

# RIGHT-TO-FARM GUIDE

SPECIAL SUPPLEMENT TO THE MICHIGAN FARM NEWS

MICHIGAN FARM BUREAU



MICHIGAN FARM BUREAU

February 28, 1997  
Issue 2



## Pesticide utilization and pest control practices

### Pesticides, other pest management techniques crucial to American agriculture

American agricultural producers have been able to meet the demands of the public for food through the use of improved agricultural technology. For the past 50 years, agricultural technology has included the use of pesticides and other pest management techniques.

Virtually all agricultural commodities produced in Michigan may be threatened by serious pest problems and may be treated with pesticides to prevent or overcome insect, disease, nematode, vertebrate or weed pests. Currently, agricultural pesticides, as broadly defined by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), are utilized for livestock and crop protection and production.

The use of pesticides has, however, caused environmental and human safety concerns. These include the appearance of pesticide contamination in surface and groundwater in Michigan, destruction of beneficial or non-target organisms, appearance of resistant pest species and pest population resurgence. Strategies for managing pests continue to be developed to reduce undesirable pesticide effects.

Agricultural producers in Michigan are encouraged to adopt practices that utilize pesticides only as needed. Such practices employ the appropriate use of all available information, methods, and technologies to achieve the desired commodity quality and yield while minimizing any adverse effects on non-target organisms, humans, and the environment.

Such practices include, but are not limited to, Integrated Pest Management (IPM) or sustainable agriculture. These practices normally involve environmental and biological monitoring such as scouting, trapping, use of pest prediction models, etc., to help producers determine when pest populations reach the economic action threshold and selection and use of safe and effective control measures. These may include, but are not limited to, biological, chemical, cultural, mechanical, regulatory controls (e.g., inspections, quarantines, fumigation, sanitation etc.) and other pest management methods.

Agricultural producers who comply with pesticide labels and labeling, relevant state and federal laws, Michigan State University pesticide recommendation bulletins, and follow pertinent sections of these Generally Accepted Agricultural and Management Practices for Pesticide Utilization and Pest Control, will meet provisions of Public Act 93 of 1981, as amended, The Right to Farm Act, which is administered by the Michigan Department of Agriculture.



The second in the Right-to-Farm series deals with pesticide use, equipment and protective clothing each pesticide applicator needs to know before hitting the spring season. Be sure to review the practices covered on the next eight pages with everyone who handles chemicals on your farm to protect their health and the health of the environment. Watch for the next Right-to-Farm issue coming the end of March dealing with nutrient utilization.

## On-farm pesticide storage and containment

All pesticides should be stored in a manner that maintains environmental quality, ensures human and animal safety, and preserves product and container integrity. Legal storage requirements are on pesticide labels.

### Bulk pesticide storage site

A site should be selected that minimizes potential for contamination of surface or groundwater by drainage, runoff or leaching. Locate the storage site an adequate distance away from wells, surface water and other sensitive areas, as herein described.

"Surface water" means a body of water that has its top surface exposed to the atmosphere and includes lakes, ponds, or water holes that cover an area greater than 0.25 acre, and streams, rivers, or waterways that maintain a flow year-round. "Surface water" does not include waterways with intermittent flow (Reference Public Act 171 of 1976, as amended). For purposes of these practices, a bulk storage area is an area where pesticides are stored over 15 days in a single container greater than 55 gallons or 100 lbs.

- Existing bulk pesticide storage areas should be located a minimum of 50 feet from any single-family residential water well, 200 feet from a public water supply, and a minimum of 200 feet from surface water. If an existing bulk storage area is located closer than 50 feet from a single family residential water well, 200 feet from a public water supply or less than 200 feet from surface water, appropriate security measures should be taken to prevent pesticide contamination of surface water or groundwater (Reference E-2335).
- New bulk pesticide storage areas should be located a minimum of 150 feet from any single-family residential water well and a minimum of 200 feet from surface water. When planning a new facility, see E-2335 for information on design and construction and for the required set-back distance from drinking water supplies. The set-back distance from any Type I or Type IIA public water supply well is 2,000 feet, if the public water supply does not have a well-head protection pro-

gram. If there is a well-head protection program, the facility must be located outside the delineated well-head protection area. For Type IIB and Type III public water supply wells, the set-back is 800 feet. For more information on these set-back distances, see Public Act 399, The State of Michigan Safe Drinking Water Act of 1976, and Act 368 of The Michigan Public Health Code of 1978, as amended.

These set-back distances pertain to bulk pesticide storage sites and facilities and do not include application sites. A storage facility is a place for the safe keeping of pesticides. An application site is where pesticides can be used according to label specifications.

### Storage facility

Pesticides should be stored in a facility which is securable to prevent unauthorized access.

- Keep all pesticides out of the reach of children, pets, livestock and unauthorized people.
- Within the storage area, store pesticides in a manner to prevent cross contamination with other pesticides or accidental misuse. Store pesticides away from food, feed, potable water supplies, veterinary supplies, seeds and protective equipment.
- The storage facility should be ventilated to reduce dusts and fumes.
- Keep pesticides cool, dry and out of direct sunlight (Reference E-2155).
- Post the pesticide storage area with highly-visible, weatherproof signs, that indicate pesticides are stored there. Also post "no smoking" signs.
- Store pesticides only in their original labeled containers, or containers appropriate for pesticide storage that are properly labeled.
- Have absorbent materials such as cat litter box filler or sawdust, and clean-up equipment readily available. A fire extinguisher approved for chemical fires should also be easily accessible.
- The storage of combustible and flammable chemicals may require special storage requirements. Contact your local fire chief and refer to NFPA 395 for further information.

## Worker and handler safety

Any person applying or handling pesticides or working in pesticide-treated areas must be knowledgeable in the safe use and handling of pesticides. Everyone must use safety equipment specified on pesticide labels.

The Federal Worker Protection Standard of 1992 was written to protect employees involved in the production of agricultural products on farms, forests, greenhouses and nurseries from occupational exposure to agricultural pesticides.

The standard requires training, notification, and information on the proper use of protective equipment. Handlers include those who apply, load, mix and transport pesticides and who clean and repair pesticide application equipment. Workers include persons who may physically come in contact with pesticides in treated areas while performing tasks related to production and harvesting.

Both need to be trained to recognize pesticide poisoning symptoms, avoid exposure and provide emergency assistance. They should be provided personal protective equipment and transportation for medical assistance. Handlers need additional training. Employers are required to provide the training, personal protective equipment, transportation, central notification points, field posting for the duration of the restricted-entry intervals and maintain pesticide application records for three years.

For specific information concerning this law, refer to the EPA-prepared book, "The Worker Protection Standard for Agricultural Pesticides, How to Comply, What Employers Need to Know."

Enforcement of the standard is in two phases. Label-specific requirements will be enforceable when they appear on pesticide labels. These include:

- Using label-specified personal protective equipment
  - Obeying label-specific restrictions on entry to treated areas during the restricted-entry intervals
  - Obeying the requirement on labels that provide oral warnings and treated area posting
- The generic requirements were enforceable as of Jan. 1, 1995 and include:
- Providing decontamination supplies
  - Training workers and handlers
  - Providing certain notification and information
  - Cleaning, inspecting and maintaining personal protective equipment
  - Emergency assistance.



This publication made possible by a grant from the

Michigan Groundwater Stewardship Program

Look for two more special supplements in the Right-to-Farm series — coming soon in future issues

# Handling pesticides safely



Handling pesticides properly — from mixing and loading products to applying them — is essential for the safety of workers and the environment.

## Equipment use and calibration

The operator shall inspect and maintain all pesticide application equipment to ensure the proper and safe operation of equipment, as well as the appropriate rate and distribution of application.

Equipment must be correctly calibrated at least annually to apply specific materials and formulations of pesticides at the intended rate and distribution.

## Mixing and loading

Pesticides should be mixed and loaded according to label directions in a manner that does not harm individuals, animals or the environment. The greatest risk occurs when handling pesticide concentrates. Follow these practices to reduce risk:

- Pesticide mixing and loading areas should be located in such a manner as to reduce the likelihood of a spill or overflow contaminating a water supply. Acceptable areas may include temporary or permanent sites which are described in bulletin E-2335.
- Review the label before opening the container so that you are familiar with current mixing and usage directions. If two or more pesticides are to be mixed, they must be compatible and mixed in the proper order.
- Measure accurately. Keep all measuring devices in the pesticide storage area to avoid their being used for other purposes. Measuring containers

or devices should be rinsed and the rinsewater put into the spray tank.

