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**Financing the Disposal of Unwanted Agricultural Pesticides**

Terence J. Centner and Lewell F. Gunter

The authors are Professor and Associate Professor, Department of Agricultural and Applied Economics, The University of Georgia, Athens.

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Dept. of Agricultural and Applied Economics  
College of Agricultural and Environmental Sciences  
University of Georgia

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Terence J. Centner and Lewell F. Gunter

Department of Agricultural and Applied Economics

University of Georgia

Athens, Georgia 30602

tcentner@agecon.uga.edu

**ABSTRACT:** The disposal of accumulated agricultural pesticides is an expensive proposition due to the hazardous nature of these materials. States have initiated unwanted pesticide collection efforts based on several funding options. Through an evaluation of regulations, funding options and comparison of amounts of pesticides collected to expenditures for pesticides, our paper offers some recommendations for future state collection efforts. It may be advantageous to give greater weight to efficiency considerations for the disposal of existing unwanted pesticide stocks, while equity considerations may be emphasized for the disposal of anticipated future stocks.

**KEY WORDS:** disposal costs, hazardous waste, pesticide, pesticide collection program, waste disposal.

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## **Financing the Disposal of Unwanted Agricultural Pesticides**

Since the mid 1980s, it has been recognized that significant quantities of unwanted pesticides are being retained by agricultural producers in barns and other out buildings throughout our Country. Some of these unwanted pesticides are pesticides whose registrations were canceled or suspended by the Environmental Protection Agency (EPA). Other unwanted pesticides were not used because they were replaced by superior products. In some instances, producers changed crops or went with a pesticide contractor and thus did not consume existing stocks. State officials Minnesota and Wisconsin estimated that approximately three and four million pounds of waste pesticides were stored in their respective states in the early 1990s (Spitzmueller 1995; Wisconsin Department of Agriculture, Trade, and Consumer Protection 1991). The Great Lakes regional EPA office estimated that more than 13 million pounds of pesticides were stored in the six states of that region (Jones 1993).

Governments at all levels have expressed an interest in dealing with the potential problem posed by stocks of unused pesticides. The EPA enacted a Universal Waste Rule to ease the requirements for the safe disposal of unwanted pesticides and other common hazardous wastes (*Code of Federal Regulations*, title 40, part 273, 1996). Many states have developed a framework regulating the disposal of hazardous wastes through household and permanent hazardous waste programs at local and county levels. An additional development at the state level has been an agricultural pesticide disposal program to provide a viable disposal option for unwanted pesticides. Nearly every state has initiated a special agricultural pesticide collection program to provide for the safe disposal of accumulated pesticides, and nearly 10 million pounds

of unwanted pesticides have been collected (table 1).

One impediment to the disposal of pesticides is cost. The lawful disposal of unwanted pesticides pursuant to the Resource Conservation and Recovery Act (RCRA) is expensive (*U.S. Code* 1994). Many persons have stored unwanted pesticides due to their unwillingness to pay for their disposal. For governments, the funding of pesticide collection programs is a limiting factor for the efforts provided by many states. Costs for early pesticide collection programs in the Great Lakes Basin were approximately \$4 per pound (Jones 1993). For its 1994-95 collection costs, Illinois reported spending \$4.07 per pound (Beaver 1996). Minnesota reported separate cost figures for 13 collection efforts from 1993-1994 with costs from \$1.43 to \$6.90 per pound (Spitzmueller 1995).

Although it is unclear whether these reported costs include organizational and administrative expenses, they show that significant amounts of money are needed to dispose of unwanted pesticides. Wisconsin estimated that an educational program, administration, and disposal costs to remove the 2.5 to four million pounds of unwanted pesticides in the state would cost between \$12.8 and \$20 million (Wisconsin Department of Agriculture, Trade, and Consumer Protection 1991).

Given the problem with funding, our paper explores major options employed by states to fund their programs. The initial inquiry concerns the federal requirements for pesticide disposal that reveals a costly infrastructure. States have responded with five funding options, with financing from state pesticide registration fees being the most significant. Consideration of these options suggests that states will need to use their particular demographics and other hazardous waste efforts to decide how best to address this environmental issue. Through a comparison of

amounts of pesticides collected to expenditures for pesticides, we frame some inferences about the various state pesticide collection efforts.

