

The Case and Opportunity for Public-Supported Financial Incentives to Implement Integrated Pest Management

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ABSTRACT Food, water, and worker protection regulations have driven availability, and loss, of pesticides for use in pest management programs. In response, public-supported research and extension projects have targeted investigation and demonstration of reduced-risk integrated pest management (IPM) techniques. But these new techniques often result in higher financial burden to the grower, which is counter to the IPM principle that economic competitiveness is critical to have IPM adopted. As authorized by the 2002 Farm Bill and administered by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), conservation programs exist for delivering public-supported financial incentives to growers to increase environmental stewardship on lands in production. NRCS conservation programs are described, and the case for providing financial incentives to growers for implementing IPM is presented. We also explored the opportunity and challenge to use one key program, the Environmental Quality Incentives Program (EQIP), to aid grower adoption of IPM. The EQIP fund distribution to growers from 1997 to 2002 during the last Farm Bill cycle totaled ≈\$ 1.05 billion with a portion of funds supporting an NRCS-designed pest management practice. The average percentage of allocation of EQIP funds to this pest management practice among states was $0.77 \pm 0.009\%$ (mean \pm SD). Using Michigan as an example, vegetable and fruit grower recognition of the program's use to implement IPM was modest (25% of growers surveyed), and their recognition of its use in aiding implementation of IPM was improved after educational efforts (74%). Proposals designed to enhance program usefulness in implementing IPM were delivered through the NRCS advisory process in Michigan. Modifications for using the NRCS pest management practice to address resource concerns were adopted, incentive rates for pest management were adjusted, and an expanded incentive structure for IPM technique adoption was tabled for future consideration. The case is strong for using public-supported financial incentives offered by the EQIP to aid grower adoption of IPM as a means to address resource concerns, but current use of the EQIP for this purpose is modest to meager. With appropriate program adjustments and increased grower awareness, USDA NRCS conservation programs, and the EQIP in particular, may provide an important opportunity for growers to increase their use of IPM as a resource conservation and farm management tool.

KEY WORDS NRCS conservation programs, EQIP, environmental quality, reduced-risk IPM

IN THE UNITED STATES, THERE is a substantial history of encouraging adoption of integrated pest management (IPM) techniques through public-supported education and regulation. The land-grant university system as supported, in part, by the U.S. Department of Agriculture (USDA), delivers education-based incentives (i.e., research and extension activities). The U.S. Environmental Protection Agency (EPA), for-profit entities such as agribusinesses, and some not-for-profit entities also deliver pest management information directly or through support of land-grant university activities (Council for Agricultural Science and Technology 2003, chapter 1). Regulation-based incentives

for pest management are primarily focused on pesticides (National Research Council 2000, chapter 3). The EPA in partnership with state agencies regulates pesticide availability and use. Food, water, environmental protection, worker protection, and international trade issues are recent driving forces in pesticide regulation, and resulting regulatory and industry decisions are leading to significant changes in pest control technologies (Johnson and Bailey 1999, National Research Council 2000, chapters 3 and 4).

In response to the need for new techniques to replace lost uses of pesticides, targeted public support has resulted in an increase in sponsored research and demonstration projects aimed at developing and demonstrating reduced-risk pesticides and alternatives to pesticides. Additional education efforts are provided by IPM and related Extension Service activities of the

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land-grant universities and other entities (Michigan State University IPM Program 2003a, Council for Agricultural Science and Technology 2003, chapters 1 and 14).

The potentially significant grower financial burden in transitioning to and maintaining reduced-risk techniques has been recognized (Johnson and Bailey 1999). Concurrently, USDA conservation programs have been developed to deliver public-supported financial incentives to encourage grower use of practices that benefits resource conservation (Ribaudo and Caswell 1999). Here, we consider the case for financial incentives to implement IPM techniques to mitigate negative effects on environmental quality by pesticide use, and we describe pertinent programs. We review and analyze the opportunity for using one key voluntary conservation program to deliver financial incentives.