- Avoid back-flow when filling a spray tank to prevent water source contamination. The simplest technique is an air gap where the fill hose does not come in contact with the tank water. Back flow prevention devices may also be used. (Reference E-2349)
- A sprayer should be monitored while it is being filled.
- Mix only the amount you plan to use immediately. Pesticides should be applied as soon as possible to maintain product effectiveness and reduce the potential for accidental discharge.
- Clean up spills immediately. Materials spilled during mixing or loading may be applied to labeled sites at or below labeled rates. Major spills or those exceeding reportable quantities under SARA Title III should be reported to the appropriate agencies (Reference E-175) as well as the Michigan Department of Agriculture, Agriculture Pollution Emergency (APE) Hotline, (800) 405-0101.

## Transport of pesticides

A person transporting pesticides will do so in such a manner as to avoid discharge into the environment, human exposure, and contamination of animal feed and human food. (Reference Public Act 346, The Commercial Drivers' License Law of 1988.)



Hooded sprayer units direct herbicides directly between the rows of crops greatly minimizing drift.

# Disposing of empty pesticide containers

Farmers are often faced with the problem of disposing of potentially hazardous pesticide containers. While most ordinary trash cans go to landfills, these sites generally won't — and can't — accept waste classified as hazardous under the U.S. Resource Conservation and Recovery Act (RCRA). Since contaminated pesticide containers and waste chemicals often fall into this category, farmers frequently have difficulty disposing of them properly. There are several solutions to this problem available in most states.

## Leftover chemicals

With the advent of refillable containers, minibulks, and pre-measured water-soluble pouches, the problem of leftover pesticides has been dramatically reduced. It does, however, still exist. Applying leftover registered pesticides over as large an area of land as possible, such as on the field where the chemical was originally used, is a common disposal practice acceptable in most states. However, disposing of banned chemicals is generally much more difficult and expensive. Contact your ag chemical dealer for information on chemical return programs in your area. To learn more about hazardous waste disposal in general, contact the EPA Hazardous Waste Hotline at 800-424-9346.

## Rinsing empty containers

Most farmers, ranchers and custom applicators rinse pesticide containers as they are emptied, dumping the rinse water into the sprayer tank. This saves money and time, and the rinsing action is much more efficient if the chemical hasn't dried in the empty container. Laboratory tests have shown



that proper rinsing results in essentially harmless, 99.999 percent pesticide-free containers, regardless of what product they originally contained. Probably the fastest, most efficient and convenient container rinse method is pressure rinsing with metal hose-end attachments which puncture plastic and metal containers, producing a forceful spray of rinse water inside the empty container. By holding the contain-

er over the opening to the spray tank while rinsing, the rinse water can be captured as it drains from the empty container spout. Manual rinsing methods, such as triple rinsing, can be as effective as pressure rinsing, although anyone who has tried it will vouch that it's much more time consuming and labor intensive.

## Disposing of rinsed containers

When rinsed according to label directions, pesticide containers are classified as ordinary solid waste and may be disposed of or recycled. Be aware, however, that some waste disposal operators will still turn away rinsed containers, even if they have adequate landfill capacity. States also have jurisdiction over burning and burying containers on private property. Contact your ag chemical dealer for state disposal regulations, and rules on burning or burying containers.

## Recycling empty containers

Collection and recycling programs are available in a number of states. If you have the opportunity to participate in a recycling program, be sure to rinse all containers properly. Contact your ag chemical dealer or the Agricultural Container Research Council at 919-549-2101 for more information about container recycling programs near you.

To rinse empty containers:

- Puncture container with special hose-end attachment.
- Spray inside of container on all sides for at least 30 seconds.
- Let all rinse water drain into spray tank.

These recommendations should not be used as the sole criteria for evaluating the adequacy of a pesticide safety program. For further information on applicable laws, contact your retail dealer or manufacturer representative.

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

# Pesticide disposal practices

## Excess spray mixtures and rinsates

Use excess mixtures or rinsates on labeled application sites at or below labeled rates as listed on the label.

Excess pesticide mixtures include, but are not limited to: leftover solution when spraying is done; haul-back solutions from a spraying job interrupted by weather and equipment breakdown.

All rinsates, including pesticide container rinsate should be put in the sprayer as part of the mixing solutions. Sprayer rinse out solution should be sprayed on labeled application sites at or below labeled rates.

## Disposal of unused pesticides

The Michigan Department of Agriculture has sponsored regional pesticide collections using local planning committees to establish collection sites serving participants in areas ranging from two to six counties in size.

Participation can be arranged by contacting the county MSU Extension office, MDA, or the Soil Conservation District. Since many of the collection sites have been at agrichemical dealerships, the

agrichemical dealers may also be able to put prospective participants in contact with the program.

The average participant brings in 200-300 pounds of unusable pesticide, which is managed at no cost. A small fee may be required if the number of participants in the region is high or for those who have very large amounts.

To assure there are funds for disposal, the application form asks the participant to identify the amount and type of pesticide. Except for the very large amounts, no official paperwork is required of the participant.

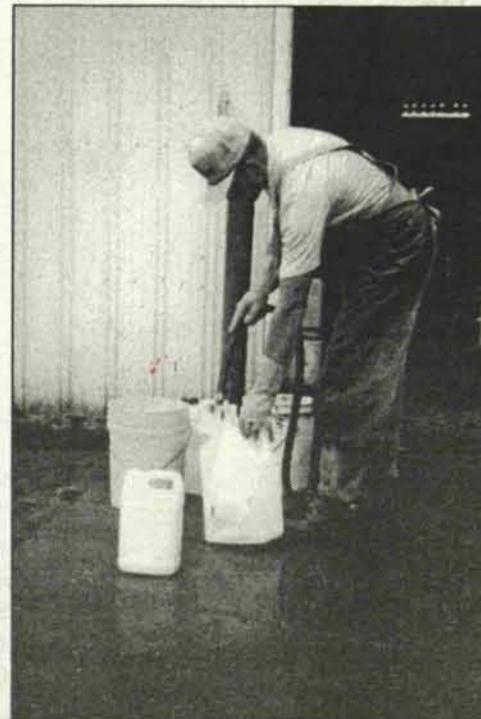
The Michigan Department of Agriculture or the contractor becomes the generator of record and is responsible for the disposal once accepted at the collection site.

## Disposal of pesticide containers

Always dispose of containers in a way that minimizes impact on the environment and is consistent with the label specifications. It is desirable to use reusable, returnable, or recyclable containers when available.

Pesticide containers should be emptied completely, rinsed when appropriate, and in general rendered a non-hazardous waste.

- Triple rinse or use other recommended practices, such as pressure rinsing to clean all glass, metal, or plastic containers to render them non-hazardous waste. (Reference AM-95)
- After rinsing, puncture metal and plastic containers. They can then be recycled or buried in a sanitary landfill approved under PA 641, of 1978.
- Michigan has had an agriculture plastic pesticide container recycling program in operation since 1992. This program allows for the grinding and recycling of clean plastic containers. For more information on this program, contact Michigan Department of Agriculture at (517) 241-0236 or Michigan Agri-Business Association at (517) 485-8580.
- Dispose of rinsed glass containers in a sanitary landfill approved under PA 641, of 1978.
- Open burning of pesticide containers is prohibited by state statute, P.A. 348 of 1965 as amended.



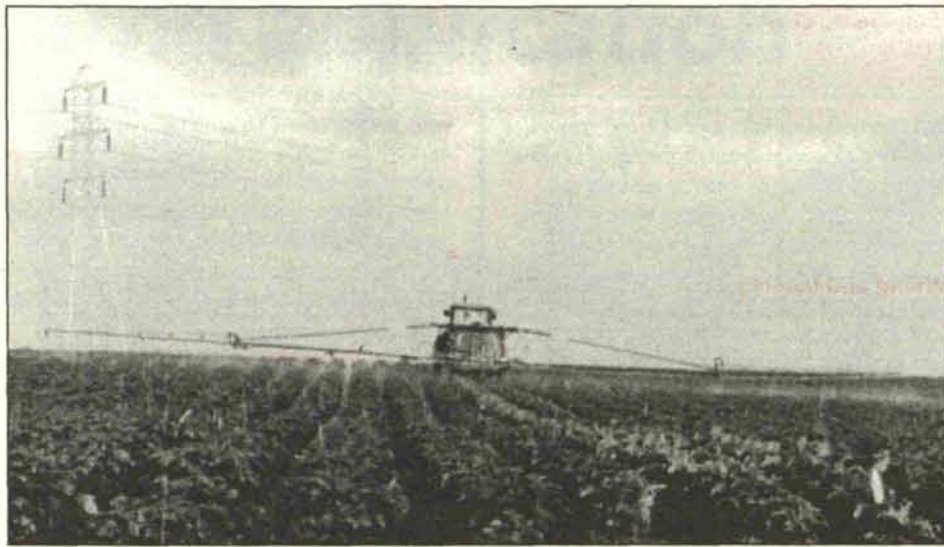
# Protection of the environment

**A**griculture involves management of biological systems to produce food, feed, fur and fiber. Pesticides and other pest management practices cause a specific effect in a biological system.