### **Costs of Disposing of Pesticides**

When pesticides are abandoned or disposed of, rather than used for their intended purposes, they are hazardous wastes. Abandoned pesticides must be handled under federal hazardous waste provisions. Besides costs of disposal, pesticide collection programs may incur special expenses due to the type or condition of material or container. Aggregate disposal costs raise questions concerning who should pay for the disposal of unwanted pesticides. This section addresses the federal disposal requirements and pesticide disposal costs as a background for evaluating funding options.

#### *Federal Provisions for the Disposal of Hazardous Waste*

The EPA delineates regulations that identify hazardous wastes and prescribes regulations that espouse human and environmental safety under Subtitle C of the Resource Conservation and Recovery Act (*United States Code* 1994). Detailed regulations in for the disposal of hazardous wastes, including pesticides to be disposed of or abandoned, have been set forth in Parts 260 through 272 of the Code of Federal Regulations (1996). An EPA generator identification number is needed by persons collecting wastes. As hazardous waste generators, persons collecting wastes must maintain a contingency plan, conduct employee training, prepare a manifest for each shipment of collected materials, and use approved hazardous waste transporters to take the materials to a designated hazardous waste treatment, storage, and disposal facility. These provisions show a required infrastructure involving significant expenditures to deal with the

disposal of pesticides.

Relaxed regulations for universal hazardous wastes were prescribed in Part 273 of the Code of Federal Regulations (1996), and the provisions are known as the Universal Waste Rule. Universal hazardous wastes including pesticides, batteries, and thermostats are small quantities of wastes held by many persons. Stocks of banned and unused pesticide products collected and managed as part of a waste pesticide collection program qualify to be treated as universal wastes. Under the relaxed rules of Part 273, agricultural producers taking pesticides to a collection program do not have to meet the paper work normally required of generators disposing of hazardous waste. Persons managing agricultural pesticides with a collection program qualify as handlers of universal wastes and have fewer burdensome requirements than apply to generators under the Subtitle C requirements. In this manner, the Universal Waste Rule provides for the safe disposal of universal waste, without all of the requirements associated with the normal disposal of hazardous wastes.

### *Special Disposal Expenses*

Several special expenses raise questions about who should pay for the disposal of certain unwanted pesticides. Should owners of particularly dangerous pesticides such as dioxins pay more due to higher disposal costs? Who should pay the testing costs for an unknown pesticide? Should there be a fee for on-site pickups or pesticides in deteriorated containers?

Not all pesticides cost the same to dispose of safely, and the disposal of some banned pesticides has involved significant costs. Overall, states have not attempted to recapture these expenses through participant charges. Indeed, some states have targeted banned pesticides due to

the greater threat they pose to the environment, though such pesticides often have greater disposal costs.

Given the age and storage conditions of unwanted pesticides, some pesticide containers have lost their labels and their contents are unknown. Testing unknown materials can be expensive, as Colorado estimated costs of over \$300 per item (Colorado State University Cooperative Extension 1995). Should these costs be absorbed by the collection program or should the owner help pay for testing? As the focus of a collection program is to remove the threat posed by unwanted dangerous materials, unknown materials need to be collected and disposed of safely. Nevertheless, the limited resources of most collection programs mean that the costs connected with unknown materials will reduce the total amount of pesticides that can be collected with available funds. Most programs have not attempted to differentiate unknowns and have expended the funds necessary to dispose of these materials safely.

A similar situation exists for the on-site pickup of deteriorated containers. A collection program must take the necessary precaution to operate safely and avoid accidents. Pesticides in containers that have deteriorated pose singular risks of a type that collection programs are meant to address. If safety requires the pickup of deteriorated containers, this is a necessary expense of the disposal of unwanted pesticides. While a fee could be assigned to safety inspections and on-site collections, states have absorbed the expenses of these measures as part of the cost of removing stored pesticides.

