FARM SAFETY TRAINING

This training module will cover many types of hazards that you may find at one of the University’s farms. However, this session does not completely cover all of your training. When you have completed this training module, print out the Farm Safety Training Test and submit to the Farm Supervisor for recordkeeping purposes. Once that is completed, the Farm Supervisor will then cover any area specific hazards.

BACKGROUND

The dangers involved with farming activities have always existed. Even in this day and age, hundreds of people die every year from farm related accidents. According to the National Safety Council, 710 farm related fatalities and 110,000 disabling injuries occurred in the United States in 2003. Here at the University of Maine, we are committed to proactively preventing all hazards associated with agricultural research.

![Figure 1: An improperly secured load that fell onto the tractor. The ROPS and canopy prevent the operator from being injured.](image)

TRACTOR SAFETY

Tractors are more common on farms than any other piece of equipment and are used to provide most of the muscle power needed. When used properly, tractors are a very safe and useful tool. Unfortunately every year, accidents involving tractors result in serious disabling injuries and tragic loss of life. These accidents are the number one cause of fatalities on the farm.

![Figure 2: A tractor rollover.](image)

There are many different types of accidents that can occur while operating a tractor. Rollovers or overturns account for over half of the fatal tractor accidents and are responsible for many disabling injuries and much property damage. Other tractor related accidents are:

- Being caught by or entangled in a PTO
- Colliding with vehicles or roadside objects
- Slipping and falling while mounting and dismounting
- Striking overhead hazards
- Being crushed by a poorly supported tractor during repair work
- Being overcome by exhaust gases (Carbon Monoxide) inside closed buildings
Prior to operating a tractor, each employee/student/volunteer must attend a hands-on tractor operating training class. Proctored by a competent person, this class will cover how to safely operate a tractor. Once this class is completed and you have the farm supervisor’s permission, you are ready to operate a tractor.

Once you are properly trained, you should follow five simple steps prior to operating a tractor.

1. Make sure that you are mentally and physically fit to operate a tractor that day.
2. Be familiar with the operation of the tractor. Read the Operator's Manual if one exists.
3. Perform a visual inspection of the environment around the tractor. Look for any obstacles that may be under the tractor or in its path of travel, including bystanders, tools, and equipment.
4. Perform a visual safety inspection of the tractor, looking for things that are out of place. Look for fluids dripping, tire wear or low tire pressure, or any broken or missing parts.
5. Perform a pre-operational check of the tractor to assure you that it is in safe operating condition. Adjust the seat! Check the brakes and hydraulics.

ROLLOVER PROTECTIVE STRUCTURE

Rollover Protective Structure or ROPS, is a cab or frame that provides a safe environment for the tractor operator in the event of a rollover. Rollover protective structures are engineered for each specific tractor and must meet national and international standards. Each ROPS that meet these standards should have a certification sticker. All University of Maine Farm tractors are required to have ROPS.

Figure 3: A tractor that flipped over as the operator attempted to remove a tree stump. The ROPS and seatbelt saved his life.

Remember, ROPS are only effective if the operator is using a seatbelt!!!
There are several methods to reduce the possibility of tractor rollovers. Follow these tips, use caution when operating a tractor, and use a seat belt on tractors equipped with ROPS.

- Securely fasten your seat belt if the tractor has a ROPS
- Where possible, avoid operating the tractor near ditches, embankments, & holes
- Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces
- If you must turn uphill, slow down and turn as gradually as possible
- Set wheels at the widest spacing possible for the task at hand
- Stay off slopes too steep for safe operation
- Operate front-end loaders and transport front end loads with the bucket as low as possible. Raise only when necessary to dump
- Lock brake pedals together before driving at transport speeds
- Watch where you are going, especially at row ends, on roads, and around trees
- Do not permit others to ride
- Operate the tractor smoothly—no jerky turns, starts, or stops
- Hitch only to the drawbar and hitch points recommended by tractor manufacturers
- When tractor is stopped, set brakes securely and use park lock if available.