The Case for Public-supported Financial Incentives. The IPM concept was formulated in light of problems with pesticides used often in exclusion of other pest management techniques (e.g., pest resurgence, pesticide resistance, and kill of beneficial organisms). Early constructs of the IPM concept emphasized the importance of using pesticides so that adverse effects on biological control agents are minimized and economic competitiveness of IPM techniques is maximized. Later contributions emphasized the importance of minimizing adverse environmental effects. Protecting environmental resources and increasing economic competitiveness are pivotal issues in gaining both broad societal acceptance and grower community acceptance in using IPM (Norris et al. 2003, chapters 8 and 19).

IPM development and implementation projects typically promote the economic desire to control pest(s) when pest populations are expected to adversely affect farm profitability without control intervention. Environmental cost and benefit associated with use of a control tactic are also relevant, and methodology has been developed to incorporate these factors into decision-making (Higley and Wintersteen 1992). But near-term financial risks are carried principally by the farm business where considerations of cost of control and yield loss have driven development of economic thresholds for agricultural pest management (Pedigo 1999, chapter 7). The long-term societal benefits and costs associated with environmental outcome of a control decision are appreciated by growers, but these factors are not well linked to the near-term grower cost of implementing a control tactic.

Growers are attracted to using new techniques in cases where pesticide alternatives are clearly financially competitive. Under such conditions, remaining grower transition barriers in adopting IPM can be addressed through education-based incentives (Norris et al. 2003, chapter 18). The same scenario applies to reduced-risk pesticides, with favorable conditions for adoption if the new product is competitively priced and can be marketed and used in an agribusiness and consulting environment similar to other competing products.

The loss of pesticides due to regulatory actions designed to protect natural resources, agricultural workers, and consumers is a more challenging scenario. Regulatory action that eliminates a pesticide use is a strong inducement for adopting a new technology, but often presents significant economic challenges to the grower. Short-term financial effect on the farm may be negative until complete transition to the new techniques, and recurring costs may be higher than the costs associated with the replaced technologies. Higher financial burden of a new technique may be derived from higher cost of the product, the application technology to use the product, and the information technologies to use the product appropriately (e.g., intensive monitoring to time application of target-specific products) (Council for Agricultural Science and Technology 2003, chapter 13; Norris et al. 2003, chapter 18). Higher costs of new techniques reduce grower competitiveness if the lost pesticides are available to others, even if significant environmental benefit is attained. Because environmental and health regulations vary among countries (National Research Council 2000, chapter 3), the unintended consequence of replacing higher risk, less costly pesticides with lower risk, more costly pesticides in the United States is the potential reduction of economic farm health in our current global agricultural market.

Under this scenario, an important question is whether the public good gained by growers using reduced-risk IPM techniques warrants public-supported financial incentives to aid growers in adopting and maintaining these techniques. The public good in controlling pests has been well documented in the form of meeting market standards and other economic short-term benefits (Smith et al. 2002). Environmental benefits are more pertinent in justifying use of conservation program financial incentives for IPM. Decreased health risks, decreased pollution of natural resources, increased effectiveness of natural controls, and overall increased ecosystem health can result from adoption of IPM techniques (Harris 2001). Techniques to achieve acceptable pest control while protecting natural resources include use of biologically based controls, cultural controls, reduced-risk pesticides, reduced-risk pesticide application methods, and judicious use of pesticides through pest monitoring and applying economic thresholds and forecasting models to pest management decision-making (Council for Agricultural Science and Technology 2003, chapter 2; Pedigo, chapters 8–15).

The general concept of providing financial incentives to growers to implement techniques that have environmental benefit while maintaining farm health has been legislatively addressed, and programs administered by the USDA have been authorized that address conservation concerns. The authorized programs are designed to be flexible and provide program access to growers on a voluntary and confidential basis (Batie and Ervin 1999, Ribaudo and Caswell 1999, United States Congress 2002a). We describe this opportunity by reviewing structure, grower recognition, and fund allocations of a current program that ad-

dresses conservation on actively farmed lands. Based on this review, we provide recommendations on enhancing use of IPM through increased grower participation in conservation programs.