For agriculture to be sustained at biologically and economically sound production levels, growers should recognize their responsibility to be stewards of the soil and the environment. Growers should be aware of environmentally sensitive conditions in their production system and adjust management practices to ensure future productivity and environmental integrity. For example, growers should limit use of highly or moderately leachable pesticides in areas with coarse textured soils or high water tables. (Reference NRCS Technical Guide 595-Pest Management Standard, MSU pesticide recommendations, Soyherb or Cornherb.)

A person applying pesticides should use good judgment to avoid adverse effects to human health and the environment. A pesticide applicator should make a determined effort to:

- Assess pest populations and apply pesticides only when needed to manage these pests during the vulnerable or appropriate stage of their life cycle.
- Avoid directing a pesticide application beyond the boundaries of the target site.
- Avoid the potential for drift or runoff.
- Avoid applications that would result in exposure of persons within or adjacent to the target site, except when such pesticides have approved use patterns permitting treatment of populated areas for specific pest management programs, for ex-



ample: gypsy moth, mosquito, etc.

- Avoid applications that would lead to contamination of usable aquifers (Water Resources Commission Act Part 22, Rule 2203, and the Michigan Groundwater and Freshwater Protection Act, Public Act 247 of 1993) or runoff to surface waters (Reference NRCS Technical Guide 595-Pest Management Standard). Applicators need to be aware of and adhere to any pesticide use directions or references on pesticide labels concerning state management plans. These plans are specifically developed for the protection of groundwater.

- Utilize safety measures including backflow safety devices when applying pesticides through irrigation systems. (Reference E-2099 and E-2349)

### Alternative pest management techniques

Growers may use alternative tools and techniques to pesticides to manage pests. These may include, but are not limited to, audible cannons, ultra-sonic and audio sound equipment, strobe lights, firearms, balloons, scarecrows, streamers, netting, traps and fences for wildlife management, tillage for weed control, controlled burning and traps for pest management, transgenic plants, introduced or managed biological control agents, mechanical

controls, resistant varieties, cover crops, crop vacuums, crop flammers, mulching, composting, crop rotation, pheromones for mating disruption and trapping, etc. All such techniques should be used according to dealer and/or manufacturer recommendations and must be used according to federal and state agency recommendations and/or regulations.

### Agriculture pollution emergencies

The Michigan Department of Agriculture has a toll-free, 24-hour hotline available for reporting agricultural pesticide, fertilizer, and manure spills. The MDA Agriculture Pollution Emergency (APE) Hotline, (800) 405-0101, is designed to improve response time and provide appropriate technical assistance, reducing the environment risk associated with an agricultural chemical spill.

Users of agricultural pesticide, fertilizer, and manure products should report all uncontained spills or releases to the MDA APE Hotline. MDA has the responsibility to initiate response activities to immediately stop or prevent further releases at agricultural spill sites and will do so through possible interaction and assistance from the Michigan Department of Environmental Quality (MDEQ). The main goal of the MDA Spill Response Program is to clean up all agricultural spills quickly and completely and get the recovered material back out to where it can be used for its intended purpose. This goal is accomplished through providing immediate response, technical assistance, a common sense approach to clean up, and utilization of legal land application of recovered materials. ■

## Pesticide storage area safety

**S**torage of crop protection chemicals poses little threat when safety is considered and your storage area is properly maintained. The following checklist will help you keep storage area hazards to a minimum:

### Location of storage areas

Your storage building should be secure, dry, well ventilated, with fire retardant construction and an unbroken concrete floor to prevent groundwater contamination in case of a spill or fire. The structure should be located down slope and at least 100 feet from wells and distanced from other water sources such as streams and ponds. It also should be located in an area not subject to flooding.

### Post key information

Product labels and Material Safety Data Sheets (MSDS) for the products stored should be posted in your storage area, along with any specific safety instructions. Familiarize yourself and your employees with any hazards associated with handling specific products. Post emergency telephone numbers near the telephone closest to your storage area.

### Prevent cross contamination

Separate chemicals by class to minimize risk. For example, keep combustibles away from flammables, and prevent cross contamination with seed, fertilizers and other materials such as fuel or oil. If possible, use secondary containers, including concrete curbing, to further prevent cross contamination and minimize environmental contamination in case of spills.

### Add ventilation if necessary

Keep hazardous fumes to a minimum by ensuring adequate ventilation of all chemical storage areas. This will minimize the risk of explosion, fire, environmental contamination and human exposure. Natural ventilation works best when vents are near the floor and ceiling. Mechanical ventilation, however, offers more control over the air quality and temperature of your storage facility.

### Protect from flames, temperature extremes

Keep crop protection chemicals out of direct sunlight and temperature extremes. This is especially important for liquid formulations. Be sure not to weld or cut with acetylene torches near storage of flammable products or vapors. Aggressively enforce no-smok-

ing rules among employees and visitors whenever entering or working in pesticide storage areas.

### Keep safety equipment handy

Keep the proper fire extinguisher, spill cleanup equipment, safety equipment and water available for emergencies.

### Move pesticides safely

Equipment used to store, move or load products should be used

properly, taking special care to avoid dropping or puncturing containers. When delivering chemicals, secure your load carefully and drive slowly to prevent unnecessary hazards. Be sure to carry an MSDS for each product when transporting pesticides.

These recommendations should not be used



as the sole criteria for evaluating the adequacy of a pesticide safety program. For further information on applicable laws, contact your retail dealer or manufacturer representative. ■

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

## Calibrating and maintaining spray equipment

Calibration Test Course Chart	
Nozzle Spacing (in.)	Test Length (ft.)
40	102
38	107
36	113
34	120
32	127
30	136
28	146
26	157
24	170
22	185
20	204
18	227
16	255
14	291
12	340
10	408

**F**aced with production deadlines, common sense can often take a back seat when it's time to calibrate spray equipment.

Complex formulas and time-consuming calculations can be discouraging. But calibration errors can add excess chemical costs, reduce yields and increase potential for water contamination.

To avoid these problems, calibrate your spray equipment at least once a year with these 10 easy steps:

- Fill your sprayer tank with water. Only use clean water to calibrate.
- Measure the distance in inches between the nozzles on your spray boom.
- Choose the course length (in feet) from the chart at left. For directed and band rigs use the row spacing of the field you plan to spray. Measure the course distance in the field and flag it for easy visibility.
- Drive the test course at your normal spraying speed. Be sure to operate all equipment, spraying clean water over the test course. The important step here is to record the seconds it takes to drive the measured distance. You'll use that number later. Be sure

to take a "running start" at the starting flag so your tractor/sprayer reaches the desired speed before you begin timing.

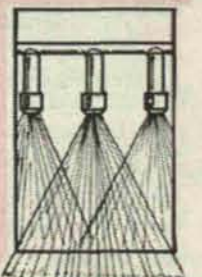
- Park your tractor/sprayer and set your brakes, but keep the engine rpm at the same setting used to drive the test course.
- Set the desired pressure on your sprayer (this will vary with the type of spray tips you use and the gallons per minute you wish to spray through them).
- Using a plastic container marked in ounces (a bottle or a measuring cup works well) collect the water that was sprayed from one nozzle during the same lapse of time it took you to drive the test course. Average your collection with several tries.
- The amount of water collected in ounces per nozzle equals gallons per acre applied. Vary the sprayer pressure slightly to fine tune your overall output. Write these numbers down for possible later use.
- Be sure to check your nozzles for uniform delivery by measuring the flow of each nozzle on the boom. If the flow rate of any tip is 10% greater or less than that of the others, replace it. If two or more are faulty, replace all tips on the entire boom. Whatever type of spray tip you choose, be sure to use all the same type on your boom.
- Finally, be sure to read the product label for proper application instructions.

These recommendations should not be used as the sole criteria for evaluating the adequacy of a pesticide safety program. For further information on applicable laws, contact your retail dealer or manufacturer representative. ■

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

### A chemical mixing checklist

- Read the label carefully and take notice of printed precautions on personal safety and environmental protection.
- Wear appropriate safety equipment when handling pesticides.
- When mixing and loading chemicals in the field, prevent spills that might contaminate water supplies.
- While filling sprayers, avoid back-siphoning by always keeping the discharge end of the fill hoses above the tank's water level.
- Prevent spray tank overflow by never leaving the filling station unattended.
- Never rinse equipment near wellheads, ditches, creeks or ponds.
- Before disposing of chemical containers, pressure rinse or triple rinse them, and drain the rinse liquid into the spray tank.





# Preventing pesticide spray drift during ground application

**W**henver pesticides are applied by ground application or by air, the potential exists for off-target movement or drift. This can create risk for nearby people and wildlife, damage non-target crops, and potentially pollute surface and groundwater resources.

