PEST MANAGEMENT

DESCRIPTION

Since its introduction to agriculture in the 1940's,[124] chemical pesticides have been the dominant approach to controlling and eliminating pests, resulting in more consistent crop yields as well as a reduction in labor needed to manage the crops. Pesticides include herbicides, insecticides, fungicides, rodenticides, and plant growth regulators. While pesticide use has increased, traditional pest management methods, such as crop rotation and growing a variety of crops, have been phased out. However, there is growing concern regarding the use of pesticides as they "...can cause harm to humans, animals, or the environment because they are designed to kill or otherwise adversely affect living organisms."[125]

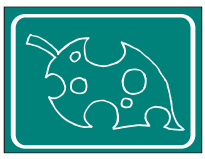
These concerns lead to an alternative approach, called Integrated Pest Management (IPM). The California Healthy Schools Act of 2000 defines IPM as "...a pest management strategy that focuses on long-term prevention or suppression of pest problems through a combination of techniques such as monitoring for pest presence and establishing treatment threshold levels, using non-chemical practices to make the habitat less conducive to pest development, improving sanitation, and employing mechanical and physical controls. Pesticides that pose the least possible hazard and are effective...are used only after careful monitoring indicates they are needed according to pre-established guidelines and treatment thresholds.[126] Elements of IPM are integrated into the Assessment Questions below.

INCENTIVES FOR CHANGE

- **Human benefits.** From a health perspective, there are diseases related to significant exposure of pesticides as well as afflictions related to minimal exposure of pesticides, but over longer periods of time. Children are especially at risk. There are "increasing amounts of data that suggest links between pesticide exposure and cancers in children"[127] as well as Parkinson's disease.[128] In addition to cancers, other suspected affects of chronic exposure, even at low levels, include damage to immune systems and the nervous system. Those working and living in close proximity to treated fields may be at significant risk, depending on factors such as the pesticide type, weather conditions during application, and frequency of application.

- **Environmental benefits.** In addition to concerns regarding the elimination of the natural predators of the pests, environmental concerns include possible contamination of ground and surface water. This could then affect human health, marine life and many other species that rely upon these water sources.

- **Cost savings.** With repeated pesticide use, the effectiveness on pests decreases. From 1945 to 1989, pesticide use in the US increased 10 times, but total crop loss from pests almost doubled from 7 to 13%.[129] The decrease in effectiveness occurs because the target pest builds up resistance and/or because competitors or predators of the target pest are also eliminated by the pesticide.[130] Moving towards IPM provides cost benefits by taking advantage of nature's own system, versus purchasing chemicals.



ASSESSMENT QUESTIONS

For all questions, please choose the categories that best identify your current management practices. Use the Summary sheet on the last page of this module to evaluate overall performance.

PEST IDENTIFICATION [131]

- ❑ 1. Farmer has not been trained to identify pests OR does not seek advice from a professional consultant when managing pests.
- ❑ 2. Farmer knows key pest species of crops and has been trained in pest identification, but does not routinely use scouting information to manage pests.
- ❑ 3. Farmer knows key pest species of crops, has been trained in pest identification, and uses this information to manage pests, OR employs certified consultant.
- ❑ 4. Farmer and consultant (if hired) understand key pest life cycle factors and exploit "weak links" for effective management. Pest identification and scouting information are always used to manage pests and beneficial organisms.

To maximize pesticide efficiency, it is best to determine what the target pest is. Once correctly identified by the farmer or a specialist, it is better to apply the pesticide specific to that pest, but only when there is evidence (through scouting) that the pest is causing problems. The best practice in terms of when to apply the pesticide includes an understanding of when the pest is most susceptible based on the optimal timeframe (day/night, weather conditions, etc.). By combining all these practices, the farmer will require less pesticide, incur lower costs, and create fewer human and environmental impacts.

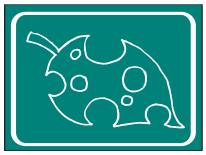
PESTICIDE SELECTION [132]

- ❑ 1. Only pesticides registered in the state as 'approved' for the target pests and affected crop are used. Pesticide mixtures prohibited by the label are not used.
- ❑ 2. In addition to #1, all pesticides at risk of pest resistance development are rotated with other pesticides of a different chemical class, starting with the first year of use. Pesticides at high risk of resistance development are used sparingly.
- ❑ 3. In addition to #2, pesticides not labeled for use on target crops are avoided. The timing of applications and selection of pesticide materials correspond to scouting records.
- ❑ 4. When a control measure is needed, efforts are made to use beneficial organisms or cultural controls. If pesticides are used, farmer uses reduced toxicity pesticides (and the minimal amount indicated to control the targeted pests) as a last resort.