Opportunity for Using USDA Conservation Programs. The general concept and application of delivering financial incentives to growers to increase environmental stewardship has been reviewed by Casey et al. (1999). Financial incentives from the USDA Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) have been provided to growers in selected U.S. counties to encourage adoption of pest management, as authorized by the 1996 Federal Agricultural Improvement and Reform Act (Council for Agricultural Science and Technology 2003, chapter 14). Common use of the NRCS-designed pest management practice in the EQIP during the last Farm Bill and the previous Special Practice 53, Integrated Crop Management (SP53 ICM) was to provide cost offsets to growers for using pest monitoring services (Bechinski 1994; Council for Agricultural Science and Technology 2003, chapter 12). More recently as authorized in the 2002 Farm Bill (Farm Security and Rural Investment Act), the EQIP is now available throughout the United States, and the new Conservation Security Program is available in select regions (United States Congress 2002a, Natural Resources Conservation Service 2003b, Natural Resources Conservation Service 2004). The EQIP as reauthorized is designed to assist growers with the expense of initiating conservation practices used to assess and mitigate resource concerns. The Conservation Security Program is expected to assist growers already using conservation practices with the expense of their continued use and provide additional financial incentives on a graduating scale of increasing payments to match increasing conservation efforts (Keeney and Kemp 2004, United States Congress 2002a).

There is legislative encouragement for the EQIP to address resource concerns related to pesticide use. The 2002 Farm Bill specified significant funding targets for animal production issues—60% of EQIP-allocated funds. But no additional funding earmarks were provided, suggesting that the legislative encouragements were applicable to the remaining EQIP fund allocation (United States Congress 2002a, b). A pest management policy and an NRCS-designed pest management practice are available (Natural Resources Conservation Service 2003a, c). Others have addressed the potential use of the Conservation Security Program (Keeney and Kemp 2004). In this program, providing growers a graduating scale of increasing payments to match increasing conservation efforts may well support use of multiple pest management techniques in a plant protection system approach. But the final rule of the Conservation Security Program has only recently been published, and it is currently constrained by a limited budget allocated to select regions (Natural Resources Conservation Service 2004). The EQIP has a well established operating structure and increasing budget, and it is available

Table 1. Resource concerns identified as priorities in Michigan for the Environmental Quality Incentives Program, and their relative ratings (points awarded) in the selection process for evaluating grower applications, 2003 and 2004

Resource concern	Awarded points	
	2003	2004
Threatened, endangered, or special concern species systems	125	100
Comprehensive nutrient management plan systems	125	100
Riparian corridor management systems	75 ^a	100 ^a
Groundwater resource protection systems	75 ^a	100 ^a
Air quality protection systems	75	100 ^a
Integrated conservation cropping systems	75	100 ^a
Animal production management systems	75	100
Integrated wildlife management systems	50	100
Forestry systems	50	100
Invasive species control systems		100 ^b

For 2003, applications were classified within low- (0–75 points), medium- (76–100), and high (>100 points)-priority categories for funding. For 2004, applications were classified within low- (0–200 points), medium- (201–299), and high (>300 points)-priority categories for funding.

^a The NRCS pest management practice addresses this concern.

^b A new concern for 2004 to recognize selected invasive non-native plants in pastures and forests. An invasive species management practice was developed to address this concern.

throughout the United States (United States Congress 2002a, Natural Resources Conservation Service 2003b); therefore, we focus on the EQIP as the current principal opportunity to encourage adoption of IPM techniques through federal public-supported financial incentives in the United States.

EQIP Method of Delivering Financial Incentives. Briefly outlined here (see also Ogg 1999), producers of agricultural commodities may receive financial assistance for implementing approved conservation practices to address resource concerns on lands in production. For practices such as pest management applied yearly to farmland, the intent is to provide financial assistance to allow growers to demonstrate the value of the practice, thereby encouraging its continued use (United States Congress 2002a, Natural Resources Conservation Service 2003b). Aggregated across all grower applications, more funds can be requested than available. An application selection process as administered by State Conservationists prioritizes resource concerns in accordance with national guidelines (Natural Resources Conservation Service 2003b). Among other uses, this process rates applications for funding priority (Table 1).

Specifically, resource concerns recognized by NRCS are centered on soil, water, air, plant, and animal conservation (United States Congress 2002a). National resource priorities for the EQIP include reducing nonpoint source pollution, with specific mention of pesticides and nutrient amendments (Natural Resources Conservation Service 2003b). As an example of local adaptation, the State Conservationist of Michigan prioritized nine and 10 resource concerns for 2003 and 2004, respectively (Table 1). Similar lists have been established throughout the United States (Natural Resources Conservation Service 2003b).