An applicator can minimize spray drift and the risks associated with it, however, by using proper equipment, being mindful of weather conditions and practicing sound judgment.

Farmers should be aware of the principal factors that can affect drift, including droplet size and application pattern, equipment adjustments and weather conditions during application. Another key factor is sound judgment. Simply planning for the possibility of off-target movement of pesticides is a key step in reducing spray drift.

Doing so will not only improve your application efficiency and bottom line, but will eliminate concerns about downwind safety and the environment when making ground applications of pesticides.

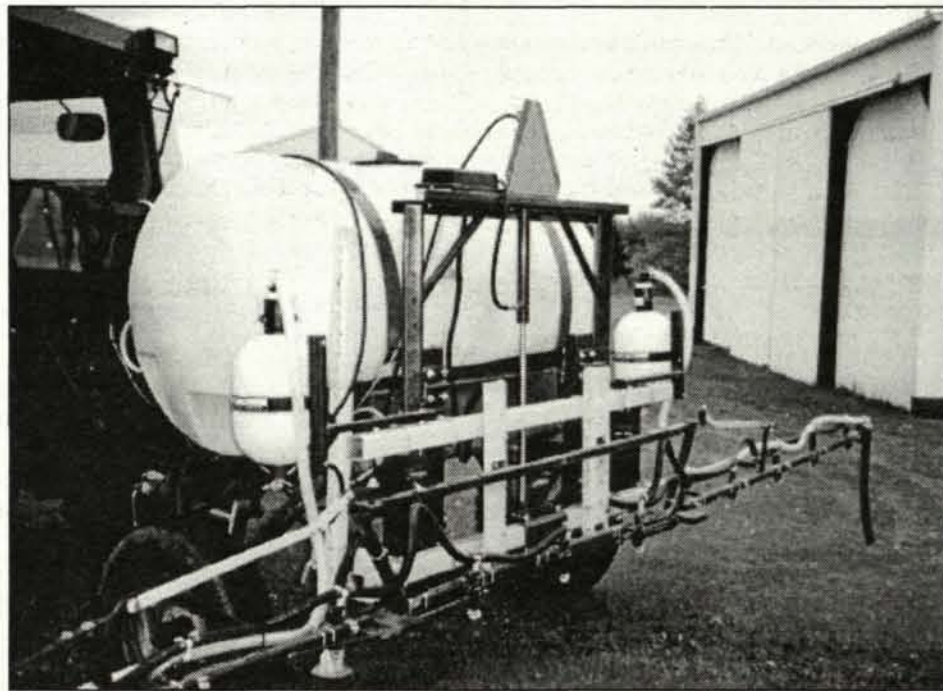
## Factors affecting drift

Several factors should be considered when planning a ground application of pesticides to avoid harmful spray drift:

### Droplet size

This is probably the most important factor affecting the potential for spray drift, as smaller droplets remain suspended in the air much longer and can drift longer distances than larger droplets.

Droplet size can be regulated by selecting the proper nozzle type and size, adjusting the spray pressure and increasing the viscosity of the spray mix. It is important to use nozzles that produce



Several factors, including wind speed and direction, relative humidity, temperature and atmospheric stability, affect drift when applying pesticides.

narrower spray-fan angles. This keeps the boom as close to the spray target as possible, while maintaining proper spray pattern. Another tip is to use minimal spray pressure, being sure to check pressure gauges for accuracy. You may also wish to install shields or shrouds on your booms.

### Weather conditions

Wind speed and direction, relative humidity, temperature and atmospheric stability are critical

weather factors that have an impact on spray drift. It's important to avoid spraying on extremely hot and dry days, when conditions are favorable for an atmospheric inversion. Wind speeds of less than four miles per hour or more than 12 miles per hour also produce risky conditions.

The impact of weather can be minimized by increasing the size of droplets, adjusting application to take advantage of wind direction or speed, and

by using adjuvants.

### Equipment adjustment

Routine sprayer calibration and replacement of worn spray nozzles should be high on your maintenance list. Other routine equipment adjustments should be identified to increase application accuracy and help reduce spray drift.

### Environmental planning

Being sensitive to the unique environment of your farm is a key component of the planning needed prior to and during pesticide application. Consider leaving an unsprayed strip or buffer zone around water supplies, sinkholes, abandoned wells, wetlands, downwind neighbors or sensitive crops. If you must spray these areas, be sure to do so when conditions are favorable.

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

### Planning checklist

- Use nozzles that produce narrower spray-fan angles.
- Keep the boom as close to the spray target as possible while maintaining proper spray pattern.
- Use minimal spray pressure and check pressure gauges for accuracy.
- Install shields or shrouds on booms.
- Avoid spraying on extremely hot and dry days.
- Do not spray when conditions are favorable for an atmospheric inversion.
- Leave an unsprayed strip of 50 to 100 feet near water supplies, abandoned wells, wetland areas, downwind neighbors or sensitive crops. If you must spray these areas, do so when the wind is favorable.

# Application equipment, methods and formulations

## Pesticide application methods

Generally accepted methods of pesticide application include, but are not limited to, the following equipment, methods and formulations.

Equipment	Methods	Formulations
airplane/helicopter	aerial	aerosol
air assisted applicator	banding	aqueous suspension
airblast sprayer	chemigation	bait
backpack sprayer, duster	controlled droplet application (cda)	control release formulation
controlled droplet applicator	dips & drenches	dispersible granule
fabric mesh and other products impregnated with pesticides	dusting	dry flowable
fogger	early preplant (epp)	dry soluble
fumigation equipment	foliar spray	emulsifiable concentrate
granular applicator	hopperbox treatment	emulsifiable solution
ground sprayer	granular surface application	encapsulated
hand gun	impregnated on fertilizer	flowable
hand sprayer	in furrow	gas
hopperbox application	injection	granule
incorporation into asphalt	preemergence (pre)	liquid
injector	pretransplant	oil solution
irrigation equipment (chemigation)	preplant incorporated (ppi)	pellet
low volume applicator	post-directed	ready to use
mister	post-emergence (post)	soluble granules
recycling sprayer	post-transplant	soluble powder
roller	ropewick	water dispersible granule
speed treated spreader	seed treatment	wettable powder
transplanter & seeder	ultra low volume (ulv)	
wick		
wiper		

**T**here are many types of pesticide application equipment and many pesticide formulations. Application methods for particular formulations may be specified on the label. To prevent degradation of water resources (and therefore to comply with federal and state laws) the applicator should choose a method that is accurate in applying the pesticide to the target.

A person applying pesticides may employ any method of application not prohibited by the pesticide label or labeling. Innovative application methods and equipment not specifically prohibited on a label or labeling are encouraged if they can improve the accuracy of application to the target and/or reduce total active ingredient or spray volume used.



The application equipment used and other factors determine the appropriate pesticide formulation.

# Proper cleanup of pesticide spills

**S**pills when handling, transporting or using pesticides are a concern for every producer. But by knowing what to do if a spill occurs, whether it's on your property or on the road, you can help minimize risk and prevent ground and surface water contamination. Here are some tips for proper cleanup of spills:

■ **Control the spill.** Stop the spill as quickly as possible by restoring the container to its upright position, closing a leaking valve or hose, or putting a secondary container in place to catch the leaking solution. Of course, appropriate personal safety equipment should be used, such as rubber gloves, rubber boots and eye protection. A respirator may be necessary for some chemicals.

■ **Call your retailer.** Get advice quickly from your ag chemical retailer on cleanup of specific chemicals. They can also provide you with special safety advice and other information.

■ **Contain the spread.** When the leak has been stopped, contain the spread of the spill by creating soil dams in the path of the spilled liquid. It may be most important to first divert a spill away from a nearby pond, stream or storm sewer before attempting to stop the spill or leak. This is a judgment call that only you can make.

■ **Begin cleanup promptly.** As soon as the situation has been stabilized, begin cleaning it up. Quick response to a spill is not only required in many states, but will prevent the chemical from leaching or washing away in a rainstorm.

■ **Use absorbent materials.** On pavement or concrete, use absorbent materials to capture the spilled liquids. They can then be shoveled or swept into disposal containers. Nonchlorinated pet litter is an excellent, inexpensive absorbent material to keep on hand for such purposes.

■ **Properly dispose of the drenched materials.** The size and content of the spill and state regulations will determine how you dispose of the drenched soil or absorbent materials. Contact state or local officials or your retailer for legally acceptable disposal options.

■ **Report the spill.** If required, report the spill before it threatens public health or the environment. If the spill is large or enters a waterway, you will need to call the local EPA office, local

emergency planning office, or the state health department. The reporting criteria varies with the chemical spilled, however, so ask your dealer to check the Material Safety Data Sheet or call the manufacturer for further details. Important telephone numbers include: Chemtrec Emergency Hotline: 800-424-9300; EPA Pesticide Management & Disposal: 703-305-7385; EPA Hazardous Waste Hotline: 800-424-9346; EPA Safe Drinking Water Hotline: 800-426-4791.

