Integrated Pest Management Systems: Back to Basics to Overcome Adoption Obstacles

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ABSTRACT Adoption of Integrated Pest Management (IPM) practices into agricultural programs and the constraints affecting adoption are topics that have been addressed since the mid-1970s when the implementation of agricultural IPM programs began. Adoption has never occurred at the levels hoped for and the constraints slowing this process have been well reviewed by many authors. The purpose of this work is to highlight the primary obstacles to IPM adoption and discuss solutions that could bring about positive change. As the title implies, these solutions are not new, but basic to implementation of any innovative system or change. With a new focus on these basic solutions, it is hoped that those involved with IPM may be reminded of their importance and reemphasize them in the planning, development, and implementation phases of programs.

KEY WORDS Integrated Pest Management, IPM, adoption, constraints, solutions

The Problem

The rate and degree of adoption of Integrated Pest Management (IPM) systems by intended users continues to be a frustration for those associated with the development and implementation processes. Slow or poor adoption rates are eroding further with many farmers backsliding and reverting to previous non-IPM practices, a process of gradual decay besetting many innovative programs that Whalon and Croft (1984) termed “implementation entropy.” Evidence for slow adoption can be found throughout the U.S. and affects many commodities, e.g., apples in New York (Whalon and Croft 1984), cotton in Texas (Stoner et al. 1986), peanuts in Georgia (Musser et al. 1986). The purpose of this paper is to highlight the primary obstacles to IPM adoption and discuss solutions that could bring about positive change.

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The Obstacles

Technical, financial, social-marketing, educational. Many constraints hamper or prevent adoption of IPM practices. Wearing (1988) surveyed more than 150 research and extension specialists in four countries. He used this survey to classify constraints into four general categories, technical, financial, social-marketing, and educational. Wearing (1988) found the most important technical constraints to be lack of simple pest monitoring devices and methods, lack of applicable economic thresholds, lack of selective or IPM-compatible pesticides, and the existence of cosmetic quality standards which result in downgrading the value of the crop produced for small amounts of pest damage.

Major financial constraints listed were lack of short-term profit for IPM users, increased labor costs, low cost of chemical control, and shortage (or lack) of extension-funds for sustaining implementation processes (Wearing 1988). Constraints in the social-marketing category included the general resistance to change, lack of grower confidence in IPM alternatives, and grower satisfaction with existing chemical control. Wearing (1988) further explained that satisfaction with chemical control was enhanced by the high ratio and accessibility of chemical sales personnel in relation to extension personnel, the advanced marketing skills of chemical companies, and growers' experience, confidence, and satisfaction with chemical pesticides.

Educational constraints, also referred to as organizational constraints (McNamara et al. 1991), have been found in all phases of IPM programming, from development through adoption. They include lack of interdisciplinary collaboration within agricultural-related disciplines during the development phase, lack of planning for the implementation phase, a shortage of scouting services-personnel, and a shortage of trained on-site extension personnel for implementation and maintenance phases (Wearing 1988).

Complexity. Complexity also has been presented by several IPM specialists as a major constraint to adoption of IPM (Lambur et al. 1985, Stoner et al. 1986, Wearing 1988, McNamara et al. 1991). McNamara et al. (1991) stated the following in their definition of IPM, "IPM is a systematic approach to crop protection using increased information to make better pest management decisions." Their discussion implies that the complexity inherent in this information-based system may be both the most important strength as well as weakness of the IPM paradigm. Although integration of complex information allows development of holistic and more sustainable pest management programs, the difficulty of integrating this information impedes progress at several levels. The development process of IPM is slow, however ambitious the scientists involved, because of the complexity of agroecosystems and the almost unlimited number of possible interactions (Lambur et al. 1985).

In addition to biological complexity, successful IPM programs also must encompass a comprehensive view of the entire production system, including the technological, commercial, social, political, and economic aspects (Stoner et al. 1986). Complexity also impacts adoption because the end user is often required to process large amounts of information. Although many computer
programs have been developed to aid in this decision-making process (e.g., Herbert et al. 1987), programs often incorporate such large quantities of complex and diverse information that their operation can be difficult and time-consuming for the user.