Table 2. Selected land management and structural improvement practices, their incentives rate schedule, and payment limits for the EQIP in Michigan, 2003 and 2004

NRCS practice ^a	Incentive rate/yr		Limit ^b	
	2003	2004	2003	2004
Pest management (595) ^c				
Vegetable crops	\$8/3	\$10/3	\$800	\$2,000
Fruit and nursery crops	\$20/3	\$20/3	\$4,000	\$2,000
Field crops	\$3/3	\$3/3	\$1,500	\$2,000
Nutrient management (590) ^c				
Specialty crops	\$10/3	\$10/3	\$2,000	\$2,000
Field crops	\$4/3	\$4/3	\$2,000	\$2,000
Waste storage (313) ^d	75%	75%	\$75,000	\$75,000
Agrichemical containment (702) ^d	75%	75%	\$20,000	\$20,000

^a Name of the practice followed by its NRCS code. Technical specifications are documented in the NRCS Field Office Technical Guide (Natural Resources Conservation Service 2003a).

^b Limits set as maximum annual payments for land management practices or as a maximum payment for structural improvement practices.

^c Land management category, financial incentives paid on a per acre basis covering the farmland where the practice is applied/maximum number of years available for payments. Vegetable crops include potato; fruit and nursery crops include Christmas trees. Specialty crops are high-value crops benefiting from tissue analyses and special nutrient application methods.

^d Structural improvement category, financial incentives paid on a percentage of cost of the improvement, maximum number of years not applicable. Both examples are facilities.

The NRCS has identified conservation practices with technical specifications to address these resource concerns (Natural Resources Conservation Service 2003a). Two broad categories of NRCS-designed conservation practices occur in the EQIP practice lists of states, although the distinction is not clearly delineated in program rules (Natural Resources Conservation Service 2003b). Structural improvement practices involve installing a permanent structure, and the financial incentive is paid on a percentage of cost (cost-share) of the structure. Land management practices involve implementing techniques, including the NRCS-designed pest management practice, and are typically linked to financial incentives paid on a per acre rate covering the farmland where the practice is applied. State conservationists set incentive rates and any payment limits, by using input from an advisory process (Natural Resources Conservation Service 2003b) (Table 2 provides a partial list from Michigan).

The pest management practice requires resource assessment and mitigation of the resource concern(s) the practice is assigned to address (Natural Resources Conservation Service 2003a). If pesticide risk is the basis of the resource concern, resource assessment and mitigation planning can be achieved, in part, by use of the computer software Windows Pesticide Screening Tool (WIN-PST), an NRCS pesticide environmental risk evaluation tool. Use of this tool is required in some states if growers propose use of the pest management practice (Natural Resources Conservation Service 2003a). The mitigation requirement can be fulfilled by adopting reduced-risk pesticides and other IPM techniques to replace pesticides with

potential to negatively affect environmental quality (referred to as high-risk pesticides through the remainder of this presentation). Also, use of economic thresholds and forecasting models may aid in mitigation through judicious and reduced use of pesticides. The broad description of the NRCS pest management practice allows considerable flexibility in meeting the mitigation requirement (Natural Resources Conservation Service 2003a).

From a grower applicant perspective, the endpoint of this process is seen in Michigan as a ranking sheet, conservation worksheets, an incentives rate schedule, and a site-specific plan to use NRCS-designed practices to address resource concerns. Other states have application procedures with substantially similar components (Natural Resources Conservation Service 2003b). The ranking sheet provides specific guidance on which resource concerns are priorities and relative ranking information among resources (Table 1). The conservation worksheets describe the resource issues and the NRCS-designed conservation practices that can be used to address the resource concern(s) (Natural Resources Conservation Service 2003b; Table 1 provides applicability for the NRCS pest management practice to address resource concerns in Michigan). These documents can be used to estimate an application's ranking in the selection process, which is very important when funds requested exceed program funds available (see Table 1 footnote; in 2003 only a portion of applications classified as high priority were approved in Michigan [M. J. Brewer, personal observation]). The incentives rate schedule lists the payment rates and limits for the conservation practices and can be used to estimate funds to be allocated to a successful application (Natural Resources Conservation Service 2003b). We provide the Michigan incentive rates for the pest management practice and for comparison one other land management practice and two structural improvement practices (Table 2). Last, a site-specific plan to implement NRCS-designed practices to address resource concerns is developed. Program direction is functionally developed through setting resource concern priorities, selecting practices to address resource concerns, and establishing financial incentive rates for conservation practices.

