

The Role of Integrated Pest Management in Sustainable Agricultural Systems

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Low input, sustainable (LISA) or alternative agricultural systems are characterized by proponents as a system which maximizes the internal resources of the farm, eliminates or at least minimizes environmental impacts and increases profits by reducing purchased inputs (Hodges, 1982; Harwood, 1985; Francis et al., 1986, Madden, 1987; Francis and King, 1988). Lockeretz (1988) adds that "the term [sustainable agriculture] particularly emphasizes avoidance of synthetic pesticides". Thus a major emphasis in sustainable systems is the reduction of pesticide use to the lowest amount possible and total elimination where practical.

Achieving this goal will be a difficult and complex task requiring creative pest management thinking. The success of pest management in LISA systems will depend upon modifying known integrated pest management (IPM) practices to function in this new arena. This appears to be an achievable task because sustainable and conventional agricultural systems are governed by the same fundamental practices and mechanisms and IPM programs have successfully implemented pesticide reducing programs on conventional farms for over 20 years.

The National Academy of Sciences report on alternative agriculture (Pesek et al. 1989) described 11 case studies of alternative agriculture farms. In several of the studies the "alternative agriculture" part of the farm was the adoption of IPM practices. In these cases the crop production practices could be considered "conventional." Thus the most comprehensive study of alternative agriculture to date relies heavily on IPM.

How will the marriage of IPM and LISA work? Since there appears to be little LISA experience in the south, one can only guess at to where IPM will fit. It seems that IPM can support and contribute to sustainable agriculture both philosophically and functionally. However, there are fundamental differences which must be resolved. It may be best to first look at the common ground of IPM and LISA then examine where differences exist.

Philosophical Support for Sustainable Agriculture.

IPM has had a traditional "low input" approach. Rabb (1972) defined pest management as the "intelligent selection and use of pest control actions that will ensure favorable economic, ecological, and sociological consequences". Thus from the beginning of what may be called the "IPM era" the judicious use of pesticides was emphasized. This is underlined in the economic threshold concept whereas pesticides are not applied unless pest levels are high enough to potentially reduce profits. Economic thresholds ensure that there is a sound economic foundation for the use of pesticides.

From this stated philosophy of economics, IPM programs have reduced costs yet preserved crop quality and yield. For example, in North Carolina studies in corn, soybean and peanut indicated that pesticide savings of 17 - 29% were possible with IPM programs (Weathers 1979). Thus IPM programs can provide the practical programs to reduce pesticide inputs.

IPM founded on systems approach. The National Academy of Sciences report on alternative agriculture (Pesek et al. 1989) admonished agricultural scientists to increase interdisciplinary research and extension programs and to develop a systems approach to crop and pest management. IPM practitioners have observed the futility of attempting to control pests without an agroecosystem perspective. Pest problems are influenced by previous crops, current crops grown nearby and regionally, past and present pesticide use, crop phenology and myriad other factors. To manage pests, as opposed to controlling them, a systems approach is necessary.

Stimac and Barfield (1979) describe a systems approach as "actions are taken to dominate or direct the system toward achievement of a particular state of behavior by incorporation of or preservation of homeostatic regulatory mechanisms". This approach requires that all crop management practices be carefully evaluated with respect to its impact on the system and utilized, modified or rejected based upon its influence upon the entire system.

This well founded philosophy of pest management coincides and supports the stated objectives of

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sustainable agriculture. Sustainable systems are not conventional systems with certain inputs withheld but are systems within which changes are made which make certain inputs unnecessary. This is possible through the approach advocated by Stimac and Barfield wherein actions are taken to stabilize the system and make pesticide use unnecessary.

IPM recognizes the importance of protecting the environment. In the preface to the proceedings of a pest management conference, Rabb and Guthrie (1970) stated that "the chemical weapon alone is not tenable. The application of pesticides to large acreage with little or no regard for deleterious side effects can no longer be ignored". This goal has guided the development of pest management programs in North Carolina for 20 years. Consideration for off-site effects, non-target organisms, pesticide resistance, destruction of beneficial organisms, and other negative aspects of pesticide use are avoided in pest management programs to the extent possible.