When determining which pesticide to use, consideration should be given to the effectiveness of the pesticide. Factors that can decrease the effectiveness of the pesticide include: (1) built-up resistance by pests and (2) accidental elimination of benign, natural competitors or predators of the pest. To minimize the development of resistance by pest to pesticides, farmers should rotate the type of pesticide that is used and understand which types of pesticides the pest is able to more readily resist. Another concern for the farmer to be aware of is the level of toxicity with regard to human health.

TIMING OF PESTICIDE APPLICATION [133]

- ❑ 1. Pesticide application is based only on calendar date or stage of crop development.
- ❑ 2. Pesticide application is made at first sign of pests, and routinely continued following manufacturers directions.
- ❑ 3. Pesticide application is based on pest population levels determined by scouting, but treatment threshold is not used.
- ❑ 4. Pesticide applications are made only when pests reach a predetermined treatment threshold. "Weak link" of pest's life cycle is targeted for pesticide applications.



Another way to decrease the amount of pesticides used while reducing costs and achieving the same outcome is to understand how to determine when pesticides should be applied. The easiest and least efficient method is to apply pesticide annually at certain time periods. In contrast a best practice is to plan ahead of time what level of pest presence will prompt you into action. When this level is achieved, the timing of the application is aligned with when the pest is most susceptible. This practice allows for optimal pesticide efficiency, which translates into cost savings and minimal threat to humans and the environment.

WEATHER CONDITIONS [134]

- ❑ 1. Weather forecasts are not considered when planning to spray. Spraying oftens occurs in weather conditions contrary to the pesticide bottle label, such as windy days or imminent rain.
- ❑ 2. Weather forecasts are considered when planning to spray. Pesticide application is usually made during rain-free periods and at low wind speeds, if time and farm workload allow.
- ❑ 3. Weather forecasts are used to plan pesticide applications. No spraying is done when wind would move it off target. Applications are always made during label-required rain-free periods.

What happens to pesticides post-application is of great importance. There is significant concern regarding the entry of these chemicals into the water system, which can happen if there is no or minimal consideration given to the rain forecast. Wind can also carry the pesticide to non-target areas, such as the barn area or farmer's house. Inadvertent exposure to these chemicals should be avoided whenever possible. By considering the weather, pesticide application can be more concise and efficient.

RECORD KEEPING [135]

- ❑ 1. Basic pesticide records are kept, including date, field identification, target pest, pesticide name and EPA number, formulation, rate and number of acres treated.
- ❑ 2. All legal requirements for pesticide record keeping are met and include regular weekly pest scouting records.
- ❑ 3. In addition to #2, the timing of applications and the selection of pesticide materials correspond to scouting records.
- ❑ 4. Application records include reference to decisions about IPM and the materials selected are based on minimal levels of pesticide toxicity rankings. Pesticide records are tabulated annually to indicate progress in reducing overall use of high toxicity pesticides.

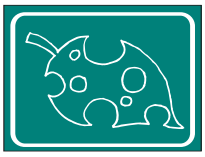
Keeping accurate and up to date records is important for regulations but also can aid in better understanding of your current pesticide management practices. Once a baseline is established, opportunities to decrease pesticide usage or increase its efficiency can be identified.

SPECIFIC MANAGEMENT PRACTICES TO CONTROL FLIES (Please check all that apply.)

- ❑ Pesticide powder/spray
- ❑ Capture flies by using fly strips
- ❑ Eliminate wet seepage areas
- ❑ Handle and store manure properly
- ❑ Maximize sanitation in and around structures
- ❑ Use biological controls (such as fly parasites)

SPECIFIC MANAGEMENT PRACTICES TO CONTROL WEEDS (Please check all that apply.)

- ❑ Conduct weed scouting, and are removed prior to their gonig to seed.
- ❑ Prepare and update weed maps twice per season
- ❑ Rank weeds in order of abundance or importance
- ❑ Plan and manage ground cover or soil quality to prevent weeds and weed seed immigration
- ❑ Manipulates weeds by rotating various crops, mechanical control, such as ascultivation and/or sterilizing weed seed beds.



One aspect of IPM is to modify the habitat so it is less conducive to pest development, improves sanitation, and employs mechanical and physical controls.[136] Such management practices for controlling flies and weeds are identified in the above questions. Some practices are less time and/or resource intensive than others and are more applicable and/or easier to implement, but they all work to minimize use of pesticides. As a farmer who switched to IPM as part of a research project commented, "You have to change with the times. That's why I got involved with the IPM project," explains Iverson. "You have to be able to adapt to survive in farming these days, whether it's portable computers or the new soft chemicals. They're here to stay."[137]

LINKAGES TO OTHER MODULES

Pest management issues are tied to nutrients, biodiversity and water management. The table below identifies where you can find more information on some of the topics mentioned in this module.

PEST MANAGEMENT TOPIC	OTHER MODULE(S)
Crop Rotation	Soil Health
GMOs	Biodiversity
Competitors or Predators of Target Pest	

FURTHER INFORMATION

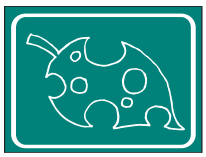
Additional details and information on the above can be obtained through the following programs.