Nonchlorinated pet litter is an excellent, inexpensive absorbent material to keep on hand for spill cleanup. Be careful to properly dispose of the contaminated material when finished.

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

# Protective clothing and equipment

**P**esticide safety begins with proper use of protective clothing and equipment. Wearing them may feel uncomfortable, inconvenient or time consuming to put on. But wearing protective equipment when handling pesticides is essential to your safety and that of your workers. Often it is also a legal requirement — an important part of the manufacturer's risk management strategies found on the product label and Material Safety Data Sheet (MSDS). Be sure you and your employees read them carefully.

## Minimize worker exposure

Chemical exposure can occur through the skin, by mouth, eyes and by inhaling fumes or dust while handling, mixing, loading or applying. Open wettable powder packages and liquid containers carefully, adjust spray nozzles and clean up spills while wearing gloves, face mask and other appropriate equipment as required.

## Workplace habits

Chemicals can find their way into your mouth by handling food or tobacco products with unwashed hands. Be sure to properly wash your hands before eating or smoking, and before using the restroom. Rinse rubber gloves thoroughly before taking them off, and then wash your hands. At the end of each day, wash your gloves and hands again, and fill the gloves with clean water and squeeze. Throw away any gloves that leak.

## Cover your eyes

Goggles and face shields join gloves as the first line of safety defense against splashes and spills



Use personal protective equipment when working with pesticides, such as what is recommended above.

when opening containers, pouring or applying chemicals — especially those carrying WARNING, DANGER or DANGER/POISON signal words on the label. Keep an approved emergency eyewash bottle close at hand.

## Clothing counts

A long-sleeved shirt, long pants or coveralls, and high top shoes or boots are also important safety precautions. Choose them for comfort and effective worker protection, regardless of style. Sandals or sneakers are totally unsafe, and even leather shoes

pose a risk, for they can absorb chemicals. Rubber boots or rubber shoe covers work best.

## Respirators are often required by law

Product labels often require respirators when working with some products. A dust mask is no substitute for a pesticide respirator. Make sure the respirator you select fits properly and is approved for pesticide use. Train your employees to use respirators properly, keep them clean and change filters as specified. Keep a supply of replacement parts handy.

## Other protection

Wide brim hats protect the head and neck when applying chemicals overhead, although hair and scalp should be thoroughly washed after using chemicals. Rubber aprons may be required by the label of some products. They provide protection from splashes, container leaks, broken hoses or other unexpected exposures. Finally, remember that water is cheap insurance. Keep a supply of fresh water available at all times for emergencies and routine wash-ups.

## When Handling Pesticides

- Wear rubber gloves.
- Use goggles or face shields.
- Wear a wide-brim hat, long-sleeved shirt, long pants, and rubber boots or shoe covers.
- Keep a supply of clean water handy and wash your hands before eating.
- Check the label for additional precautions. ■

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

# Cleaning up after pesticide use

**A**t the end of a long day of field or yardwork, your first thought is probably eating a hot meal or sinking into your favorite chair to relax. But if your work included pesticide application, the first thing you should do is head for the sink or shower. Like working with any hazardous material, the potential health risks associated with pesticide use not only depend on the toxicity of the product, but the extent of your exposure to it (risk = toxicity x exposure). Whether you're pouring gasoline or pesticides, if you reduce your exposure, you reduce your risk.

## Washing up

In addition to wearing personal protective equipment and following the label to safely apply pesticides, one key way to reduce exposure is to make sure you properly clean yourself and your clothing following each contact with a pesticide. The greatest amount of exposure occurs on the hands and forearms. In fact, the skin is the main route for chemical entry into the body. When you consider a typical day, you can quickly see how your hands can get contaminated. After all, your hands open pesticide and other containers, turn valves, adjust nozzles, carry hoses, clean up equipment and

sometimes clean up spills. These same hands rub dust from your eyes, wipe perspiration from your face, blow your nose, and hold cigarettes or food. A good safety practice before eating, drinking, smoking or using the restroom is to rinse your gloves thoroughly before taking them off, then wash your hands. At the end of each day, rinse your gloves inside and out. Fill your gloves with water and squeeze — throw away any that leak. Scrub your forearms, hands and fingernails carefully after washing your gloves and other safety equipment. A hot shower will clean any pesticide traces from your ears, hair and other exposed places.

## Carefully handle contaminated clothing

Always assume clothing worn when working around pesticides is contaminated. Changing into clean work clothes or coveralls after each session of handling, mixing or applying pesticides will significantly reduce the risk of exposing yourself or your surroundings. Don't "bring your work home with you" by wearing pesticide-contaminated work clothes in your car or house, and don't store or wash them with the "family load" of other clothing. In fact, you may wish to install a separate washing machine and shower where you store, mix or load chemicals.

## Washing pesticide-contaminated clothing

Here's what to do with those coveralls, socks and other clothing if you've been applying pesticides:

- Wash work clothing promptly. Even if they look clean, always wash clothing promptly after applying pesticides. The longer soiled clothing is stored, the harder it is to remove chemical contaminants.
- Handle contaminated clothing properly. Wear rubber gloves when handling contaminated clothing. If liquid concentrates have spilled on any clothing other than rubber gloves or boots, throw them away — they can't be completely cleaned. Granules or wettable powders should be emptied from cuffs and pockets outdoors.
- Pre-rinse or pre-soak contaminated clothing. In a washing machine filled with hot water and heavy-duty liquid detergent, pre-rinse or pre-soak a few items of clothing at a time. Then spin out and drain the contaminated water before running the wash cycle. Pre-rinsing followed by a regular wash is the most effective method of removing contamination from clothing.

- Careful washing and rinsing is essential. After pre-soaking, fill the washing machine a second time with hot water and heavy-duty liquid detergent. Select an extended wash cycle if it is an option on your machine.
- Clean the empty washing machine. When you are finished, be sure to run a complete hot-water, heavy-duty liquid detergent wash cycle to thoroughly remove any remaining chemical residues.
- Line-dry the clothing. Unless a dedicated work clothes dryer is available, line-dry your clothes to avoid possible contamination of the family dryer.
- Add starch as an added protective measure. Recent research by Cornell University textile scientists shows that starch provides a finish that traps pesticides and helps prevent their transfer to skin. The starch-bound chemicals will rinse away in the wash.
- Don't forget to wash safety equipment. Safety equipment is only as good as it is clean, so don't forget to rinse masks, gloves, aprons and boots daily and check them for leaks and proper fit. Fill your gloves with clean water and squeeze. Throw away any gloves that leak. ■

Source: Agriculture for a Clean Environment, an organization sponsored by the American Crop Protection Association and the Agricultural Retailers Association.

# Using pesticides properly, safely is key

**I**n the rush of the growing season, it's easy to overlook important safety precautions when using pesticides. But the benefits of pesticides can quickly disappear if accidents occur and injury or environmental contamination results. To avoid such mishaps, "take time for safety" before using pesticides — no matter how experienced you may be. Here are some important considerations to ensure you and those around you remain safe:

## Read the label carefully

No matter how familiar you are with a specific product, refer to the label for important application guidelines, chemical compatibilities and precautions for safety and environmental protection. The label information isn't advertising — it's solid science. It provides exact application procedures, required protective clothing, equipment, precautions about hazards to people, wildlife and the environment, proper reentry intervals, and emergency response information, and the product manufacturer's name and address.

## Wear protective equipment

When handling or applying pesticides, appropriate personal safety equipment is essential. Start out by routinely wearing a wide-brim hat, long-sleeved shirt, long pants and chemical-resistant gloves. You should also wear sturdy work shoes or rubber boots, not sneakers or sandals when handling pesticides. Depending on the product you are

using, it may be necessary for you to wear goggles, a face shield or a respirator. Be sure to keep a supply of clean water handy in your truck and spray rig, and wash your hands, forearms and face before eating or smoking.

## Eliminate spills when mixing and loading

Prevent spills that waste product and might contaminate water supplies. Prevent tank overflow by never leaving a sprayer unattended during filling. Use a 100-foot hose to move chemical mixing and loading operations as far away from your well-head as possible to reduce the risk of contamination in case of a spill. Be certain chemical pumping equipment has anti-backflow devices and check valves. While filling sprayers, avoid back siphoning by keeping the discharge end of the fill hose above the tank's water level. If you put the end of the hose down into the pesticide liquid in the tank, you run the very real risk that the hose will suck water and chemicals back into the well when you turn off the water supply.