**Perceived risk and lack of trust.** Perceived risk and lack of trust also are cited as major constraints to IPM adoption. A shift to IPM represents adoption of new technology whose association with risk is a natural response. In summarizing literature concerning adoption of IPM technology, Musser et al. (1986) and McNamara et al. (1991) conclude that growers perceive information that is different from original beliefs as having risk. For example, Wearing (1988) states that risk associated with implementing the IPM scout-treat-as-needed alternative, rather than using conventional treatments and spray schedules, constituted a major obstacle to IPM in all regions surveyed. Many growers view pesticide treatments as “insurance” against the risk of loss (Stoner et al. 1986). Changing attitudes of growers has proven difficult even when pesticide treatments have not resulted in economic gains.

**Lack of convincing information.** Another constraint to IPM adoption is the lack of convincing information that IPM works (Musser et al. 1986, Wearing 1988, McNamara et al. 1991). Growers’ doubt and perceived risk associated with changing to a new technology must be overcome by providing access to information through a number of media that presents clear, accurate, and convincing data demonstrating advantages over the standard practice. McNamara et al. (1991) concluded that this lack of convincing information constituted a major constraint, especially regarding the information required to integrate IPM into current management practices.

**Lack of incentives.** Finally, lack of incentives to use IPM has been identified as an important constraint to IPM adoption. Poor or poorly defined incentives affect both development and implementation of IPM practices. Incentives for development of IPM programs by industry have been hampered. To ensure adequate investment return, the product or practice must be patentable, marketable, and registrable, i.e., with the United States Environmental Protection Agency. These conditions do not fit most multifaceted IPM approaches to pest management. Incentives for adoption of IPM also are lacking and difficult to develop, for they must compete with the entrenched experience with pesticides that are easy to use, provide highly visible results, and achieve high and predictable levels of pest control.

**New “Old” Strategies to Improve Adoption of IPM**

**Fit, collaboration, funding and “good old-fashioned extension.”** Many authors have put forth suggestions for improving or maintaining current levels of IPM adoption. Wearing (1988) specifies four key principles of successful adoption of IPM, fit, collaboration, funding, and “good old-fashioned extension.” For adoption of innovative IPM practices to proceed, they must fit the intended users. In addition, analysis and improvement of the user-fit must begin early in the research and development stages. Programs of IPM must first, and perhaps foremost, satisfy a need by offering
a clear advantage to the standard or old practice. Programs must fit the perceptions, resources, and constraints of intended users. Programs must be modified to satisfy a multitude of local conditions including growers' requirements, such as equipment, irrigation constraints, and/or rotation practices, as well as local climate, marketing strategies, financial and political climates, and labor constraints.

A high level of collaboration and cooperation among all groups affected by IPM programs is critical to successful implementation. The chances for success increase when cooperative teams are comprised of representatives from funding agencies, administration, research, extension, and the intended user group. It is especially important to encourage involvement with, and continual feedback from the intended users.

Funding, a key to any program, must be available for the development, implementation, and maintenance of IPM programs. Wearing (1988) specifies that distinct financing for implementation has been a severe shortcoming for IPM programs. Lack of funds for extension personnel and programs has been a traditional problem that continues to decline as states reduce funding for research and extension.

The importance of what was termed "good old-fashioned extension" was emphasized by Wearing (1988) as necessary for successful implementation of IPM. Increased availability of trained extension specialists was viewed as one of the most critical ways to improve IPM adoption. Although expensive, one-on-one verbal exchange with support from other methods is most influential in gaining and nurturing the confidence of users while providing the continued support necessary for promotion of new IPM programs. Maintaining this level of contact requires research and development to take place on the user's site. Knowledgeable support personnel should be continually accessible to users to whatever extent is feasible.