## **Funding Options**

Our survey of state pesticide collection efforts revealed that nearly one-half of the states

have passed special legislation or a designated state agency has enacted administrative regulations governing this issue (table 1). A ranking of the states by amounts collected and notation of legislation or regulations in table 1 fails to show a correlation that would recommend legislative or administrative action. Rather, the survey information seems to suggest that the major constraint on pesticide collection programs is funding. An analysis of funding provisions for pesticide collection programs shows five different categories of financial resources: (1) grants, (2) user fees, (3) pesticide registration fees, (4) taxing the sale of pesticides, and (5) surcharges or site taxes. Some states employ more than one of these categories, as the use of one of these funding sources does not preclude the use of another.

### *Grants*

Some states have not assessed any charges against participants, relying on federal and state monies to cover program costs. Grants for pesticide collection programs have come from the EPA pursuant to programs under the Clean Water Act, the Federal Insecticide, Fungicide and Rodenticide Act, and the Resource Conservation and Recovery Act (Beaver 1996; Jones 1993; Karnatz 1991; Panter 1996; Tolar 1996; Virginia Department of Agriculture and Consumer Services 1996; Vogel 1994). Often these have been for egregious situations or have required some type of special qualification. In 1993, floods justified the use of some EPA funds for the disposal of unwanted pesticides (Beaver 1996; Hagen 1996; Spitzmueller 1995; Vogel 1994). The U.S. Department of Agriculture also has made monies available, and private companies have contributed funds in some states (Karnatz 1991). Private contributions have also been made by pesticide retail outlets through the provision of sites for the collections (Spitzmueller 1995).



In other cases, states have made special appropriations from general funds for collection programs. These appropriations are often similar to grants in that they provide one-time or temporary funding for collection programs.

The funding of many initial pesticide collection programs through federal grants has enabled states to remove thousands of pounds of unwanted pesticides and dispose of them safely. However, these efforts do not provide a basis for a pragmatic long-term response to the issue of the safe disposal of unwanted pesticides due to the continued generation of such materials. Moreover, applying for funding is time consuming and the management of short-term individualized efforts may involve extra costs. Collection efforts dependent on largesse may cause a state to forego the development of a more meaningful long-term collection program. Therefore, while grants have been significant in addressing the environmental program of accumulated pesticides, many states have arranged for additional funding.

#### *User Fees*

An objective of some states is to have persons who own unwanted pesticides help pay disposal costs through user fees. By adopting user fees, the pesticide disposal program does not foster dependence on governmental benevolence for an expense connected with private business activities. A fee of no more than \$10 per pound is authorized for collections in Illinois (*Illinois Compiled Statutes Annotated* 1997). Montana provides two different rates; \$2.00 per pound for up to 200 pounds, and \$1 per pound for amounts greater than 200 pounds (*Montana Administrative Rules* 1994). Given normal pesticide disposal costs, the Montana charges probably do not cover the cost of the program. Montana also has registration fees that may be

used for pesticide collection programs (*Montana Code Annotated* 1995; *Montana Laws* 1997).

Perhaps the most elaborated system of user charges is Minnesota's graduated cost-sharing program (*Minnesota Rules* 1997). Under Minnesota's administrative rules, a distinct account for waste pesticides exists with monies being used for a waste pesticide collection program. The regulatory assessment schedule provides for payment by pesticide end users who participate in a collection program. There are no costs for disposal of 300 pounds or less. For quantities between 300 and 1,000 pounds, a fee of at least \$1 per pound is assessed, but if the disposal cost is greater than \$1 per pound, the participant is obligated to pay one-quarter of the disposal price. Producers with 1,000 to 2,200 pounds are charged at least \$3.00 per pound, but must pay 50% of the disposal cost if such costs are greater than \$3.00 per pound. However, under the Minnesota program, 95% of the participants have not incurred any costs (Spitzmueller 1996). Thus, other funding sources, including pesticide registration fees, provided most of the monies used for disposal of pesticides (*Minnesota Statutes Annotated* 1996).

Colorado's 1995 collection effort also shows elaborate cost provisions for participants (Colorado State University Cooperative Extension 1995). First, the program established priority for the disposal of banned pesticides. Participants were to pay \$2 per pound for the first 300 pounds of banned pesticides excluding dioxin, but for poundage above 300 pounds, participants were to pay \$5 per pound. For dioxins, persons were to pay \$8 per pound, and participants disposing of unusable pesticides that were not banned were to pay \$5 per pound. Due to lower costs than expected, participants were not charged (Panter 1996).