## Calibrate your sprayer

After you've read the label and chosen the right application rate, it's important to make sure your sprayer is delivering the right amount of product per acre. Calibrate your sprayer before the season begins and throughout the season. Be sure to check nozzles by measuring the flow of water from each nozzle on the boom to ensure uniform distribution. If the flow rate of any tip is 10 percent great-

er or less than that of the others, replace it. If two or more are faulty, replace all tips on the entire boom. The total expense involved is small compared to the cost of wasted product or environmental harm. Whatever type of spray tip you choose, be sure to use all the same type on your boom.

## Mix only needed quantities

Prevent leftover chemicals by calculating the amount needed for your field size and desired application rate. Things to consider when preparing your tank mix recipe include: (a) the prescribed rate per acre for each product, (b) the capacity of the spray tank, (c) the amount of mix to be applied per acre, (d) the order in which to mix the products, (e) types and rates of any additives, (f) acres covered per tank, (g) types of nozzle to be used, (h) nozzle pressure in psi and tractor speed. If you are still left with some excess material, dispose of it by spraying it over another piece of ground. Remember to follow label instructions.

## Container management

Always pressure-rinse or triple-rinse pesticide containers immediately following application, pouring the rinse water into the spray tank. When properly rinsed, your pesticide containers are ordinary trash. The best way to dispose of them is to take them to a pesticide container collection and recycling facility.

## Spill cleanup

When a spill occurs, immediately control it, using care and safety equipment to avoid personal exposure. Turn the spilled container upright, close the leaking valve or hose, or put a secondary container in place to catch the leaking solution. Call your retailer for advice on cleanup of specific chemicals and other emergency response and safety information. When the leak has been stopped, contain the spread of the spill by creating soil dams in the path of the spilled liquid, taking special care to divert the flow from nearby storm drains or water bodies. Begin the cleanup as soon as possible, using absorbent materials. Follow state regulations on the proper disposal of the drenched soil or absorbent material. Report the spill, if required, before it threatens public health or the environment. Contact state or local officials or your retailer for legal responsibilities.

## Washing up

At the end of the day, carefully remove contaminated work clothing. Assume all clothing is contaminated if it has been worn around pesticides. Wash clothing daily in hot water and heavy-duty detergent, using a separate washing machine if possible. Always keep work clothing separate from "family" wash loads. Line-dry clothes after washing and run an empty wash cycle with hot water and detergent to clean the machine. Also, be sure to wash and inspect your safety equipment for damage. ■

# State and federal laws and regulations

**A person applying agricultural pesticides in Michigan must comply with all relevant state and federal laws and regulations. These include, but are not limited to:**

**The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947 as amended.**

This is the basic federal law regulating pesticide registration and use in the United States. A new part of this law requires states to implement a state management plan for specific pesticides that may contaminate groundwater. Pesticide applicators are required to adhere to state components of this plan.

**Federal Worker Protection Standard of 1992.**

This regulation was written by EPA governing the protection of employees on farms, forests, nurseries, and greenhouses from occupational exposures to agricultural pesticides. They are intended to reduce the risk of pesticide poisoning and injuries among agricultural workers and pesticide handlers through appropriate exposure reduction measures. The regulations expand the requirements for insuring warnings about pesticide applications, use of personal protective equipment and restriction on entry to treated areas. New requirements are added for decontamination, emergency assistance, maintaining contact with handlers of highly toxic pesticides, and pesticide safety training.

**Federal Record Keeping.** Authorized by the 1990 Federal Food, Agriculture, Conservation and Trade Act (farm bill), new requirements are being developed for record keeping of federally restricted use pesticides (RUPs) by certified applicators.

**The Superfund Amendments and Reauthorization Act (SARA) of 1986 Title III: Emergency Planning and Community Right-to-Know.**

This Federal law provides mechanisms to prepare for chemical emergencies. Persons storing pesticides that are considered to be extremely hazardous by EPA above "Threshold Planning Quantities", must notify the State Emergency Response Commission within MDEQ, the Local Emergency Planning Committee and the local fire chief that they store at least one of these chemicals above threshold at some time. The location of the storage facility and name and telephone number of a responsible person must be reported also. If there is a spill or release of one of these chemicals above the "Reportable Quantity", the same organizations must be notified. MSU Extension Bulletin E-2175 contains information to help farmers comply with the law.

**The Endangered Species Act (ESA) of 1973 as amended.** This Federal law protects endangered species and their habitats from the adverse effects

of pesticides. Pesticide labels will contain information on endangered species and restricted use areas.

**National Fire Prevention Association Code 395.**

The Michigan State Fire Marshal has adopted the NFPA Code 395 which regulates the storage of combustible and flammable liquid chemicals with a flash point below 200°F on the farm. If you construct a new chemical storage facility, contact your local building inspector to be sure you are in compliance with the fire code's construction, diking and location requirements. The code sets requirements for the amount and location of stored chemicals; the type, construction and size of containers; and fire prevention devices which need to be incorporated into structures.

**Public Act 451, The Natural Resources and Environmental Protection Act of 1994.**

■ **Part 31, Water Resources Protection** (formerly Public Act 245, The Michigan Water Resources Commission Act of 1929 as amended). This act provides broad substantive bases for protection and conservation of surface and groundwater resources of the state.

■ **Part 55, Air Pollution Control** (formerly Public Act 348 of 1965 as amended, Air Pollution Control). The Michigan Department of Environmental Quality has statutory authority, powers, duties, functions and responsibilities for rule making and issuance of permits and orders for air pollution control, including burning of pesticide containers. The Act provides for control of air pollution which may be in the form of a dust, fumes, gas, mist, odor, smoke, or vapor, in quantities which are or can become injurious to human health or welfare, animal life, plant life or to property, or which interfere with the enjoyment of life or property.

■ **Part 83, Pesticide Control** (formerly Public Act 171, Michigan Pesticide Control Act of 1976 as amended). This Michigan law regulates registration, distribution, labeling, storage, disposal and application of pesticides in Michigan. The act was amended in 1993 to allow MDA to respond to incidents of confirmed groundwater contamination.

■ **Part 87, Groundwater and Freshwater Protection** (formerly Michigan Groundwater and Freshwater Protection Act, Public Act 247 of 1993). This act establishes the necessary legal

authorities to develop and implement voluntary, proactive management practices for pesticides and fertilizers that are protective of groundwater. The act provides for technical assistance, grants and research and demonstration projects that will be available to agricultural producers in order that they can change current practices that may be impacting groundwater. The act also establishes a statewide advisory committee and regional groundwater stewardship teams that will work directly with producers.

■ **Part 111, Hazardous Waste Management**

(formerly Public Act 64, The Hazardous Waste Management Act of 1979 as amended). This law protects public health and the natural resources of the state from harmful effects of hazardous wastes. When pesticides are not used according to label directions, are out of condition, or are suspended or canceled, they may become hazardous wastes and have strict transportation, treatment, storage and disposal requirements. This also includes pesticide containers that are not triple-rinsed or power-washed.

■ **Part 115, Solid Waste Management**

(formerly Public Act 641, The Michigan Solid Waste Management Act of 1978 as amended). This law provides for proper design and licensing of non-hazardous landfills, and provides disposal requirements for various types of wastes. It lists over 60 approved licensed landfills that can accept properly rinsed pesticide containers.

■ **Part 201, Environmental Response**

(formerly Public Act 307, The Environmental Response Act of 1982 as amended). This act provides for the identification, risk assessment and priority evaluation of environmental contamination and provides for response activity at certain facilities and sites. This Act also provides an exemption from liability for farmers if they follow the pesticide label and Generally Accepted Agricultural and Management Practices. Any spills or discharges of polluting material (including pesticides) that may potentially reach any surface or ground water must be controlled and reported to the Michigan Department of Agriculture Pollution Emergency Hot Line, (800) 405-0101, or the Michigan Department of Environmental Quality, Pollution Emergency Alerting System (PEAS) at (800) 292-4706.

■ **Public Act 154, The Michigan Occupational Safety and Health Act**

(MIOSHA) of 1974 as amended. The Michigan Department of Public Health and Michigan Department of Labor jointly enforce this law to protect workers who handle or during normal working conditions might be exposed to pesticides. Employers are required to develop and implement a written employee training program as well as insure that all pesticides or other hazardous chemical containers are properly labeled. For hazardous chemicals other than pesticides, the employer is required to have Material Safety Data Sheets available for employee review. In case of pesticide, labeling information may be furnished if Material Safety Data Sheets are unavailable. Copies of Material Safety Data Sheets for pesticides are normally available from pesticide manufacturers or distributors. Additionally, farmers are advised to cooperate with their local fire department and local emergency planning committees in furnishing requested information.

**Public Act 339, The State of Michigan Safe Drinking Water Act of 1976 as amended.**

An act to protect the public health; to provide for supervision and control over public water supplies; to provide for the classification of public water supplies; and to provide for continuous, adequate operation of privately owned, public water supplies. This act sets forth standard isolation distances from any existing or potential sources of contamination and regulates the location of public water supplies with respect to major sources of contamination.