**Emphasize incentives and improve communication of information.** Another important attribute for successful promotion of IPM programs is the presentation of clear incentives. McNamara et al. (1991) stated that psychological learning theory espouses that beliefs underlie attitudes and attitudes motivate response. Correct information that is different from original beliefs must be provided in a way that stresses incentives for change. To adopt a new activity, an intended user must be sufficiently convinced of its value and the rate of adoption is increased by the perceived advantage over the old method (Musser et al. 1986). In the case of IPM programs, producers choose not to adopt because they lack access to and/or trust in IPM information. In general, IPM users hold more positive beliefs concerning IPM than non-users, but even they need continued reinforcement. Therefore, just as adoption and continuance of IPM are constrained by lack of accurate information, educational theory also holds that educational programs tailored to address IPM can have a positive effect on adoption.

Educational programs for IPM must emphasize incentives. McNamara et al. (1991) and Musser et al. (1986) suggest that concerns for health and the environmental impact of pesticide use had little importance in influencing the adopting process, but incentives associated with increased yield and ultimately profit did have a strong impact. More information must be
developed and presented through a number of media that clearly states the profit incentives associated with adoption of IPM. Additional information is needed for intended users on the cause-and-effect relationships of pest-related damage and suggested economic thresholds (Harper et al. 1990).

**Characterize and target intended user groups.** In addition to improving IPM information with an emphasis on incentives, educational programs should be tailored to target specific intended user groups, such as those involved in agricultural activities. Some studies suggest that growers, for example, may adopt IPM practices for one particular crop and not another, depending on many factors (McNamara et al. 1991). A general approach using materials containing information on IPM principles may not provide the impetus to change. Policies to expand educational programs to non-traditional audiences and those not reached by traditional extension programs must be developed. Non-traditional audiences, such as part-time farmers that may not normally attend extension functions, could benefit if reached. Educational programs targeting urban groups, homeowners, and other non-farming groups also could improve IPM adoption. Such programs would increase the awareness of the positive aspects of IPM, such as benefits to the environments and thereby help generate a more supportive social and economical environment.

If IPM adoption is to increase through restructuring of educational programs to reach a broader range of clientele, the first step will be to characterize different groups in terms of beliefs and attributes (Kovach and Tette 1988). For example, assessing beliefs concerning IPM is helpful in identifying the incorrect beliefs of non-users that may be changed with specific information. Characterization of the factors associated with adoption of IPM also is helpful. McNamara et al. (1991) grouped and ranked the attributes of peanut farmers as to their importance in influencing IPM adoption. They included the three general categories of producer characteristics, differences in management practices, and differences in farm structure. Producer characteristics included age, which has been positively correlated to adoption (Napit et al. 1988), level of education, which has been shown to have both a positive correlation (e.g., increased cognitive skills linked to increased adoption) and a negative correlation (e.g., more educated growers felt they could get a better return on their time doing other things, Harper et al. 1990), level of farm experience, and total family income.

Differences in management practices also influenced adoption. For example, farm operators who participate in other innovative activities, such as forward contracting (Napit et al. 1988), federal crop programs, and new varieties (e.g., rice farmers using new semidwarf varieties in Texas, Harper et al. 1990), are more likely to adopt IPM practices. Contacts with extension, attendance at field days, reading farm literature, and the practice of IPM on other crops also are positively correlated with adoption (Harper et al. 1990).

Several farm structure components, including total area farmed and the percent of total area in the crop in question, also are related to IPM adoption (McNamara et al. 1991). Time available for IPM, which implies willingness or ability to participate, is an important factor. For example, splitting effort with off-farm enterprises was negatively correlated with adoption. In
addition, number and extent of animal enterprises or other high management input crops also conflicted with adoption because increased demand for managerial time leaves less time for participation in IPM efforts. Crop value also influences adoption. Adoption of IPM occurs more readily on high value crops, or even in the same crop where yields are higher because of differences in soil type or rainfall patterns, such as rice farmers in Texas (Harper et al. 1990) and soybean farmers in Virginia (Herbert, unpublished data).

A general summary of IPM participant characteristics was provided by Napit et al. (1988). A typical IPM-user is white, male, with at least some college education, has frequent contact with extension agents, has higher than average gross farm income, and a higher than average percent of total income from farming.