Grower Recognition and Fund Distribution of the EQIP. Current program recognition by specialty crop growers with particular interest in pest management, program fund allocations to the NRCS pest management practice, and an indicator of grower success in applying to the program were analyzed to assess the current status of the EQIP in addressing conservation concerns related to use of high-risk pesticides. We note that in review of the technical standards for other NRCS practices, the field border practice states as one purpose the encouragement of beneficial organisms to control pests. Two other practices (cover crop and invasive species control) state weed management as a purpose (Natural Resources Conservation Service 2003a). Also, the agricultural containment facility structural improvement practice contributes to prevention of point-source pollution of pesticides and

Table 3. Results of vegetable and fruit grower surveys conducted in fall 2003 and winter 2004 to assess awareness of the Farm Bill conservation programs and their use in implementing IPM, taken before (before survey) and after (after survey) an educational effort to increase awareness of the EQIP and its use to support implementation of IPM

Question	Before survey: % positive responses (total responding) ^a	After survey: % positive response (total responding) ^b
Are you aware of EQIP?	44% (52)	62% (101)
Are you aware of incentives for growers to use IPM in the 2002 Farm Bill?	25% (52)	74% (101)

Responses taken from a one-page survey made available to Michigan vegetable and fruit growers through newsletters and educational meetings. The survey audience focused on growers participating in grower organizations and utilizing Michigan State University services (Michigan State University IPM Program 2003a). The χ^2 test of equality (Freund and Walpole 1980) was used to test equality of the proportion of growers responding affirmatively to the two questions, tests conducted separately for the two surveys.

^a More growers were aware of EQIP than were aware of incentives to use IPM ($P < 0.05$, $df = 1$, $\chi^2 = 4.25$).

^b More growers were aware of incentives to use IPM than were generally aware of EQIP ($P < 0.05$, $df = 1$, $\chi^2 = 4.08$).

other agrichemicals (Natural Resources Conservation Service 2003a). Because of the specific intent of the pest management practice for plant pest management and the identification of nonpoint source pollution as an NRCS national resource priority (Natural Resources Conservation Service 2003b), the focus here is on the pest management practice.

A survey of fruit and vegetable crop growers in western Michigan was conducted to assess grower knowledge of the EQIP, and its use in aiding implementation of IPM techniques. Surveys were conducted before and after an educational effort designed to increase grower knowledge of this opportunity (Michigan State University IPM Program 2003b). Before the education effort, there was lower awareness of the availability of the EQIP financial incentives to aid the adoption of IPM techniques than awareness of the EQIP generally. The education effort seemed to significantly increase awareness of using the EQIP for this purpose, with more growers specifically aware of incentives to use IPM than were broadly aware of the EQIP (Table 3).

The EQIP fund distribution to growers from 1997 to 2002 during the last Farm Bill cycle totaled \approx \$1.05 billion with \approx 1.02% of the funds supporting the NRCS pest management practice. Each state received a fund allocation and made allocations to address their resource concerns (Table 1) through providing financial incentives to growers to implement NRCS-designed practices, including pest management (Table 4). The average percent allocation of the EQIP funds to the pest management practice among states was $0.77 \pm 0.009\%$ (mean \pm SD). Significant variation in fund allocation to the pest management practice was detected among states ($\chi^2 > 1000$, $df = 99$, $P < 0.0001$, χ^2 test of equality; Freund and Walpole 1980). Delaware allocated the highest portion of funds to the pest management practice during this period (3.52%), and 19 states allocated $<0.2\%$ of funds to the pest management practice (Table 4) (raw data for statistics provided by E. Brzostek, personal communication). For the new Farm Bill cycle starting in 2003, comprehensive national statistics were not available, but Michigan data were provided to the State Technical Advisory Committee (M. J. Brewer, personal observation). For Michigan in 2003, the NRCS pest management practice in approved grower contracts rep-

resented 1.1% (\approx \$110,000) of the state's EQIP budget in 2003, roughly the same percentage for Michigan in 2002 (1.02%, \approx \$70,000), and somewhat less than the percentage during the last Farm Bill cycle (1.3%, \approx \$311,000 over a 6-yr period).