Conflicting concerns confront a user fee requirement. While user fees can force participants to assume some responsibility for their unwanted pesticides, is such needed? Is there

a danger that agricultural producers or others will buy excessive amounts of pesticides due to free disposal of unused amounts? Will a gratis program somehow be exploited by unscrupulous owners of unwanted pesticides?

Conversely, persons owning unwanted pesticides may be less likely to participate when there is a fee. States intent on requiring persons to help pay for the disposal of unwanted pesticides may discourage participation so that significant quantities of unwanted pesticides remain in storage. A program with a 5-gallon limit for free disposal had one participant making multiple trips (Wisconsin Department of Agriculture, Trade & Consumer Protection 1991). Would it be preferable to have amounts above the 5-gallon threshold remain in storage due to the owner's refusal to pay a nominal disposal fee? Another producer declined to bring in amounts above the threshold due to the user fee. While threshold limits may be relevant given funding, whenever a state goes through the work of organizing and funding a collection program, it may want to encourage participation. Survey results from Minnesota and Texas show low participation in pesticide collection programs, and raise a question of whether user fees dampen participation (Spitzmueller 1995; Texas Natural Resource Conservation Commission 1997). Yet, some participants have stated a willingness to pay a nominal fee (Wisconsin Department of Agriculture, Trade & Consumer Protection 1991).

Two additional issues involving user fees are whether such are needed for political reasons and whether such are economical? States not requiring persons to contribute may be sending the wrong message to the public that the government will take care of private environmental problems. Therefore, legislation or regulations that provide a user fee may send an important message that the government is only coordinating a response to an environmental problem rather

than assuming responsibility for the problem. Perhaps this is the objective of the Minnesota regulations where a user fee is imposed, yet the threshold before the fee applies has meant that 95% of the participants have not incurred a fee.

From an economic perspective, user fees may involve an inordinate amount of effort to raise insignificant sums. Since user fees often do not cover the costs of disposal, provisions for other sources of funds will be required. States organizing collection programs will need to decide from their own experiences, needs and funding sources whether a user fee would be appropriate.

### *Pesticide Registration Fees*

A prevalent financing provision for states with established agricultural pesticide programs is to use pesticide registration monies for collection programs. Some states specifically allocate part of the registration fee to cleanup and collection programs. For example, Vermont allocates \$10 from each product registration to collect and dispose of obsolete and unwanted pesticides (*Vermont Statutes Annotated* 1996). Other states have funds in which some registration monies are deposited for use for pesticide collection programs. North Carolina created a Pesticide Environmental Trust Fund (*North Carolina General Statutes* 1996; *North Carolina Session Laws* 1997). Registration monies for pesticides are credited to the fund and 75% of the monies in the fund are to be budgeted for environmental programs, including a pesticide container management program to enhance the North Carolina pesticide disposal program.

Regulatory provisions for minimum or maximum amounts that may be collected or used for collection programs may also be important. The Michigan law provides for the suspension of groundwater protection fees if the money in the fund exceeds \$3,500,000 (*Michigan Compiled*

*Laws Annotated* 1996). In this manner, fees are discontinued if monies are not needed for disposing of unwanted pesticides or funding environmental remedial projects. The Michigan groundwater protection fee would be reinstated when the fund contained less than \$1,000,000 at the close of a succeeding fiscal year. With respect to the Minnesota registrant application fee, the state requires “at least \$600,000 per fiscal year to be credited to the waste pesticide account” (*Minnesota Statutes Annotated* 1996).

### *Taxing Pesticides Sold*

Another funding possibility is a tax on pesticide products. Michigan has adopted a detailed funding program that involves both registration monies and a tax on pesticides sold (*Michigan Compiled Laws Annotated* 1996). There is a specialty pesticide groundwater protection fee of \$100 per product, with products excluding agricultural pesticides. Groundwater protection fees for agricultural pesticides are 0.75% of wholesale value of the previous registration year’s product sales or a minimum of \$150. Monies are deposited into the freshwater protection fund to be used for numerous purposes, including “pesticide pickup programs for pesticides not currently registered for use.”