**TRACTOR SAFETY RULES**

- Do not permit others to ride.
- Hitch only to the drawbar and hitch points.
- Never engage in stunt driving or horseplay.
- Set the brakes securely when the tractor is stopped.
- If you get stuck, notify the farm supervisor.
- Properly mount and dismount the tractor. Do not jump off!
- Do not leave a front-end loader bucket in the up position.
- Keep the front-end loader bucket low as possible while transporting.
- Wear hearing protection while operating a tractor.
- Shift to a lower gear before going up or down hills. Don't coast, and avoid "free-wheeling" gears.
- Refuel only when the engine is turned off. Don't smoke while refueling.
• Do not operate a tractor inside of a building for prolonged periods of time. Carbon Monoxide, the "Silent Killer".
• Never leave a tractor running unattended.
• Always wear your seatbelt.

**Driving Farm Machinery on Public Roads**

You may be asked to operate a tractor on a public road while you are working at one of the University of Maine Farms. If so, you must obey all traffic laws. Make sure the tractor has a "Slow Moving Vehicle" emblem attached in a conspicuous location. If you are towing a farm implement that obstructs the sign attached to the tractor, you are required to attach an additional sign to the farm implement. Be sure that the tractor’s flashing lights are visible and working. If you are pulling an implement that blocks your view of traffic, ask a co-worker to escort you with a truck that has the hazard lights flashing. Always look before making a left turn. This step may allow you to avoid a serious accident as a driver attempts to pass.

![Figure 6: A tractor with a 'Slow Moving Vehicle' emblem.](image)

![Figure 7: Tractor / Auto accident.](image)
POWER TAKEOFF SAFETY

The Power Takeoff (PTO) shafts are used to transmit power from a tractor or other source of power to an implement. Two speeds are commonly used with PTO shafts, 540 and 1000 rpm. RPM means revolutions per minute, the number of complete turns of the shaft in 60 seconds.

Did You Know?

The typical PTO shaft can:

- Wrap up 424 feet of shoelace in one minute at 540 rpm, or 785 feet of shoelace at 1000 rpm. How long is your shoelace?
- Wrap your arm or leg around the PTO shaft nine times in one second at 540 PTO rpm, or nearly 16 times in one second at 1000 PTO rpm. Is your body that flexible?

Figure 8: Landscaping fabric wrapped up by an unguarded PTO shaft.

- Produce second degree burns on your skin, even if you are lucky enough to have the PTO strip only the cotton clothing from your body. Nylon and other synthetics will cut into skin and muscle tissue rather than rub across it.
- Grind away skin, muscles, tendons, and break bones starting in less than three-fourths of one second when you are caught by an unshielded PTO shaft.
- A very strong man can generate about three-fourths of one horsepower. A tractor transmits nearly all of the engine horsepower to the PTO shaft. There is simply no contest; even between a very strong man and a PTO shaft -- the tractor will win.

Figure 9: Left – PTO Stub Shaft without the Master Shield.

Figure 10: Right – PTO Stub Shaft with the Master Shield
How Can You Be Safe When Using PTO Shafts?

- First, make sure the shaft is shielded. This includes the driveline shield that covers the implement driveline, and the master shield that covers the universal joint and PTO stub shaft on the tractor.
- Maintain the shield so it can work for you. PTO driveline shields are usually mounted on bearings, so they need to be maintained. Always REPLACE the shield when it is damaged or missing.
- Next, keep a safe distance from it when in use. Keep others away, too. How far? A distance of twice your height is a good start.
- Allow only those who absolutely must be in the area to be there. Keep all children away!
- Always pay attention to what is happening. Most PTO victims were caught by surprise.
- If something goes wrong -- stop the machinery; take the PTO out of gear, stop the engine and set the brake. Put the keys in your pocket before working on the machinery.
- When stopping the machinery for any reason -- end of work, lunch, repairs, or communication -- take the PTO out of gear, stop the engine and set the brake.