It was not possible to directly evaluate grower success in applying to the EQIP because individual grower application data are confidential. As an indicator measure, we used information on the total number of contracts approved in 2002 and 2003, aggregated across two agricultural interest areas, as provided to the State Technical Advisory Committee of Michigan (M. J. Brewer, personal observation). In 2002, there were 46 and 21 contracts related to building animal waste storage facilities and sponsoring activities of specialty crop growers, respectively, of 181 total contracts approved with growers in Michigan. In 2003, there were 99 and 26 contracts in these two interest areas, respectively, of 211 total contracts with growers. This represented a significantly greater proportion of contracts supporting one animal-oriented NRCS practice than contracts supporting the aggregated specialty crop grower interests in both years ($\chi^2 > 19$, $df = 1$, $P < 0.005$, χ^2 test of equality; Freund and Walpole 1980). We assumed that many of the specialty crop growers used the pest management practice. This is likely a liberal assumption, based on modest grower knowledge of the availability of financial incentives from the EQIP to aid the adoption of pest management (Table 3). For reference, there were \approx 18,203 animal production and 8,734 specialty crop (combined fruit, vegetable, nursery, and cut Christmas tree and short-rotation woody crop production) producers, of a total of 53,315 farms contributing sales in Michigan in 2002. These producers generated cash receipt value of \$1.41 billion and \$1.16 billion, respectively (Kleveno and Matthews 2003, National Agricultural Statistics Service 2004).

In summarizing the current status of the EQIP in addressing resource concerns related to use of high-risk pesticides, vegetable and fruit crop grower recognition of the program was modest in western Michigan, and their recognition of its use in aiding implementation of IPM was much improved after a special educational effort. The percentage of funds allocated to the NRCS pest management practice among the states was concentrated in a low percent-

Table 4. Total Environmental Quality Incentives Program funds allocated to grower contracts and portion used to implement the NRCS pest management practice, 1997–2002, by state

State	Budget (funds allocated)	Pest management (% total budget)
Alabama	\$19,969,429	0.105
Alaska	\$2,184,719	0.00
Arizona	\$29,909,909	0.045
Arkansas	\$26,000,075	0.19
California	\$43,778,710	0.57
Colorado	\$42,330,918	0.59
Connecticut	\$3,668,857	0.00
Delaware	\$5,232,996	3.52
Florida	\$26,680,669	1.25
Georgia	\$22,283,256	2.12
Hawaii	\$3,719,691	0.33
Idaho	\$18,312,671	0.008
Illinois	\$21,660,319	0.4
Indiana	\$15,320,335	2.80
Iowa	\$25,835,612	2.19
Kansas	\$31,602,242	1.30
Kentucky	\$16,842,061	0.023
Louisiana	\$20,457,311	1.66
Maine	\$11,416,535	2.32
Maryland	\$10,647,824	2.26
Massachusetts	\$4,346,547	0.98
Michigan	\$23,927,578	1.30
Minnesota	\$31,414,369	0.80
Mississippi	\$26,318,980	0.027
Missouri	\$27,433,988	3.20
Montana	\$35,301,960	0.12
Nebraska	\$31,878,260	0.60
Nevada	\$7,047,293	0.75
New Hampshire	\$3,218,143	0.59
New Jersey	\$5,050,653	0.25
New Mexico	\$30,883,345	0.008
New York	\$21,355,299	0.30
North Carolina	\$24,828,564	1.62
North Dakota	\$22,886,364	0.30
Ohio	\$17,576,444	1.63
Oklahoma	\$27,475,630	1.20
Oregon	\$22,430,104	0.18
Pennsylvania	\$19,100,837	0.04
Rhode Island	\$1,838,049	0.009
South Carolina	\$12,838,601	0.18
South Dakota	\$26,058,690	0.01
Tennessee	\$16,527,511	0.00
Texas	\$86,696,121	0.39
Utah	\$24,234,616	0.02
Vermont	\$6,964,215	0.59
Virginia	\$16,606,675	0.09
Washington	\$22,247,818	1.08
West Virginia	\$9,872,972	0.11
Wisconsin	\$23,143,329	0.31
Wyoming	\$21,870,042	0.00
Total	\$1,049,227,136	Ave ^a
		0.77 ± 0.009%

Information provided by E. Brzostek (USDA NRCS).