**Public Act 346, The Commercial Drivers' License Law of 1988.**

This act requires farmers to obtain a hazardous material endorsement on their commercial drivers' licenses when transporting pesticides requiring placarding on vehicles exceeding 26,001 pounds GVWR.

**Public Act 368, the Michigan Public Health Code of 1978 as amended.**

An act to protect and promote the public health; to codify, revise, consolidate, classify, and add to the laws relating to public health; to provide for the prevention and control of diseases and disabilities; and to provide for the classification, administration, regulation, financing, and maintenance of personal, environmental, and other health services and activities. ■

## Pesticide use recommendations and technical assistance

Michigan State University Extension provides education and recommendations on correct and effective use of pesticides on most agricultural commodities grown in Michigan (see list at right).

Growers meet pesticide rate standards for Generally Accepted Agricultural and Management Practices if they apply pesticides at or less than legal labeled rates. Pesticide uses for commodities not included in MSU recommendations but in accordance with their respective labels or labeling will also meet the application rate requirements of these Generally Accepted Agricultural and Management Practices.

The Natural Resources Conservation Service (NRCS) role is to provide technical assistance to agricultural producers. Their Field Office Technical Guide (FOTG) provides the standards which establish minimal acceptable elements of conservation plans designed to maintain soil productivity and protect the environment.

The Michigan Certified Crop Adviser (CCA) is a nationally recognized, voluntary certification program developed through the collaborative effort of the public sector and the agriculture industry to ensure high standards for crop advisers. It is intended for anyone who makes nutrient, pesticide, crop or environmental recommendations to producers, including dealers, distributors, applicators, consultants, manufacturers, allied industries, and state and federal agency personnel. The CCA program is administered by state boards in association with the American Society of Agronomy, which handles similar programs for specialists in agronomy, crop consulting, weed science and other agricultural disciplines. ■

## Agency recommendations

**MSU pesticide use and pest control recommendations are contained in, but not limited to, these publications and computer programs**

- E-154 Fruit spraying calendar for commercial growers
  - E-312 Control of insects, diseases, and nematodes on commercial vegetables
  - E-434 Weed control guide for field crops
  - E-1582 Chemical control of insects and nematodes in field and forage crops
  - E-2022 1987 Disease Control Guide for Broadleaf Trees, Shrubs, Ground Covers and Vines
  - E-2088 Insect and mite management on landscape plants
  - E-2178 Insect, weed and disease management on commercial turfgrass
  - E-2572 Control and Management of Christmas Tree Insect Pests in Michigan
  - NCR-251 Effective Herbicide Use on Christmas Tree Plantations
  - NCR-330 North Central Weed Control Guide for Vegetable Crops
  - NCR-491 Control of Diseases on Commercial Outdoor Flowers
  - NCR-521 Control of Diseases on Commercial Greenhouse Crops
  - NCR-558 Insect Control for the Greenhouse Industry
  - CPO22 SOYHERB
  - CPO28 CORNHERB
- MSU extension bulletins and other resources relevant to these Generally Accepted Agricultural and Management Practices can be obtained through the MSU Learning Materials Catalogues and include:
- AM-95 Rinsing and Recycling Pesticide Containers
  - E-2099 Using Chemigation Safely and Effectively
  - E-2106 The Michigan Worker's Right to Know Law
  - E-2155 Storing Pesticides Commonly Used in Vegetable/Fruit Production
  - E-2575 SARA Title III, The Farmer's Responsibilities Under the Emergency Planning and

Community Right-to-Know Law

- E-2195 Commercial and Private Pesticide Applicator Core Manual: Initial Certification
- E-2215 Using Pesticides Safely: A Guide for the Applicator
- E-2335 On Farm Agrichemical Storage and Handling
- E-2349 Protect Your Water Supply From Agricultural Chemical Back-flow

Midwest Plan Service 37  
Fertilizer and Pesticide Containment Facility Handbook

- WQ-27 Managing Pesticides on Dry Beans-Avoid Contaminating Water
- WQ-28 Managing Pesticides on Christmas Trees to Avoid Contaminating Water
- WQ-29 Managing Pesticides on Hay/Forage-Avoid Contaminating Water
- WQ-30 Managing Pesticides on Potatoes-Avoid Contaminating Water
- WQ-31 Managing Pesticides on Soybeans-Avoid Contaminating Water
- WQ-32 Managing Pesticides on Small Grains-Avoid Contaminating Water

Useful U.S.D.A. Natural Resources Conservation Service publications include:

Technical Guide 595, Pest Management Standard

Useful Worker Protection Standard Publications include:

- The Worker Protection Standard for Agricultural Pesticides — How to Comply, What Employers Need to Know
- Protect Yourself From Pesticides — Guide for Agricultural Workers
- Protect Yourself From Pesticides — Guide for Pesticide Handlers
- Protect Yourself From Pesticides — Safety Poster
- Protect Yourself from Pesticides: Safety Training

for Agricultural Workers — Flip Chart

Pesticide Handlers and the Worker Protection Standard: EPA-Approved Pesticide Safety Training for Your Pesticide Handlers. Available in English and Spanish. VT 048-EN, VT 048-SP.

Pesticide Safety for You and Your Family's Health. EPA-Approved Pesticide Safety Training for Your Workers. Available in English and Spanish. VT 046-EN, VT 046-SP. ■



**In the event of an agricultural pollution emergency such as a chemical or fertilizer spill or manure lagoon breach, the Michigan Department of Agriculture and/or the Michigan Department of Environmental Quality should be contacted at the following emergency telephone numbers:**

**Michigan Department of Agriculture  
(800) 405-0101**

**Michigan Department of Environmental Quality  
(800) 292-4706**

If there is not an emergency, but you have questions on the Michigan Right-to-Farm Act or items concerning a farm operation, please contact:

Michigan Department of Agriculture  
Right-to-Farm Program  
P.O. Box 30017  
Lansing, MI 48909  
(517) 373-1087

# Pesticide applicator survey — What the survey says ...

**M**embers of Michigan Farm Bureau Commodity Advisory Committees, county Farm Bureau boards of directors and MACMA Marketing Advisory Committee Members totaling 850 participants completing the survey in the summer of 1995 on the effectiveness and value that the Michigan Department of Agriculture's (MDA) Pesticide Applicator Certification Program. The results of the survey provided MFB and MDA with data on what is working and what needs to be corrected.

Nearly 90 percent of the farmers who responded are certified pesticide applicators and work with agricultural pesticides. These farmers have been applying/handling pesticides for an average of 20.6 years. While some farmers have only three years experience, others have had 55 years.

Most farmers strongly favor the certification examination requirements. The examination helps to teach farmers to work more responsibly with chemicals. However, several farmers were quick to point out the certification does not assure proper handling or application. Many respondents feel the process helps create a public perception of farmers as professionals.

Preparing for the applicator certification exam, the majority of the respondents attended a training program. The quality of learning material and length of the program was very beneficial. Several respondents expressed the need to have additional training sessions or review sessions. In addition, about 80 percent of the farmers spent time on their own studying the pesticide applicator core manual. While the majority picked up the manual at their local Extension office, over 25 percent ordered the manual from MSU Extension Bulletin office. Farmers who used the manual found it easy to understand.

The vast majority of respondents (93.1 percent) found it easy to obtain a certification application form. In addition 93.2 percent of the respondents found the certification exam about right or too easy based on the knowledge of material covered in the exam. Over 81.9 percent of the respondents feel the content of the exam is applicable to their pesticide application activities. The questions were clear and understandable and related to current pesticide application. The majority of the respondents felt the overall length of the exam to be about right.

The majority of the respondents were satisfied with the exam location and staff which conducted the exam. The results of the exam were returned in a reasonable length of time. Several respondents indicated the results should include the questions which were answered incorrectly. In addition it was suggested there be an exam for fruit growers and field crop applicators rather than a general exam.