Guarding of Farm Field Equipment and Farmstead Equipment (OSHA 29 CFR1928.57)

- Keep all guards in place when the machine is in operation.
- Guard all "Nip Points" on each piece of equipment. All belts, pulleys, shafts, spindles, sprockets, chains, or moving parts shall be guarded.
- Stop engine, disconnect the power source, and wait for all machine movement to stop before servicing, adjusting, cleaning, or unclogging the equipment, except where the machine must be running to be properly serviced or maintained. If the machine must be running, the supervisor must instruct employees as to all steps and procedures which are necessary to safely service or maintain the equipment.
- Make sure everyone is clear of machinery before starting the engine, engaging power, or operating the machine.
- Lock out electrical power before performing maintenance or service on farmstead equipment.

Figure 11: Potato Scrubbing Equipment with an unguarded belt and flywheel.
PESTICIDE SAFETY AWARENESS

Pesticides are chemical agents that are used to control pests. They include herbicides, fungicides, insecticides, and others. Most pesticides are organic compounds which interfere with a physiological process in the pest organism. At the University of Maine Farms, a wide variety of pesticides are used on a continual basis.

The purpose of this section is to inform all University of Maine employees of hazards associated with pesticide application. All University employees that apply pesticides shall receive additional pesticide safety training. Remember, only licensed applicators are allowed to apply pesticides at any of the University of Maine Farms.

All personnel must submit a current copy of their Maine Pesticide Applicators License to the Farm Manager prior to applying a pesticide at any of the University of Maine Farms!!!
DERMAL EXPOSURE

Dermal (skin) exposure accounts for about 90% of the exposure pesticide users receive from non-fumigant pesticides. It may occur any time a pesticide is mixed, applied, or handled, and it often goes undetected. Dry materials--dusts, wettable powders, and granules, as well as liquid pesticides--can be absorbed through the skin.

Figure 13: A man sampling pesticide drums without Tyvek Suit or apron, proper gloves, and safety goggles (Dwight Seal, Virginia Tech Pesticide Program).

The seriousness of dermal exposure depends upon:

- the dermal toxicity of the pesticide;
- rate of absorption through the skin;
- the size of the skin area contaminated;
- the length of time the material is in contact with the skin; and
- the amount of pesticide on the skin.
- the condition of the skin.

Rates of absorption through the skin are different for different parts of the body. Using absorption through the forearm as the standard, absorption is over 11 times faster in the lower groin area than on the forearm. (Absorption through the skin in the scrotal area is rapid enough to approximate the effect of injecting the pesticide directly into the bloodstream.)

Absorption continues to take place on all of the affected skin area as long as the pesticide is in contact with the skin. The seriousness of the exposure is increased if the contaminated area is large or if the material remains on the skin for a period of time.
INHALATION EXPOSURE

Inhalation exposure results from breathing pesticide vapors, dust, or spray particulates. Like oral and dermal exposure, inhalation exposure is more serious with some pesticides than with others, particularly fumigant pesticides. Inhalation exposure can occur from the applicator's smoking; breathing smoke from burning containers; breathing fumes from pesticides while applying them without protective equipment; and inhaling fumes while mixing and pouring pesticides.

Should this person be wearing safety glasses or safety goggles when mixing pesticides?

Answer: Safety Goggles provide splash protection, safety glasses do not.
INJECTION EXPOSURE

An injection exposure is probably the least frequent type of pesticide exposure. This type of exposure usually occurs when a glass bottle of pesticide breaks. The contaminated glass from the bottle becomes imbedded into the body. This is very similar to hypodermic needle injection.

Figure 16: This person is using a knife to open a poorly labeled pesticide container. The knife could become contaminated during this process. If cut by the contaminated knife, the pesticide could be injected directly into the bloodstream.

Should this person be wearing protective gloves?

PERSONAL HYGIENE

An all too common method of pesticide exposure is ingestion. Usually, this does not refer to an employee opening a bottle of Diazinon and gulping down a pint. However, it does refer to an employee neglecting to wash his/her hands before eating lunch. Another scenario could be an employee smoking a cigarette that has been contaminated with a pesticide.

Here are some general rules pertaining to Personal Hygiene when working with or around pesticides.

- **WASH YOUR HANDS!!!** Always wash your hands before you eat, smoke, use the restroom, and go home. This should remove most pesticide residue from your hands.
- Do not bring any pesticide into the break room or where you eat your lunch.
- Do not smoke while you are around pesticides. Not only can you inhale and ingest trace amounts of pesticides, but also the pesticide could be flammable.
- Do not launder pesticide-contaminated clothes at home.
- Properly maintain personal protective equipment as recommended by manufacturer. Store you PPE away from pesticides.