### *Surcharges or Site Taxes*

Household hazardous waste programs show alternative surcharges and site taxes as a means to help fund the collection of pesticides. Michigan has enacted provisions to allow qualifying counties to impose a surcharge on households for waste disposal including hazardous waste (*Michigan Public Acts* 1996). Households may be taxed \$25 per year for this service. Colorado enacted legislation for a site tax under which property owners within the jurisdiction of

the waste facility would be assessed a hazardous waste site tax (*Colorado Revised Statutes Annotated* 1989). The funds raised from a site tax would be used with other funds to pay for the cost of land, labor, equipment, and services needed for the operation of the hazardous waste facility.

### **Efficiency and Equity Characteristics of Funding Sources**

The funding methods discussed above differ in their efficiency and equity characteristics with respect to voluntary disposal programs for unwanted stored pesticides. These differences are summarized in table 2 which rates equity and efficiency characteristics for each type of funding for two objectives: the disposal of existing pesticide stocks and the disposal of pesticide stocks that may be accumulated in the future. The equity rating is concerned with the degree to which the cost of disposal is borne by owners of unwanted stocks. The potential efficiency rating is concerned with the potential of a funding strategy to result in the “complete” disposal of stocks of unwanted stored pesticides.

Equity ratings in table 2 range from lowest equity (1) to highest (3). An equity rating of 1 indicates that there is no linkage between the source of disposal funds and the ownership of unwanted stored pesticides. An equity rating of 2 indicates a partial linkage between ownership and disposal cost, and an equity ranking of 3 indicates that a high percentage of disposal cost is borne by the owner of unwanted stored pesticides.

Potential efficiency indices in table 2 range from lowest efficiency (1) to highest (3). A ranking of 1 indicates that the funding method provides a disincentive to pesticide disposal in a voluntary program. An efficiency index of 2 indicates the absence of a disposal disincentive

associated with the funding method. An efficiency index of 3 indicates both the absence of funding related disposal disincentives and the existence of incentives to reduce pesticide use. Reducing pesticide use may lessen future disposal problems by reducing the quantities of pesticides purchased.

Because the ability of a program to effect the complete disposal of unwanted pesticides is influenced by more than the source of funding, table 2 considers the *potential* efficiency of each funding method. The level of disposal that is attained will be affected by both the size of the pool of disposal funds and the specific characteristics of the disposal program. Additionally, if participation in a disposal program is voluntary, the degree of disposal attained by any program will depend on characteristics of owners of unwanted pesticides. Some pesticide owners may want to be rid of stored pesticides to the extent that they would be willing to pay some or all of the costs of disposal. Other owners may choose not to participate, even in a no-fee disposal program, simply to avoid transactions costs (*e.g.*, time, paperwork) associated with the program.

The disposal of existing stocks of unwanted pesticides is distinguished from the disposal of future pesticide stocks in table 2 due to possible effects of the disposal funding source on pesticide accumulation. Since existing stocks are already in place, their accumulation cannot be affected by the funding method used for a disposal program. The method of funding may, however, affect future pesticide use, accumulation, and disposal costs. The highest efficiency rating for disposal of existing stocks is therefore 2, since the source of funding cannot affect accumulation of existing stocks. An efficiency rating of 3 is possible for the objective of eliminating future unwanted stocks, since the funding method may affect future accumulation as well as future disposal.

State or federal grants for the disposal of unwanted pesticide stocks were assigned efficiency and equity ratings of 2 and 1, respectively, for both existing and future stock disposal. The efficiency rating of 2 for existing stocks reflects the fact that grant funding imposes no disincentives for disposal. The efficiency rating for grants is also 2 for future disposal because grant funding provides no incentives to reduce future pesticide use. The equity rating of 1 for both existing and future disposal under grant funding reflects the fact that grant funding is supported by unspecified sources of state or federal dollars and is unrelated to ownership of unwanted pesticides. A reliance on grants to fund pesticide disposal also raises questions about sustainability of the disposal program over time, as this is not a continuous method of raising funds, but is subject to periodic funding decisions by state or federal governments.