Several suggestions were made to improve the exam:

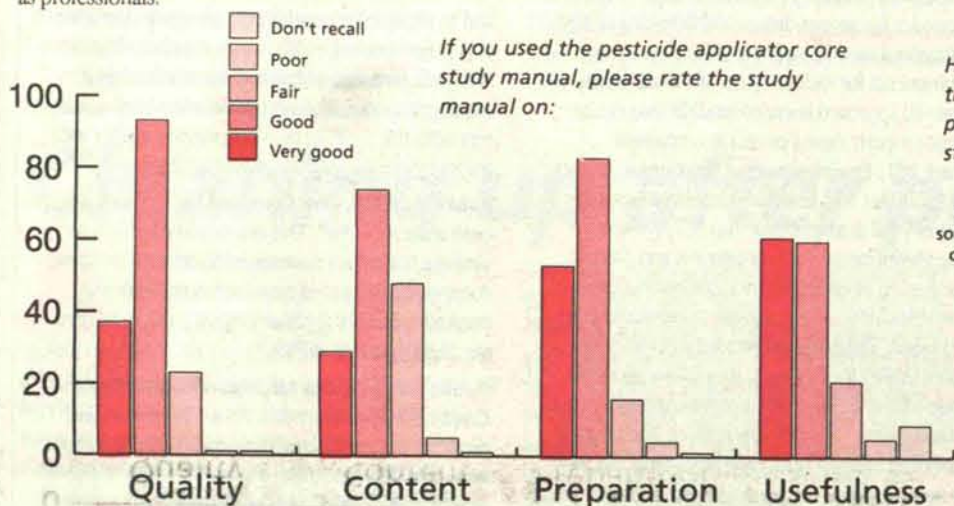
- Provide a question on how to mix products into the sprayer after you have determined the rate of applications.
- Offer exam sessions at the Secretary of State office in each county.
- Offer test at different times of the day - morning, noon and evening at the same location.
- Develop an exam that, once graded by the examiner, the farmer can have the test results.

Over two-thirds of the respondents have attended college or vocational school and are 51 years or older.

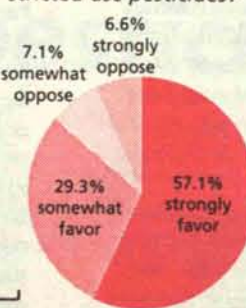
A few respondents believe recertification is not necessary but rather attend a few chemical

meetings. The information presented in the meeting will assist the farmer on technology change faster than taking an exam every three years. Also the question was raised, why don't homeowners take an exam for lawn and garden care?

The overwhelming majority of the respondents are very satisfied with Michigan Department of Agriculture pesticide applicator certification program. Education seminars where exam recertification credits are obtained are beneficial. These sessions need to stress protecting the environment and how to properly apply pesticides. The information at these meetings can be directly applied to the operation, while some of the information in the manual or on the exam may not be useful in applying and handling pesticides on the farm. It was suggested that these sessions be offered at least twice a year. Attending sessions should result in recertification every five years rather than the current program of every three years also was suggested. Finally, the respondents agreed that the certificate does not replace proper management. Each individual applicator still has to be responsible and follow the labeled directions. ■



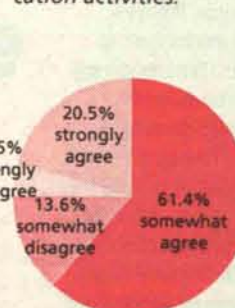
**How do you feel about the requirements for people who apply restricted use pesticides?**



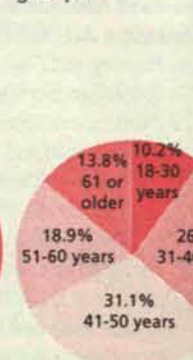
**Given what pesticide applicators should know, do you think the certification exam was ...**



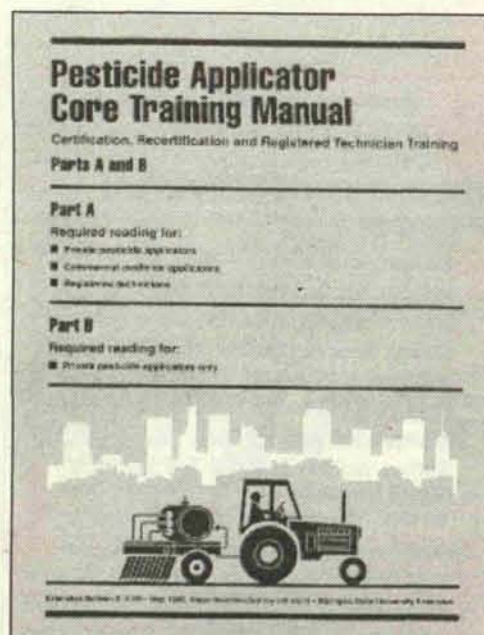
**The content of the exam was applicable to my pesticide application activities.**



**What is your age group?**



## Pesticide Applicator Core Training Manual



To obtain pesticide applicator certification, candidates must pass an exam administered by the Michigan Department of Agriculture. The Pesticide Applicator Core Training Manual serves as a study guide. Following is an excerpt from the manual.

### Compatibility of pesticides

Two or more pesticides may be combined and applied at the same time. Such mixtures can save time, labor and fuel. Manufacturers sometimes combine pesticides for sale as a premix, but pesticide handlers also sometimes combine pesticides at the time of application.

Unless federal law, combining pesticides is legal unless the pesticide labeling of any of the pesticides involved instructs you not to combine them. However, not all pesticides work well when mixed together. They must be compatible — that is, mixing them together must not reduce their safety or effectiveness in any way. The more pesticides you mix

together, the greater the chance of undesirable effects.

Several possible types of incompatibility should be considered before an applicator attempts to mix products — physical, chemical, phytotoxicity, placement and timing.

Some pesticide mixtures that are physically incompatible make the mixture difficult or impossible to apply and may clog equipment, pumps and tanks. These reactions sometimes cause the pesticide to form lumps or gels, to become solids that fall to the bottom of the mix tank or to separate into layers that cannot be remixed.

Sometimes the combined pesticides create a chemical reaction that cannot be seen by looking at the mixture. However, the chemical change can result in:

- Loss of effectiveness against the target pests.
- Increased toxicity to the pesticide handler.
- Injury to the treated surface.

Some pesticide labeling lists pesticides (and other chemicals or fertilizers) known to be compatible with that formulation. If you cannot find information on the compatibility of the two pesticides (or the pesticide and other chemical) that you wish to mix, test a small amount of the mixture before you mix large quantities and contact the manufacturer for information. This process is described in the next section.

It is necessary to time pesticide applications when the pest is at a vulnerable stage of development. When using two or more chemicals to manage different pests, it is of utmost importance that the mixture be applied at the correct time in the life cycles of all pests involved to be effective.

Phytotoxic incompatibility occurs when a product mixture causes injury to plants sprayed with the mixture. This can happen even though each of the pesticides in the mixture, when applied separately, does not cause injury.

Lastly, when mixing two or more pesticides, be sure that they are both required to be placed at the site or on the target pest in the same manner — e.g., avoid combining a foliar pesticide with a pesticide that must reach the root zone of a plant.

Remember, never assume that pesticides can be mixed together or mixed with a fertilizer unless the combination is specifically indicated on a product label. If recommendations for use are not given on the label, the products in the mix must be applied at a rate not to exceed the label directions for use of any component product applied alone for the same purpose; and the mix can be applied only if not prohibited on any of the component product labels.

Compatibility testing — First, put on personal protective equipment required by the labeling of any of the pesticides to be combined. Get a large, clean, clear glass container, such as a quart jar. Use the same water (or other diluent) that you will use when making up the larger mixture for application. Add the water and each of the products in the same proportions as you will mix them for your treatment. If you are working with large areas, Table 3.1 will help you mix the proportionate amounts of diluent and pesticide for the compatibility test.

Unless the pesticide labeling states otherwise, add pesticides to the diluent (usually water) using the "W-A-L-E" plan:

- Add some of the diluent first.
- Add **W**ettable and other powders and **W**ater-dispersible granules.
- **A**gitate thoroughly and add the remaining diluent.
- Add the **L**iquid products, such as solutions, surfactants and flowables next.
- Add **E**mulsifiable concentrates last.

Shake the jar vigorously. Feel the sides of the jar to determine if the mixture is giving off heat. If so, the mixture may be undergoing a chemical reaction and the pesticides should not be combined. Let the mixture stand for 15 minutes and feel again for unusual heat.

If scum forms on the surface, if the mixture clumps or if any solids settle to the bottom (except for wettable powders), the mixture probably is not compatible. Some commercially available adjuvants, known as compatibility agents, may be added to overcome physical incompatibilities between certain pesticides. These should be added into the quart jar

at the beginning of the compatibility test to determine their effectiveness. Finally, if no signs of incompatibility appear, test the mixture on a small area of the surface where it is to be applied. ■

**Table 3.1 — Amounts of pesticide(s) and diluent to use in compatibility test**

Amount of diluent to add to quart jar	Amount of diluent to add to a quart jar
10 gallon	0.4 pint (6.4 oz.)
15 gallon	0.6 pint (9.6 oz.)
20 gallon	0.8 pint (12.8 oz.)
25 gallon	1.0 pints
30 gallon	1.2 pints
40 gallon	1.6 pints

Teaspoons of pesticide(s) to be added to quart jar:  
1 teaspoon for each quart of E.C. recommended per acre.  
1 1/2 teaspoon for each pound of W.P. recommended per acre.