Figure 17: A student worker washing his hands after applying a pesticide.
RESTRICTED ENTRY INTERVALS

Restricted-Entry Intervals (REI's) is the amount of time that must past before it is safe to enter the area where pesticides have been applied. Re-entry intervals can range from 12 to 48 hours. To prevent inadvertent exposure, employers are required to warn employees about pesticide-treated areas. Notification can be oral or via signs. If the pesticide is highly toxic, notification must be both oral and via signs.

Figure 18: Restricted Entry Interval sign.

Pesticide Application Information at a Central Location

Each University of Maine Farm is required to post information in an easily seen, central location about each pesticide application that occurs. This pesticide information must be posted just prior to application and must remain posted for 30 days after the end of the restricted entry interval listed on the pesticide label. Farm Superintendents must tell workers and handlers where the information is posted and allow them access. The information must remain legible and employees must be notified of any changes to the emergency medical facility information.

Information that must be listed in a central location for each pesticide application:

- Product name
- EPA registration number
- Active ingredient(s)
- Location and description of treated area(s)
- Time and date of application
- Restricted Entry Interval
- Name, address, and telephone number of the nearest emergency medical facility
- An EPA Worker Protection Standard Poster

Figure 19: An example of a Pesticide Information board.
MATERIAL HANDLING

Preventing a back injury is much easier than repairing one. Because your back is critically important to your ability to walk, sit, stand, and run, it’s important to take care of it. Most back pain arises from using your back improperly, so learning a few basic rules about lifting, posture and proper exercise can help keep your back in good shape.

LIFTING TECHNIQUES

- **SPOT THE HAZARD**-Take note of heavy, stressful, awkward, or repetitive activities. Bending and twisting can cause back injury as easily as attempting to lift heavy objects.
- **ASSESS THE RISK**-Assess the likelihood of each identified hazard resulting in injury. If you consider there is a significant risk of serious injury, look for the best way to minimize the risk.
- **MAKE THE CHANGES**-Here are some possible changes that one can make to eliminate or reduce back injury.
  - Plan ahead. Consider the safest possible ways of lifting, carrying, holding, lowering, pushing or pulling
  - Eliminate unnecessary tasks
  - Avoid double handling
  - Use mechanical aids
  - ASK FOR HELP
  - Lighten the load
- **USE CORRECT BODY TECHNIQUES**-When lifting a load from ground level, bend knees, keep back straight, keep load close to your body, lift with leg muscles, support forearms with knees, and support the load with your body. When lowering a load, use leg muscles and lower the load by bending your knees, not you back.

For more information, you may download a copy of the NIOSH Simple Solutions, Ergonomics for Farm Workers (pdf) located on the SEM Farm Safety webpage at http://www2.umaine.edu/SEM/trainingid176.htm

![An employee demonstrating the proper lifting technique.](image)
CONFINED SPACE AWARENESS

The Occupational Safety and Health Administration (OSHA) defines a Confined Space as:

1. large enough and so configured that an employee can bodily enter and perform assigned work; and
2. has limited or restricted means for entry or exit; and
3. not designed for continuous employee occupancy.

Confined spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet deep such as pits, tubs, vaults, and vessels."

In an agricultural setting, the three most common environments that meet OSHA's definition of a confined space are, Manure Pits, Grain Bins, and Silos. Other than specifically, trained Facility Maintenance Employees, **NO** one should ever enter a confined space. All confined spaces have been labeled with a sign that reads "Permit-Required Confined Space. Do Not Enter". If you are unsure whether or not a space is a confined space, ask you supervisor before entering.
Lock Out Tag Out Awareness

Farm workers performing service or maintenance on machinery and equipment may be exposed to hazards from the unexpected energization, startup of the machinery or equipment, or release of stored energy in the equipment. At the University of Maine Farms, authorized individuals are required to perform Lock Out Tag Out on all equipment or machinery that require servicing or maintenance. The performance of Lock Out Tag Out requires the adoption and implementation of practices and procedures to shut down equipment, isolate it from its energy source(s), and prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed.

