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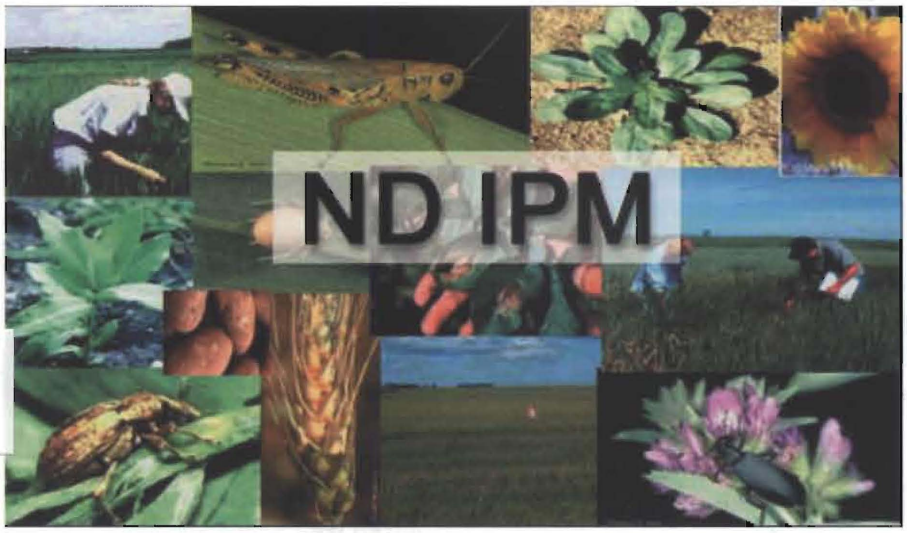

Integrated Pest Management in North Dakota Agriculture

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What is IPM?

IPM stands for Integrated Pest Management. The definition of IPM from the National IPM Network is:

> *"IPM is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks."*

IPM is an integral part of North Dakota's agriculture. One of the primary missions of IPM is to help growers produce profitable crops using environmentally and economically sound approaches. These IPM tools contribute to a system that produces high-quality, safe, and affordable foods and other agriculturally related products. For many growers, IPM helps balance pest management with profitable crop production and environmental protection. Although this circular primarily addresses IPM and crops, IPM also includes pest management in livestock production, landscapes and home settings.

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Strategies of IPM:

How Can IPM Help Produce a Profitable Crop?

IPM is designed to help growers protect their crops from pests while minimizing input costs and environmental risks. IPM incorporates several pest management strategies to maintain crop profitability, minimize pest selection pressures, and minimize environmental impacts. Once a pest exceeds the economic threshold or reaches a threatening level, it is necessary to determine the best way to prevent unacceptable yield losses. The cost, safety, benefits, and risks of the following management strategies need to be evaluated:

■ Cultural (Agronomic practices)

- **Selecting plant resistant varieties**
  Growing resistant varieties of wheat for reducing severity of Fusarium head blight [scab].

- **Crop rotation**
  Levels of *Sclerotinia sclerotiorum*, white mold, are reduced by crop rotation to non-susceptible hosts; common hosts of *Sclerotinia* in North Dakota are dry bean, sunflower, soybean, and canola.

- **Cultivation**
  Clean tillage between field rotations decreases the establishment of weeds, especially perennials; cultivating row crops reduces herbicide applications.

- **Variation of planting or harvesting dates**
  Delayed planting of sunflower until late May or early June reduces sunflower stem weevil and sunflower beetle densities.

- **Plant spacing**
  Narrower row spacing may reduce weed pressure in some broadleaf row crops.

- **Fertilization level**
  A crop with balanced fertility levels has greater capacity to resist disease organisms and a greater capacity to compete with weeds when fertilizer is placed near crops.

- **Sanitation**
  Cleaning out storage areas or grain bins help prevent infestations of stored grain insect pests.