^a State average (mean ± SD, n = 50).

age range and skewed toward minimal allocation levels (from <0.2% for 19 states to 3.5% for one state). Related, the number of specialty crop growers in Michigan successfully participating in the program was low compared with animal producers.

Mechanism of Program Modification. Overall national guidance of resource priorities, conservation practices, and incentive payment structure are provided (United States Congress 2002a; Natural Resources Conservation Service 2003a, b, c), but there is considerable opportunity to adjust priorities, prac-

tices, and incentive rates to address critical local resource concerns as effectively as possible. Local adaptation is based on recommendations from an NRCS advisory process (i.e., the State Technical Committee, affiliated subgroups, and local working groups), composed of public and private sector environmental and agricultural participants who report to State Conservationists. State Conservationists verify concordance with national guidance and finalize the selection procedures and incentive rate schedule for the regions under their care (Natural Resource Conservation Service 2003a, b, c).

In planning for the 2004 program year for EQIP, we participated in the NRCS advisory process in Michigan. Based on analyses of grower recognition, fund allocations, and current program guidelines of the EQIP, proposals to modify the ranking sheet, conservation worksheets, and incentive rate schedule were presented to the EQIP subgroup. Three recommendations from the subgroup were forwarded to the State Technical Committee, and one proposal was tabled for consideration for the next program year. Two recommendations were adopted by the state conservationist that were designed to enable growers interested in addressing resource concerns related to pest management to receive higher prioritization of their applications. Descriptive language of the air quality resource concern was adjusted to allow use of the NRCS pest management practice to address pesticide drift potential as an air quality concern. Description of the integrated conservation crop management resource concern was adjusted from erosion management on cropland to also include soil quality management. Pest and nutrient management practices were added to address this expanded resource concern. From an application selection standpoint, conservation worksheets were modified to allow the pest management practice to address four resource concerns in 2003 compared with two in 2002 (Table 1). The second proposal adopted was establishment of an invasive species resource concern to address damage from selected non-native plants, although it is limited to use in pastures and forests (Table 1).

The remaining two proposals involved modification of the incentive rate schedule for the pest management practice to better encourage grower implementation of IPM. The acre rate payment (vegetable crop category) and the maximum yearly payment (vegetable and field crops categories) of the pest management practice were adjusted upward for 2004, although the maximum yearly payment for the fruit and nursery category was decreased (Table 2). A proposal to create additional subcategories for each cropping system category was not adopted. Specific IPM subcategories discussed in the EQIP subgroup were conversion to reduced-risk pesticides, conversion to reduced-risk application methods, use of forecasting tools and economic thresholds, biologically based management methods such as mating disruption and release of beneficial organisms for pest control, and cultural management methods such as use of pest-resistant plants (Pedigo 1999, chapters 8–15; Norris et

al. 2003, chapters 8 and 9). Although NRCS does not delineate specific methodology for implementing the pest management practice, the current pest management incentive structure was based on offsetting costs of pest monitoring services (Table 2), similar to support of pest monitoring as a common use of the pest management practice during the last Farm Bill and the previous Special Practice 53, Integrated Crop Management (SP53 ICM) program (Bechinski 1994). The proposal for subcategories was designed to provide financial assistance for implementing desirable IPM techniques to reduce resource damage, as required by the NRCS pest management practice and as intended in the 2002 Farm Bill (Natural Resources Conservation Service 2003a, United States Congress 2002a). Incentives for specific techniques within NRCS practices are allowable (Natural Resources Conservation Service 2003b) and for the pest management practice may increase the adoption and diversity of IPM techniques on the farm (Council for Agricultural Science and Technology 2003, chapter 14).