Only authorized personnel are allowed to perform service or maintenance on any equipment or machinery located at the University of Maine Farms. To become authorized to perform Lock Out Tag Out, one must receive additional Lock Out Tag Out training by a qualified individual. Contact your supervisor if you believe you need Lock Out Tag Out Training.

What to do if you find a piece of equipment that is locked and tagged out?

1. Do not remove the lock, locking device, or tag.
2. Do not attempt to use that piece of equipment or machinery. It is locked out for a reason.
3. If you need to use a piece of equipment or machinery that is locked and tagged out, talk to the person(s) who locked and tagged it out. That person(s) name should be written on the tag.
4. Inform your supervisor if someone has removed a lock or a tag.
COLD EXPOSURE

During the winter months, farm employees may be required to face the occupational hazard of exposure to the cold. Prolonged exposure to freezing temperatures can result in health problems as serious as trench foot, frostbite, and hypothermia. Workers in such industries as construction, commercial fishing and agriculture need to be especially mindful of the weather, its effects on the body, proper prevention techniques, and treatment of cold-related disorders.

PREVENTING COLD-RELATED DISORDERS

1. Wear a Minimum of Three Layers of Clothing
   - An outer layer to break the wind and allow some ventilations (Gore-Tex® or Nylon)
   - A middle layer of wool or synthetic fabric to absorb perspiration and retain insulation in a damp environment. Down is a useful lightweight insulator, but ineffective once it becomes wet.
   - An inner layer of cotton or synthetic weave to allow ventilation.

2. Pay Special Attention to Feet, Hands, Face, and Head
   - Up to 40% of body heat can be lost when the head is exposed. Footgear should be insulated to protect against cold and dampness.

3. Avoid Exertion
   - Cold weather puts an extra strain on the heart. If you have heart disease or high blood pressure, follow your doctor's advice about shoveling snow or performing other hard work in the cold. Otherwise, if you have to do heavy outdoor chores, dress warmly and work slowly. Remember, your body is already working hard just to stay warm, so don't overdo it.

4. Select the Warmest Part of the Day
   - Reduce the amount of activities performed outside. When employees must brave the cold, select the warmest hours of the day (10:00 am - 2:00 pm).

5. Remain Hydrated
   - Fluid replacement is important while working in cold temperatures, because significant dehydration can occur. In addition, employees should be encouraged to eat a normal, well balanced diet.

6. Take breaks
   - Set up a work-rest cycle for employees working outside in cold temperatures.
COLD-RELATED DISORDERS

Hypothermia

When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature. Body temperature that is too low affects the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and won't be able to do anything about it.

Hypothermia is most likely at very cold temperatures, but can occur even at cool temperatures (above 40°F) if a person becomes chilled from rain, sweat, or submersion in cold water.

Victims of hypothermia are most often (1) elderly people with inadequate food, clothing, or heating; (2) babies sleeping in cold bedrooms; and (3) people who remain outdoors for long periods -- the homeless, hikers, hunters, etc.

Recognizing Hypothermia

Warnings signs of hypothermia:

- shivering / exhaustion
- confusion / fumbling hands
- memory loss / slurred speech
- drowsiness
- glassy look in their eyes

If you notice any of these signs, notify your supervisor!!!
Then call 911!!!

What to Do

- Get the victim into a warm room or shelter.
- If the victim has on any wet clothing, remove it.
- Warm the center of the body first -- chest, neck, head, and groin -- using an electric blanket, if available. Or use skin-to-skin contact under loose, dry layers of blankets, clothing, towels, or sheets.
- Warm beverages can help increase the body temperature, but do not give alcoholic beverages. Do not try to give beverages to an unconscious person.
- After body temperature has increased, keep the person dry and wrapped in a warm blanket, including the head and neck.
**Frostbite**

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and color in affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage the body, and severe cases can lead to amputation. The risk of frostbite is increased in people with reduced blood circulation and among people who are not dressed properly for extremely cold temperatures.