Dispelling the risk myth. As discussed above, perceived risk and lack of trust are major constraints to IPM adoption. Risk is associated with change, especially in the fiscally conservative farming socioeconomic environment. Tradition is strong in farming and the attitude prevails that what has worked in the past is good for the present. As discussed above, typical IPM-users generally have larger farms, higher gross incomes, a higher percentage of total income from farming, and are more likely to participate in other innovations. It also has been suggested (Napit et al. 1988, Szmedra et al. 1990) that these growers could view IPM as risky, but adopt practices anyway because their larger operations make them more resistant to, or capable of taking risk.

The risk associated with IPM is "perceived" rather than "real" for the most part, and in reality practicing IPM strategies can reduce risk. Napit et al. (1988) cite a significant correlation between risk reduction and use of IPM. Budgeting analyses indicated that IPM increased respondents revenues per hectare in most states. Long-term increases in profits reduced uncertainty about the potential for pest damage and, thus, reduced the need for pesticide applications as insurance against loss. In addition, IPM significantly decreased the variability of revenues per hectare, and in the final analysis, growers who used IPM practices had more profitable, less risk-prone farming operations. Logic follows that action based on determining and using economic thresholds will almost guarantee three results. No crop loss to the pest in question will occur because treatments will be applied if populations reach critical levels. No money will be spent unnecessarily because no pesticide applications will be made unless yield is threatened. Thus, net profit will be higher and less variable from field-to-field and from year-to-year.

Role of Extension. One of the most effective components in the IPM adoption process is the Cooperative Extension Service, and many authors have referred to the importance of extension in implementation (Stoner et al. 1987, Wearing 1988, Harper et al. 1991, McNamara et al. 1991). The positive influence that extension had on IPM adoption by Georgia peanut growers was elucidated by McNamara (1991). Educational extension programs that informed producers of the merits of IPM and how to incorporate IPM into current management practices increased adoption. The extension component
had one of the largest associated changes in probability of adoption, 0.184, compared with education, 0.092, or user age, 0.011 (McNamara et al. 1991). Mass media was effective in promoting knowledge and changing attitudes (Stoner et al. 1986), but the inter-personal contact (espoused as one-on-one verbal exchange, Wearing 1988) offered through extension programs was considered necessary for successful adoption of IPM practices. Attendance at extension field days with educational programs on the expected benefits of IPM also was ranked as important (Harper et al. 1990). The shortage of personnel and reduced funding that besets many state extension programs must be addressed if IPM is to continue benefiting from the positive influence of extension.

**Maintaining funding.** Just as funding has been identified as a constraint to IPM adoption, it is a component that can provide stability and growth. Because incentives (as discussed) are generally lacking for industry development and marketing of IPM programs, funding must fall to public and political interests. Interest in IPM must be maintained in the private sector and political arenas where funding decisions are made by presenting educational programs that stress socioeconomical and environmental benefits. Although funding has traditionally been more available for development of IPM programs, funds must be encumbered from the outset to finance not only implementation, but adoption and continued maintenance as well. Funds for existing programs that deliver results must be maintained along with funding for new programs as they evolve.

**Summary**

Adoption of IPM has never occurred at the levels hoped for, and the constraints that slow this process have been well reviewed. The purpose of this work was to highlight the primary obstacles to IPM adoption and discuss solutions that could bring about positive change. As the title implies, these solutions are not new, but basic to implementation of any innovative system or change.

Teams consisting of members from all levels and functions, users to administrators, should be organized and maintained from development through adoption. Programs must offer advantages to old methods and fit within identified constraints. Incentives for adoption of IPM should be well presented. Educational programs must be expanded to target non-traditional groups and the agencies responsible for funding. Funding for the entire process should be encumbered from the outset. The importance of personal contact between implementors and users, or potential users, must be realized and supported. Funding and training for adequate personnel must be maintained if implementation and personal contacts are to remain in the purview of extension. Whether responsibility for IPM programs falls to extension or the private sector, users must take an active role in the decision-making process. Without this involvement, users could lose touch with the problems and the outcome of recommended actions, and lose appreciation for the IPM technology.
References Cited