The use of user fees to finance disposal merits a 3 rating for equity in the disposal of both existing and future pesticide stocks, because user fees are imposed directly on the owners of these stocks. The efficiency rating of user fee financing is 1 for both existing and future stocks, however, because the user fee creates a financial disincentive for owners of unwanted pesticides to participate in a disposal program. A user fee program for disposal of future stocks may reduce future pesticide use and accumulation, since the user knows he will pay for disposal, but an efficiency rating of 1 was still assigned to user fee programs for future stocks because, in a voluntary program, user fees still provide a disincentive for participation.

Registration fees, imposed on pesticide manufacturers, were assigned an efficiency rating of 2 for disposal of existing stocks because they do not create a barrier to participation. The efficiency rating increases to 3 for disposal of future stocks, because the increase in pesticide cost may be expected to reduce pesticide usage and serve to reduce future accumulation of unwanted



stocks. An equity rating of 1 was assigned to registration funding for disposal of existing stocks, since the funds will come from current and future purchasers of pesticides rather than current owners of unwanted pesticides. The equity rating increases to 2 for disposal of future stocks because future owners of unwanted stocks will be a subset of current and future pesticide purchasers. The equity rating is 2 rather than 3, however, because fees on purchasers who do not accumulate unwanted pesticides will be subsidizing the disposal costs of purchasers who do accumulate these stocks.

Pesticide tax funding for disposal is similar to registration fee funding with respect to incentives for disposal, pesticide accumulation, and distribution of costs. Efficiency and equity ratings for pesticide taxes are thus the same as those for registration fees. It should be noted that both registration fees and pesticide taxes shift part of the disposal costs to pesticide manufacturers, with the distribution of costs to suppliers and demanders of pesticides determined by pesticide supply and demand elasticities (Gunter, Jeong and White).

Site taxes provide funds for disposal by imposing a cost on individuals residing within a specific political boundary. Site taxes were assigned efficiency ratings of 2 for disposal of both existing and future stocks, since they do not create participation disincentives, but neither do they create disincentives for future accumulation. Site taxes were assigned equity ratings of 1 for disposal of both existing and future stocks, since they are based on location rather than on ownership of unwanted pesticides.

### **Pesticide Collection Relative to Pesticide Use**

Although it would be useful to analyze the relationship between funding sources and

pesticides collected on a state level, such analysis is precluded by incomplete information on pesticide accumulation, pesticide collections, and funding sources for collection programs. A summary table of pesticide use, collection, and funding data is presented in table 3 for states that reported pesticide collection levels in the Cabbage study. A complete delineation of funding sources for each state was unavailable.

Table 3 uses 1992 total pesticide expenditures as a proxy for pesticide use (and accumulation). States in table 3 are ordered from highest to lowest by the ratio of pounds of pesticide collected to total 1992 pesticide expenditures, providing a measure of pesticides collected relative to a proxy for pesticides accumulated. The level of pesticide expenditures per acre of crop-land is also shown as a proxy for the intensity of pesticide use in each state. Note that the pesticide expenditure figure is a rather crude measure of pesticide use since it does not account for differences in the types of pesticides used in different states, differences in toxicity of pesticides, or for price differences among pesticides.

Given caveats about both the pesticide use and collection data, the collection-to-expenditures ratio can be interpreted as a rough indicator of each state's progress in disposing of accumulated pesticides. Of the ten states with the highest ratios, one-half are in the Northeast. Eight of the ten states with the highest ratios have lower than average collection amounts, but all of these states also have lower than average pesticide expenditures. Overall, the high ranking of these top ten states is due to their relatively low level of pesticide use rather than to high levels of pesticide collection. The intensity of pesticide use, as measured by the collection to expenditure per acre ratio, does not appear to affect the ranking of the top ten states, as three of the states had higher than average intensity while seven were lower than average on this measure.

Of the ten states with the lowest collection to expenditure ratios, all but California had lower than average reported amounts of pesticides collected. Six of these ten states had higher than average pesticide expenditures in 1992. Although the low ranking for several of these ten states is due to both lower than average collections and higher than average expenditures, the low ranking is attributable more to high expenditures for California and Illinois, and more to low collection amounts for the other eight states. There is no discernable relation between intensity of pesticide use and the ranking of these states, although the bottom ten ranked states include the two states with the highest total expenditures on pesticides ( California and Illinois), as well as the two states with the highest pesticide expenditures per acre of crop-land (California and Florida).