![Figure 28: An example of Chilblains. Notice the red, swollen skin.](image)

**Chilblains**

Chilblains is a condition that usually occurs in temperatures above freezing, accompanied by high humidity. It appears as red, swollen skin which is tender, hot to the touch and may itch. This can worsen to an aching, prickly (pins and needles) sensation and then numbness. It can develop in only a few hours in skin exposed to cold. In severe cases, blistering may appear. The most commonly affected areas are the ears, nose, fingers and toes.

**Recognizing Frostbite**

At the first signs of redness or pain in any skin area, get out of the cold or protect any exposed skin -- frostbite may be beginning. Any of the following signs may indicate frostbite:

- a white or grayish-yellow skin area
- skin that feels unusually firm or waxy
- numbness
HEAT EXPOSURE

As temperatures rise, so can problems related to heat. As gardeners, horticultural, and agricultural workers, we need to be aware of how serious heat related illnesses can be and how to avoid them. If the body does not rid itself of excess heat fast enough, it cooks the brain and other vital organs. Heat stroke is often fatal, and those who survive may have permanent damage to their vital organs.

PREVENTING HEAT-RELATED DISORDERS

Acclimatization (to heat)

- Acclimation is a process of adaptation that involves a stepwise adjustment to heat over a week or sometimes longer. An acceptable schedule for achieving acclimatization is to limit occupational heat exposure to one-third of the work day during the first and second days, one-half of the workday during the third and fourth days, and two-thirds of the workday during the fifth and sixth days. The acclimatization procedure must be repeated after days off due to illness or a vacation of one week or more. To achieve acclimation, a person must work in the heat at the activity level required by the job. If the risk of heat stress is increased, additional acclimatization will be required.

Fluid Replacement

- Always drink plenty of water when in the heat. Simply relying on feeling thirsty will not ensure adequate hydration. To replace the four to eight quarts of sweat that may be produced in hot environments, people require one-half to one cup of water every 20 minutes of the workday. Water at 55° F is preferable to ice water or warm water.

Physical Fitness

- Physical Fitness is extremely important. The rate of acclimatization is a function of how physically fit the individual is. The unfit worker takes 50 percent longer to acclimate than one who is fit.

Limit Exposure Time

- Schedule as many hot activities as practical for the coolest part of the day (early morning or late afternoon). Employ additional help or increase mechanical assistance if possible.

Minimize Heat Exposure

- Minimize Heat Exposure by taking advantage of natural or mechanical ventilation (increased air velocities up to 5 mph increase the rate of evaporation and thus the rate of heat loss from the body) and heat shields when applicable.
Take Rest Breaks

- Take Rest Breaks at frequent, regular intervals, preferably in a cool environment sheltered from direct sunlight. Anyone experiencing extreme heat discomfort should rest immediately.

![Figure 31: Rogers Farm employees taking a rest break.](image)

Wear Permeable, Loose Fitting Clothing

- Generally less clothing is desirable in hot environments, except when the air temperature is greater than 95°F or a person is standing next to a radiant heat source. Then covering exposed skin is beneficial to reducing heat stress.

Heat Exhaustion

Heat exhaustion results from the reduction of body water content or blood volume. The condition occurs when the amount of water lost as sweat exceeds the volume of water drunk during the heat exposure. Heat exhaustion usually develops after several days of exposure to high temperatures. The victim of heat exhaustion may have some or all of the signs or symptoms: heavy sweating; clammy, flushed, or pale skin; weakness; dizziness; nausea; rapid and shallow breathing; headache; vomiting; or fainting.

Factors that may increase the risk of heat stress include sleep distress, obesity, poor physical condition, lack of acclimatization, dehydration, and alcohol use. Many commonly used drugs may also interfere with the body's response to heat stress. Preexisting medical conditions, such as cardiovascular disease, diabetes, certain skin disorders, and some diseases of the central and peripheral nervous systems, can impair people's normal physiological response to heat stress.

It is now time for the quiz (located on the SEM Farm Safety Training website at http://www2.umaine.edu/SEM/trainingid76.htm). When you completed the quiz, print out a copy and submit it to the Farm Superintendent. He/She will train you on the area-specific hazards associated with the farm you will be working at. Remember, all training must be documented.