- **Planting pest-free seed**
  Planting disease-free seed or using seed treatments with a fungicide will help protect germinating seed and seedlings from seedling blight.

- **Planting trap crops**
  A field margin planted to an early maturing sunflower that surrounds the remaining sunflower field area may act as a trap crop to certain sunflower insect pests. Plants in the margin flower earlier than the remaining field interiors and attract the red sunflower seed weevil first. As a result, the trap crop concentrates the weevils in a smaller area, reducing the cost of insecticide and time required for control.

■ Mechanical

- **Hand weeding**
  Removing weeds by hand is only practical for use by the home gardener, organic grower or researcher; although sugarbeet growers may hire labor for hand weeding.

- **Exclusion using screens or barriers**
  Banding trees with Tanglefoot to control cankerworms.

- **Trapping, suction devices, collecting machines**
  Walk-through fly trap removes horn flies from range cattle; insect traps predict outbreaks of certain crop insects, such as bertha armyworm.

■ Physical

- **Heat**
  Burning surface residues, soil pasteurization.

- **Cold**
  Cold storage of potatoes to prevent storage rot.

- **Dry**
  Dry storage of grain to prevent mold and insects.

■ Biological

- **Augmentation of natural enemies**
  Simple sugar solutions can be used as artificial honeydew to promote aggregation of adult lady beetles in aphid infested crops.

- **Introduction of parasites or predators**
  Releasing biocontrol agents to control noxious weeds (for example, *Aphthona* flea beetles for biocontrol of leafy spurge.)

- **Propagation of diseases of pests**
  Bacterial agents, *Bacillus thuringiensis*, for natural control of insect pests like Colorado potato beetle or European corn borer.

■ Genetically Modified Organisms (GMO)

- **Use of genetically modified trait for pest resistance**
  Genetically modified corn that has the Bt trait for resistance to corn borer.

■ Chemical

- **Herbicides, Insecticides, Fungicides**

- **Miticides, Nematicides, Rodenticides, Avicides (blackbirds)**

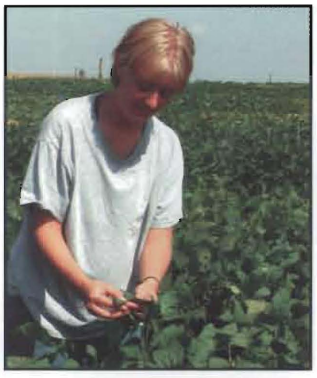
- **Biological pesticides**
  insect molting inhibitors; use of a naturally occurring fungus for control of Sclerotinia.

- **Defoliants**

- **Desiccants**

Steps of IPM

Scouting or Monitoring



The purpose of scouting is to detect the presence, number, and type of pests. Scouting involves a regular and methodical procedure to quantify field information needed to make sound pest management decisions. Field observations are used to make immediate IPM decisions as well as part of the field's history for making future decisions. Pest levels can vary greatly from one field to another, so each field should be scouted thoroughly, even though the fields may appear similar.

Identification

Correct identification of pests is an important aspect of scouting. Natural enemies that help keep pests in check also are present in fields, so it is important to recognize these friends. For example, certain insects, such as Syrphid flies, may be abundant in a field, but do not cause crop damage. Knowledge of specific insects, weeds, or diseases in a field is important for IPM decision-making.

Pest Situation Assessment

Scouts analyze information obtained from scouting and pest identification, and determine the need for pest control. One question is whether the damage potential is more costly than the control cost. The economic threshold plays an important role in IPM decisions and is defined as when there are enough pests present to warrant treating the crop. Keep in mind that economic thresholds are developed for average conditions. In unusual situations, such as drought stress, thresholds may have to be altered. Furthermore, economic thresholds may not be available for certain pests, so assessment may have to be based on general guidelines about the pest population.

