methods would be useful, but this could be done most easily by taxing all pesticides on some less complicated basis than their selectivity.

The present existence of heavy internal costs for agricultural pesticides, in the form both of the price of chemicals and application service, and of secondary consequences such as pest resurgence, is the most important reason for suggesting that a pesticide tax is unlikely to be important in changing present use patterns. Another reason, however, is difficulty of administration. Many chemical manufacturers sell broad-spectrum pesticides upon which a tax could be directly levied at some point in the distribution system. However, applicators in the field often get broad-spectrum effect by combining several different pesticides in order to deal with several pests at once. To be fair, a tax on broad-spectrum pesticides would somehow have to include those that are formulated by applicators, a task which would be rather complicated. Indeed, one might expect that if the tax was of any serious economic significance to agricultural pesticide users a practice of buying untaxed narrow-spectrum chemicals for user combination might develop. Combination of chemicals at the application stage might of course be banned in order to simplify the pesticide tax, but this would introduce another aspect of complexity to support a measure which seems of doubtful utility to begin with.

264. Van den Bosch, supra note 8, at 622. These include damage from target pest resistance and resurgence, and secondary pest outbreaks, as well as expenditures for pesticides.

265. Pesticide costs for Imperial Valley cotton growers have run as high as $100 per acre. Senate Hearings, supra note 9, at 157 (statement of Everett Dietrick), 617 (statement of Robert van den Bosch). In 1969, with an average of $414.94 per acre harvested, production costs for cotton in Southern California and southwestern Arizona were the highest in the United States. U.S. DEP’T OF AGRICULTURE, COSTS OF PRODUCING UPLAND COTTON IN THE UNITED STATES, 1969, at 15 (1972).

266. Recently an assessment on pesticide sales was instituted to raise funds needed to improve state and county pesticide law enforcement activity. See note 236 supra. If revenues exceed the enforcement funds required, the Director of Agriculture is authorized to reduce the assessment below the statutory figure of eight mills per dollar of sales. CAL. AGRIC. CODE § 12841 (West Supp. 1972). Surplus moneys could be better used if devoted to further research on methods of integrated control.
CONCLUSIONS

Agricultural pesticide control is an example of the now familiar problem of technology control. Unlike the situation with most types of technology, there has been developed over the years a relatively advanced apparatus for controlling agricultural pesticides at the input or materials level. The factor of production is regulated, not simply the wastes which are created by the agricultural production process. Control over agricultural pesticides, including use control through label recommendations, began with the protection of the user of the material, and the regulatory system is still dominated by that concern. Adequate protection has been provided the consumer of food products through establishment of residue tolerances, but much remains to be done to provide equally satisfactory protection for farm workers and the environment.

The use permit system as practiced in the Imperial Valley has considerable utility. Despite the necessity to operate most of the system on a seasonal rather than a job basis, it establishes nearly comprehensive control over agricultural pesticides of a sort which would probably be useful in most other areas. It can help bring solutions for local problems where agricultural pesticides are causing short-term, direct damage. The system in two instances has been used to force significant changes in agricultural pesticide use patterns, so that the bee-pesticide problem has been eased and the DDT-alfalfa hay-milk problem eliminated. There are limits to what a permit system can do, of course, as illustrated by the pink bollworm campaign. Where state or federal agencies take the initiative in area wide eradication programs, whatever fine tuning a permit system can provide tends to be put aside. Subsequent to the state's unsuccessful pink bollworm spray program, however, permit control is proving useful in enforcing the cultural controls which are again receiving emphasis.

Experience in the Imperial Valley suggests that a use permit system alone is unlikely to help deal with environmental problems which are subtle and long term in nature. Where such problems are suspected, one solution is to prohibit particular pesticides in order to eliminate the possibility that environmental accumulation will lead to trouble. Another is to reduce use in order to minimize the risks. Although one might expect that a permit system would itself bring less use of agricultural pesticides, this has not been the case in Imperial Valley. The effect of use controls has been simply to bring a change in the time of day materials are applied, as in night application to reduce bee losses, or a change in the particular pesticide used. Thus use controls have reduced the damage from agricultural pesticides without generally reducing their dominance as a means of pest control.
To develop a regulatory system which does reduce agricultural pesticide use, it is suggested that one should look to pest control adviser licensing rather than use permits as the basis for a viable system. Informed and independent field judgment formed with an ecological awareness is the key to an improved regulatory system. It is unlikely that a job permit system with pesticide use decision making in effect put into the hands of public officials is presently workable. Their numbers are too few, the tasks are too difficult, and the threat of a cumbersome and inefficient system too real to rely on permit control across the board. Job permit control is useful for selected materials, but to put a widely used material on a job permit basis in an area of intensive agriculture is in fact most useful as a way of phasing out use of that material.

Policy and technocracy are the two key elements of a regulatory system which will reduce the use of agricultural pesticides. The philosophy of pest management by integrated control has been accepted by a large number of the country's leading entomologists, as well as by some regulatory officials. There are not yet, however, adequate legislative statements adopting this approach to pest problems as public policy, nor has there been adequate attention paid to the institutional implications of integrated control ideology. Policy needs to be laid out, and measures taken to develop a new technocracy of pest control advisers to implement the policy. These advisers must control the use of most agricultural pesticides the way physicians control the use of powerful drugs used for human medication. They must be trained to deal with the central problem, the protection of plants against excessive pest damage, and to recognize the hidden costs of many pesticidal solutions. Plant protection depends upon many variables in a given agro-ecosystem, and successful pest management advice therefore requires that an adviser be able to influence a series of different agricultural production practices. Comprehensive pest management legislation should provide a strong policy favoring integrated control, a licensing scheme for independent pest control advisers, and permit control to allow back-up supervision by public officials.