- **University of Vermont Extension Program** is conducting research on Integrated Pest Management. Information on the program's current efforts can be accessed on the web at http://pss.uvm.edu/ipm/.

- **Farm*A*Syst,** managed through the Vermont Natural Resources Conservation Council, is devoted to national and state-level improvements to pest management and provides comprehensive evaluation and best management sheets specifically for dairy farmers in Vermont. More information can be found at their web-site, http://www.vt.nrcs.usda.gov/technical/FarmASyst/.

- **The Food Alliance.** http://www.thefoodalliance.org/. This organization certifies producers, which use socially and environmentally responsible farming practices. The certification process includes sections on natural area management, watershed management, crop management, pest management, pastureland management, and animal welfare. Details on pest management are included under pesticide applications and record keeping.

- **Appropriate Technology Transfer for Rural Areas (ATTRA)** "Sustainable Agriculture: An Introduction." http://attra.ncat.org. ATTRA specializes in developing sustainable agricultural information and tools. For a summary of the practices they advocate regarding pest management, see "Sustainable Agriculture: An Introduction" at http://attra.ncat.org/attra-pub/PDF/sustagintro.pdf. Phone: 1-800-346-9140.



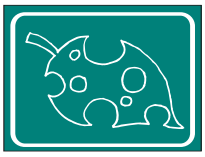
SUMMARY RESULTS FOR PEST MANAGEMENT

Instructions: In the table below, please record the score for the answer you selected for each question. For multiple-choice questions, the response number serves as your score for that category (i.e. choice # 2 is worth 2 points). For "check all that apply questions," please see scoring criteria for each question in the chart below. Once all responses have been completed, add up the answers and record the totall.

QUESTION	ANSWER/SCORE
1. Pest Identification	
2. Pesticide Selection	
3. Timing of Pesticide Application	
4. Weather Conditions	
5. Record Keeping	
6. Specific Management Practices: Flies (Add 1 for each box checked)	
7. Specific Management Practices: Weeds (Add 1 for each box checked)	
Total Score (Out of Possible 30)	

Interpretation: The next step in understanding your farm's performance in the category of Pest Management is to compare your results to best practices. Below is a table that ranks your performance from best practice (green) to practices that require improvement (red). Compare the number of points you received for your practices to optimal practices.

	Point Range	Interpretation
Green	26 - 30	Best practices regarding Pest Management are currently being employed on this farm.
Yellow	18 - 25	Farm is using some good practices regarding Pest Management, however there are some key areas that should be improved upon.
Red	5 - 17	Pest Management practices should be carefully evaluated and a strong effort should be made to adopt improved practices in several areas.



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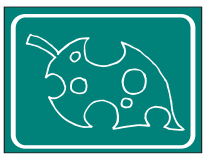

Footnotes

124 Heller, Martin C., Keoleian, Gregory A. "Assessing the sustainability of the US food system: a life cycle perspective." Center for Sustainable Systems Agricultural Systems. 6 Dec. 2000. <http://css.snre.umich.edu/css_doc/CSS00-04.pdf>. March 2003.

125 US EPA. "About Pesticides" 18 June 2003. <http://www.epa.gov/pesticides/about/index.htm>. 1 Nov. 2003.

126 State of California. "Definition of IPM (Integrated Pest Management)." 2003. <http://www.cdpr.ca.gov/cfdocs/apps/schoolipm/overview/definition_ipm.cfm?crumbs_list=1,19>. 1 Nov. 2003.

127 Pesticide Use in the US. Oregon State. Oct. 2003. <http://oregonstate.edu/instruction/bi301/pesttren.hm>. 1 Nov. 2003.

128 Ibid.

129 Heller, Martin C., Keoleian, Gregory A. "Assessing the sustainability of the US food system: a life cycle perspective." Center for Sustainable Systems Agricultural Systems. 6 Dec. 2000. <http://css.snre.umich.edu/css_doc/CSS00-04.pdf>. March 2003.

130 Central Coast Vegetable Integrated Pest Management Project, University of California Cooperative Extension. <http://ccvipmp.ucdavis.edu/media5-salinas.ipm.final.html>. 18 Oct. 2003.

131 Question from Farm*A*Syst. Pesticide Storage and Handling.

132 Question adapted from The Food Alliance. Dairy Inspection Tool for the Pacific Northwest. 2002.

133 Question from Farm*A*Syst. Pesticide Storage and Handling.

134 Ibid.

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136 State of California. "Definition of IPM (Integrated Pest Management)." 2003. <http://www.cdpr.ca.gov/cfdocs/apps/schoolipm/overview/definition_ipm.cfm?crumbs_list=1,19>. 1 Nov. 2003.

137 Central Coast Vegetable Integrated Pest Management Project, University of California Cooperative Extension. <http://ccvipmp.ucdavis.edu/media6-media-quotes.html>. 18 Oct. 2003.