Some incentives for specific IPM techniques have been adopted in selected localities in California and Washington state (Natural Resource Conservation Service 2003b). The current NRCS pest management practice is broadly written, which provides flexibility, but also challenges as presented here. As currently used in the Michigan EQIP, a grower can propose using any number of IPM techniques to mitigate the identified resource concern(s). But the incentive rate varies only by commodity grown, and not by the cost and number of techniques used. Growers are allowed to use the NRCS pest management practice again on the same farmland in a new EQIP application, if another IPM technique is used to address remaining resource concerns. Again, the same incentive rate is provided (M. J. Brewer, personal observation). We recommend establishing an array of financial incentive subcategories for the NRCS pest management practice offered in the EQIP to encourage grower adoption of recognized IPM techniques that vary in cost and potential environmental benefit. Techniques to achieve acceptable pest control while protecting natural resources include use of biologically based controls, cultural controls, reduced-risk pesticides, reduced-risk pesticide application methods, and judicious use of pesticides through pest monitoring and applying economic thresholds and forecasting models to pest management decision-making (Council for Agricultural Science and Technology 2003, chapter 2; Pedigo, chapters 8–15).

An applicant addresses resource concerns through selection of NRCS-designed practices, including pest management if it can alleviate the resource concern(s) identified (Table 1); therefore, shifting financial resources to pest management from practices that address other priority resource concerns is of little concern. In using an incentive structure to advance environmental stewardship, appropriate incentive payment rates need to be established so that the practice is attractive to growers (Batie and Ervin 1999) and desirable techniques can be used. Our recommenda-

tion is designed to provide growers pest management options, with appropriate incentives, within the NRCS structure to address as many as four resource concerns in Michigan (Table 1). If adopted, the allocation to pest management may increase in the future, because of its increased usefulness in addressing multiple resource concerns priorities (Table 1) and its attractiveness to growers as a resource conservation and farm management tool. The broadly written pest management practice would benefit from national guidance on this issue.

Concluding Remarks. The NRCS national resource priority of reducing nonpoint source pollutants justifies use of USDA conservation programs to help growers transition from high-risk pesticide use to reduced-risk pesticides and alternatives to pesticides. The EQIP has been provided legislative encouragement to encourage grower transition to IPM, which would be particularly appropriate for IPM techniques that have significant implementation barriers but modest recurring costs compared with the techniques being replaced. If budgetary and geographic constraints of the new Conservation Security Program are remedied, this program may play a significant role in providing continuing assistance to growers using advanced IPM techniques that provide increasing environmental benefit but have recurring higher costs. Currently, the case is strong for using public-supported financial incentives offered by the EQIP to encourage growers to demonstrate the value of IPM techniques new to their farm as a means to address resource concerns.

The EQIP structure and NRCS advisory process provided both opportunities and challenges to use the EQIP as a means to increase IPM adoption. Full participation in the Michigan program advisory process was critical in having several proposals adopted that were designed to increase program usefulness for growers interested in IPM as a tool in addressing pesticide concerns linked to NRCS resource priorities. The selection process was modified to recognize pest management as a tool to address air quality and soil quality concerns. The incentive rate schedule for the pest management practice was modified but needs further improvement to encourage adoption of appropriate IPM techniques that are variable in cost and environmental benefit. These issues are likely relevant in other states as judged by low allocations to the NRCS pest management practice in most U.S. states and the similar structure of the EQIP application process (Natural Resources Conservation Service 2003b). Current use of the EQIP to encourage growers to demonstrate the value of IPM techniques is modest to meager.

Farmers enhance environmental quality as well as worker and consumer safety when they mitigate negative effects of pesticide use by adopting reduced-risk IPM techniques, including biologically based controls, cultural controls, reduced-risk pesticides, reduced-risk pesticide application methods, and judicious use of pesticides through pest monitoring and applying economic thresholds and forecasting models. Because these tactics benefit the public good, public-supported

financial incentives to aid grower adoption of these techniques are warranted. In our current regulatory and global marketing environment, these financial incentives are a needed complement to the education and regulation-based incentives well known to the grower community. With appropriate program adjustments and increased grower awareness, USDA NRCS conservation programs, and the EQIP in particular, can be an important mechanism to expand use of IPM as a resource conservation and farm management tool by providing these public-supported financial incentives.

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