"Our treasure lies in the beehive of our knowledge. We are perpetually on the way thither, being by nature winged insects and honey gatherers of the mind" Friedrich Nietzsche

Agriculture Resiliency

Integrated Pest Management

Photo: Tracey Baute, OMAFRA

Snohomish Conservation District

working together for better ground since 1941

WHAT IS INTEGRATED PEST MANAGEMENT?

Integrated Pest Management or IPM is an ecosystem-based approach that aims to keep pest populations below the economic injury level, while minimizing risks to people and the environment. By carefully considering the available pest control techniques rather than defaulting to traditional practices, farmers can significantly reduce the use of pesticides and their overall exposure. This is not only a benefit to the environment—and potentially to the health of those applying such products—the over-reliance on pesticides has created its own set of problems, including pest resistance, pest resurgence, and lethal effects on non-targeted organisms (Duffor, 2001).

Integrated Pest Management can drastically reduce the reliance on pesticides through an approach that first addresses these questions:

- Why is the pest there?
- How did it arrive?
- Why doesn't the parasite/predator complex control the pest?

To address these questions, Integrated Pest Management begins with accurate diagnoses of the nature and source of the pest problem. It then examines a range of preventive approaches and biological controls to reduce pest population numbers to acceptable limits. Pesticides are used only as a last resort, if other approaches are unsuccessful.

Proactive Integrated Pest Management Strategies:

Cultural Controls

Cultural controls are practices that reduce the initial establishment, reproduction, and overall survival of a pest by creating a less hospitable environment. Increasing diversity on a farm is one example of a cultural control. Low biodiversity tends to result in instability and makes systems more prone to pest outbreaks. High biodiversity creates systems that tend to be more dynamically stable and resilient. A wide variety of biological organisms offer a "checks-and-balances" dynamic making it difficult for one species to overwhelm the system (Dufor, 2001). Increasing diversity of crops in a single field will help avoid pest outbreaks that can devastate a monocrop. Biodiversity is extremely important for healthy, resilient plant communities that can resist pests.

Some methods for increasing diversity include:

- Planting multiple cultivars of a single crop
- Planting native trees and shrubs in hedgerows to create habitat for beneficial insects such as lacewings or assassin bugs
- Rotating crops, inter-cropping, multiple cropping, cover crops, and strip cropping.

Diversity above ground directly influences the diversity below ground. The soil food web includes organisms not visible with the naked eye, such as micro-organisms (e.g. bacteria, fungi, protozoa and nematodes) and meso-fauna (e.g. acari and springtails), as well as the more familiar macro-fauna (e.g. earthworms and termites). These organisms improve the entry and storage of water, resistance to erosion, plant nutrition, and breakdown of organic matter. Each of these organisms has different habitat needs. These needs are supported by a variety of plants because of the different kinds of habitat they provide, such as leaf matter, root structures, and fungi. Studies have shown that soils rich in organic matter and, in turn, biological organisms that feed on that matter suppress plant pathogens through intricate interactions of symbiosis and predation (Hobbs et al, 2007).

Additional cultural controls can include altering planting dates to avoid specific pests, mulching to suppress weeds and pests, and paying attention to growing conditions and plant spacing. Thrips are a good example of pests that can be reduced by altering planting dates. Thrips tend to infest crops planted early, but are typically less of a problem in crops planted later in the season (Zehnder, 2011).

Biological Controls

Biological controls use a pest's natural enemies such as parasites, predators, or pathogens to keep pest populations under control. Mammals, birds, bats, insects, fungi, and bacteria are all effective natural biological controls in an agricultural system. You can take advantage of natural biological controls on your farm by increasing habitat for desirable species. Planting annuals and perennials that provide pollen and nectar attract beneficial insects. Adding features such as water sources, perching sites, and overwintering spaces for birds can also reduce pests.

The National Center for Appropriate Technology has produced an Appropriate Technology Transfer for Rural Areas (ATTRA) publication on "Farmscaping to Enhance Biological Control" that will walk you through how to establish habitat features on your farm. (https://snocd.org/pub-145)

Another option for biological control is the timed release of specific predators or pathogens. This practice is known in Integrated Pest Management as applied biological control and can make use of specialist organisms such as parasitic wasps that attack a specific species, or generalist organisms like lacewings that attack a wide range of pests. This method can be particularly effective on small farms or in greenhouses. Effective distribution of organisms on large farms can be problematic. Biosprayers and aerial delivery have been used to more effectively apply organisms on a large scale (Dufor, 2001). A growing number of companies producing and selling fungi, bacteria, nematodes, and viruses to be applied to combat specific pests.

Mechanical Controls

Mechanical controls directly kill, block, or make the environment inhospitable to pests using physical components, such as temperature, humidity, or light. Mechanical controls have traditionally been used on small scale farms, or in localized situations. However, due to public pressure, these methods are gaining in popularity and scale as they are seen as more environmentally friendly. Examples of mechanical controls include tillage, flaming (burning an area), barriers (such as fine mesh), soil solarization (heating the soil with plastic and sun to kill pests), and plastic mulching for weeds (Dufor, 2001).

Monitoring

Monitoring and correct pest identification are main components of Integrated Pest Management. Regularly accounting for which pests are present and in what numbers and how much damage they have caused allows for a measured response. Tools such as insect traps and nets can be used to monitor for both harmful and beneficial insect numbers while field grids can provide a structure for weed counts. See "Find Out More" section for pest identification resources.

Considering what pests have been identified, their biology, and ecological factors can help you make decisions on whether or not the pest can be tolerated or if it has become a problem that will need to be controlled. Proper identification and knowledge of pest biology will help in the selection of the most effective management strategy and timing.

Photo: Tracey Baute, OMAFRA

How to Begin?

Integrated Pest Management promotes proactive measures for pest management. It seeks to create a farm that attracts beneficial predators and parasites while discouraging pests.

Proactive planning is the key and should be considered before planting annual crops. Planning considerations include:

- Health of soil (soil health has direct links to the health of plants and their resistance to pests)
- Habitat for beneficial insects
- Possible crop rotations or crop diversity
- Cover crops and associate effects on pest management such as mustards
- Crop cultivars
- Monitoring options
- Reactive management options (least toxic options first, herbicides, tillage, pesticides)

Pests adapt and change quickly. Building diversity into your farm will help your overall system absorb and be more resilient to pest changes and pressures. Keeping up with new information and management techniques will help you to remain proactive when it comes to pest management.

Washington State University (WSU) Extension has an Integrated Pest Management program with a quarterly newsletter and other resources to assist you in utilizing Integrated Pest Management on your farm. http://ipm.wsu.edu/

Contact the Snohomish Conservation District or the WSU Extension office for assistance in starting an Integrated Pest Management program on your farm.

Find Out More!

For more information on integrated pest management contact the Snohomish Conservation District at (425) 335-5634.

USDA Western Integrated Pest Management Center

- http://westernipm.org/

Common Bugs and Insects Found in Washington

- https://www.insectidentification.org/insects-by-state.asp?thisState=Washington

Washington State Department of Agriculture

- https://snocd.org/invasive-booklet

References

Zehnder, Geoff. 2011. Planning Crop Rotation and Timing to Avoid Insect Pests. eOrganic. Extension.org

Dufor, Rex. 2001. Biointensive Integrated Pest Management. National Sustainable Agriculture Information Service.