Use of Pest Forecasting Models

Computerized models play an important role in forecasting the potential risk of a particular pest problem in specific areas. The North Dakota Agricultural Weather Network (NDAWN) has been expanded to include 63 automatic weather stations located in different areas of the state.

http://ndawn.ndsu.nodak.edu/index.html

These stations provide weather data for pest forecasting models. This information also is used for calculating growing degree day units for estimating crop development and pest emergence. Forecasting models determine if the weather conditions were favorable for a particular pest's development and then predict a risk factor, such as low, moderate, or high. Growers can then use this information to help decide if a control action is warranted in their particular area.

Implementation

Once the management strategy (or strategies) has been selected, it should be employed in a timely manner. Cultivation or using herbicides on weeds, for example, must be done at the proper stages of development for both the weed and the crop for greatest impact. IPM integrates several different pest management strategies when feasible.

Evaluation

Did IPM work? Compare the pest activity before and after implementation of IPM strategies. Review what went wrong and what went right. Was the pest properly identified? Was the field sampling unbiased? Was the choice of control based on sound judgment or outside pressure? What changes to the system would make it better?

IPM Benefits

■ New Products and Innovative Methods

New IPM products and methods are being developed and extended to producers to maximize yields. In North Dakota, growers use several forecasting model to make accurate predictions of pest developments for specific production areas. Some examples of these models used in North Dakota agriculture include:

- **Small Grain Disease Forecasting Models**
  http://www.ag.ndsu.nodak.edu/cropdisease/cropdisease.htm

- **Potato Late Blight Disease Models**
  http://ndawn.ndsu.nodak.edu/application/potatoes.html

- **Canola Sclerotinia Risk Forecasting Program**
  http://www.ag.ndsu.nodak.edu/aginfo/sclerotinia/sclerotinia.htm

- **Wheat Midge Growing Degree Days**
  http://ndawn.ndsu.nodak.edu/application/midge_app.html

Use of these forecasting models have helped growers make judicious pesticide applications only when the pests are present at economically damaging levels.

■ Reduced Crop Loss through Improved IPM Strategies

For farmers, this means producing high-quality, affordable products. For society, it means maintaining safe and ecologically sound environments. One of the IPM success stories in North Dakota is the improved control of Fusarium head blight with use of more tolerant spring wheat varieties and judicious use of fungicides. *Alsen*, a new spring wheat variety with improved resistance to Fusarium head blight, was released in 2000. By 2002, North Dakota producers planted 30% of their acreage to this variety. For less resistant spring wheat varieties, judicious and timely use of fungicides to control this disease has increased yields by 15-20% on average and improved grain quality.

■ Judicious Use of Pesticides — Decreasing Environmental Impacts

As researchers develop environmental friendly ways to manage pests, IPM practitioners have helped North Dakota growers reduce unnecessary pesticide use. Examples include:

- Wheat producers have used the wheat midge risk maps and wheat midge growing degree days information to predict midge emergence and to time their field scouting to determine whether insecticides are needed.
- Drybean producers have adopted the practice of banded spraying of fungicides to achieve white mold control, a practice that allows fungicide use to be cut in half from that required for broadcast application.
- Wheat producers have used the NDSU small grain disease forecasting models to determine need for fungicides on wheat.
- 96% of North Dakota sugarbeet producers have adopted use of micro-rates of herbicides to achieve good weed control and subsequently use only one-half the total active ingredient per acre as compared to a full herbicide rate.

■ Increased Partnership

IPM Programs are being incorporated by growers, crop consultants, and industry into crop production systems of North Dakota, and have increased collaboration between private and public stakeholders.

For more information, visit the NDSU IPM website at:
http://www.ag.ndsu.nodak.edu/aginfo/ndipm/

Please contact your local county extension office of the North Dakota Extension Service for further information on IPM.

County extension offices can help you directly or refer you to area/state extension specialists. Trained crop consultants or professionals may also help provide pest information, pest identification, and IPM recommendations.

For more information on this and other topics, see: www.ag.ndsu.nodak.edu

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