Although the funding source data for each state in table 3 is incomplete, there is no apparent relationship between known funding sources and pesticide collection ratios. This is unsurprising in that even where funding sources are known, levels of funding and characteristics of collection programs are unknown.

### **Concluding Comments and Implications**

The continued storage of unwanted pesticides creates the risk of potential environmental contamination by a natural disaster; a tornado or a flood could cause a stored pesticide to be dispersed into the ground or water. Farm properties sold or inherited often mean that pesticides are passed to persons who have not had training or experience in using them. In many cases, persons possessing or inheriting pesticides lack knowledge of how to dispose of them safely. The hazards created by unwanted pesticides have led states to provide for the collection and proper disposal of unwanted pesticides as a precautionary measure that safeguards citizens and natural

resources.

The initiation of a collection program, however, does not guarantee that accumulated pesticides will be disposed of safely. Nor do targeted efforts or one-time collections completely respond to the hazard. Surveys have shown that possessors of unwanted pesticides may be hesitant to submit them at a collection event. If there is a fee for disposal, even fewer owners of pesticides may avail themselves to the governmental collection effort. Thus, states have found that multiple collections over a number of years are necessary to attain the removal of most accumulated stocks of unwanted pesticides. Often, states have actively involved the cooperative extension service to increase participation in the collection efforts. Given differences in population, amounts of accumulated pesticides, dangers posed by unwanted pesticides, and other hazardous waste collection efforts, recommending a single strategy for all states is not possible.

Our research suggests that a state's regulatory framework is not an important indicator of the volume of collected materials. Instead, the availability of funding is more likely to restrain collection efforts so that each state will need to adopt a strategy in view of its resources. The costs of pesticide collection efforts need not be that expensive. If known banned or dangerous pesticides are present in a region or county, a targeted program involving participants registering their materials before collection may be appropriate. Costs of such a program, including administrative overhead, may be \$4 to \$6 per pound. Where most of the older more toxic materials have been collected, the cost may be approximately \$1.50 to \$3 per pound. In view of the new Universal Waste Rule and its relaxed requirements concerning pesticide collections, achieving lower collection costs should be possible. Once states have removed large quantities of stored pesticides, they can probably forego participant registration and move to a relaxed program

where costs would be about \$1 per pound.

If pesticide collection programs are to remain voluntary, states may want to consider different programs for the disposal of existing and future unwanted pesticide stocks. It may be necessary to give greater weight to efficiency considerations in facilitating the cleanup of existing stocks, since a high rate of participation will be needed to accomplish a high level of disposal. Equity considerations may be given greater emphasis in designing programs to reduce future stocks of unwanted pesticides, since program design may affect accumulation of stocks as well as disposal. Registration fees and pesticide taxes are attractive funding sources for disposal of future stocks since they impose disposal costs on pesticide manufacturers and users, provide disincentives to future pesticide accumulation, and avoid disincentives to participation in collection programs. Although registration fees and pesticide taxes do not restrict disposal cost allocations to owners of future stocks, they do impose the costs on suppliers and users of pesticides rather than on the general public or residents of a specified area. A registration fee/pesticide tax system also has the advantage of providing a continuing source of funds that is related to the level of pesticide use.

Two additional issues may be noted as they may influence future collection efforts. First, some states limit collection programs to agricultural producers, which excludes participation by small businesses, including golf courses, landscape contractors, and aerial applicators. While restricting participation to agricultural producers may be valid given financial resources, the purpose of pesticide collection programs is to eliminate a potential environmental hazard. Since the preclusion of participation by these small businesses may frustrate achievement of the objective, states might contemplate how they can attain the financial resources to offer similar

assistance to others.

Second, states with other hazardous waste collection programs may find that these programs can be used with agricultural pesticide collections. Iowa and New York accept agricultural pesticides under their household collection efforts (*Iowa Code Annotated* 1990; New York State Department of Environmental Conservation 1993). Florida has initiated special agricultural collection programs employing the expertise and facilities of existing household collection sites (Florida Department of Agriculture and Consumer Services 1997). While agricultural producers may need special encouragement to participate in such programs, the existing infrastructures of household programs offer an inexpensive way to dispose of accumulated pesticides safely.

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