IPM as a challenge to traditional economic, social and political policies. Many IPM extension demonstration programs began in the early 70's and struggled against the established concept of prophylactic treatments. The concept of treat as needed and scouting met with skepticism and in some cases, ridicule. An attitude prevailed that there was no reason to "take a chance" on economic thresholds when schedule pesticide applications allowed growers to sleep peacefully. However, IPM challenged conventional thinking and successfully demonstrated the many benefits of a systematic approach.

It appears that sustainable agriculture will have to survive the same gauntlet. And, like IPM, will be proven or disproved on the farm. Sustainable practices will have to contribute to the economic well being of the agricultural community or face rejection. Current changes to the farm bill being considered may aid in the adoption of certain sustainable practices. However, the final verdict will rest with the jury of growers. They alone will determine the outcome.

Practical Support for Sustainable Agriculture.

Proven methodology for pest management. IPM has shown the flexibility necessary to adapt to many crops and situations. LISA proponents have advanced the concept of what may be called "an experiment of one". This concept proposes that growers take an active role in customizing production systems to their farm and management style. This system will require flexible pest management programs which will allow growers to test various components and utilize tactics which prove

useful. IPM programs have developed this flexibility through the years and will be able to help growers devise an individualized plan.

IPM has an established demonstration system. Growers respond slowly to changes in production practices. For a system such as sustainable agriculture to be adopted, a vigorous demonstration system should be established to show growers first, what a sustainable practice is, and second, how the practices are implemented, and third, the potential economic impact of the practice. Extension IPM programs have had over 10 years of experience demonstrating methodology to reduce pesticide use. These programs have been encompassing and information intensive. Sustainable agriculture demonstrations can benefit from this experience.

Changes required in IPM systems.

IPM often pesticide dependent. IPM programs have not stated as a goal the elimination of pesticides. It was the legislative intent of Congress in funding the extension IPM system that IPM be a mechanism for reducing pesticide use but not necessarily eliminate use. IPM systems have always depended upon the pesticide safety net to prevent economic loss. And there appears to be little change in the near future.

If LISA systems are a fundamental redesign of production methods then additional reductions may be possible. For example, poor rotation patterns are perhaps the single biggest contributor to institutionalizing pesticide use. If changes being considered for future farm bills encourage long rotations then additional, significant, pesticide reductions are possible.

Agronomist often not consulted when designing IPM systems. Anyone responsible for developing pest management programs realize the impact that crop management has on subsequent pest problems. Yet the designers of those systems, agronomists, are often not consulted when pest management strategies are constructed. Too often pest management recommendations conflict with agronomic recommendations leaving our clientele confused, and in some cases, angry. LISA systems emphasize the interrelationship of the crop and pest management. This emphasis will strengthen and improve pest management.

IPM dependent upon economics. IPM has provided a timely and needed service to growers in the south by showing them how to reduce pesticide use during a period of economic difficulty. However, although IPM has been an program of environmental stewardship, it

has traditionally been promoted as a way to reduce costs. This close linkage with economics has hurt the furtherance of IPM in some cases. For example, fresh market tomatoes in N. C. may have a total value of \$10,000 to \$15,000 an acre. The best IPM program for tomatoes can save the grower \$150 to \$250 an acre. A grower is highly unlikely to make many changes for a potential savings of 1.6% of the crop value. But from a food safety and environmental perspective, any pesticide reduction is worthwhile. The food safety and environmental concerns which have been the hallmark of LISA proponents will strengthen the arguments for some pest management programs.

The Role of IPM in LISA Systems,

It seems that a synergism can result from the combined expertise of IPM and LISA programs. IPM has the practical experience and proven results which can provide reliable pest management options as productions systems vary. It may be useful to look at the practical contributions IPM can make to a LISA system.

- 1) proven scouting procedures and economic thresholds for a wide array of crops and pests.
- 2) crop management considerations when designing pest management programs.
- 3) practical experience on designing and operating large scale on-farm tests and demonstrations.
- 4) an established and proven relationship of trust with a wide array of grower groups.

These characteristics of IPM will be useful to the testing and implementation of LISA principles. LISA has much to prove under southern growing conditions and there is little indication thus far as to the direction of LISA in the south. Whatever the outcome, IPM programs will be a positive contributor to the effort.

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