HEALTH AND SAFETY OF PERSONNEL IN AGRICULTURE

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Summary

Agriculture is one of the most hazardous industries in the world in which to work. Many agricultural workers suffer serious and fatal injuries each year, and many others suffer work-related illnesses. Farmers, farm operators, and farm contractors have invested a great deal of time and money in their operations, and have a financial as well as moral obligation to take seriously the health and safety hazards on farms and to protect the health and safety of their workers and family members. Children who live on or visit farms must also be protected. Farm hazards include tractors and other machinery, animals, confined spaces and storage structures, electricity, fires, chemicals, respiratory hazards, repetitive motions, noise and others. Developing and implementing a safety program, including searching out and eliminating or minimizing hazards on a farm, is the most important thing that can be done. Proper training of all who work on the farm or with various types of equipment, including family members, is necessary. Being a

good neighbor means protecting the health and safety of the general public and neighbors to the farm.

1. Introduction

Agricultural workers are involved in one of the most hazardous industries in the world. In the United States, according to worker death rate statistics from the National Safety Council, agricultural workers, including farm owner/operators, family workers and hired workers, are five times more likely to suffer a fatal injury than the national work force as a whole. In addition to 720 fatal injuries in 1997, agricultural workers in the United States suffered an estimated 140 000 injuries serious enough to cause at least one-half day lost from normal activities. A different study of five states in the upper Midwestern United States showed one farm in five had a work-related injury each year serious enough to require professional medical care or resulted in at least four hours of restricted activity. This does not include the countless work-related illnesses and chronic injury conditions which occur to workers over longer periods of exposure.

Injuries and illnesses on farms can be prevented by being proactive and consciously deciding to have a safe operation. Hazard control is the most effective way to do this; the farm manager and workers need to search out and eliminate or reduce the hazards on each farm. Safe behaviors to avoid hazards are a secondary but necessary method of injury prevention when hazards cannot be eliminated.

This article discusses potential hazards and the most basic ways of eliminating or avoiding them. It is important that agricultural workers understand the basics and have a positive safety orientation. There may be hazards on particular farms or in particular countries, involving different cropping or livestock practices, that are not mentioned here. Each farm operator should acquire more detailed information about all farm hazards on his or her farm. For example, additional information can be obtained from machinery owner's manuals and by contacting appropriate governmental agencies.

2. Tractors

Tractors are the most-used machines on most farms, and are involved in more fatal injuries than any other single agent of injury. In fact, the tractor rollover, which occurs when the tractor turns over on top of the operator, is the single most common fatal farm injury.

Tractors more commonly tip over to the side, although they can tip over to the rear as well. Some of the causes of sideways tractor rollovers include operating near hazards like ditches, gullies, holes, or stumps; operating on steep slopes; carrying heavy loads high; taking turns at high speeds; loss of control with towed loads; or roadway collisions. Any action that results in the tractor's center of gravity being moved outside of its wheelbase, whether due to slopes, bumps, or centrifugal force, can result in the tractor tipping over sideways. Rearward overturns are usually caused by improper hitching, where the load is hitched above the drawbar and helps pivot the tractor up and over its rear axle, or improperly trying to move a tractor that is stuck in the mud and having it pivot up and over rearward.

Safe operating procedures are necessary to minimize the likelihood of a tractor rollover. These include both proper handling of the tractor, and also proper set up, such as proper weighting and wheel spacing. Thus, tractor operators must be trained in the preparation, operation and maintenance of their tractors. However, because situations occur which may be beyond the control of even the safest and most competent operator, such as hitting a hidden obstacle, losing control on an icy road, or having an unexpected mechanical failure, tractors must be capable of rolling over and still protecting the operator from being crushed. The most important way to prevent tractor rollover injuries and deaths is for every tractor to have a Rollover Protective Structure (ROPS) or ROPS cab, which provides a zone of protection around the operator in case of a tractor rollover. In addition, the operator should wear the seat belt if one is provided with the ROPS, particularly on open-station (non-cab) tractors, to prevent being thrown off the seat and outside the zone of protection.

The tractor run-over, when one or more of the tractor wheels runs over the victim, is the second most common tractor-related fatal injury. Many run-over injuries involve extra riders who fall off and end up under the wheels. Children who ride on a tractor with a parent or other person are at great risk. Other run-overs often involve unseen bystanders who are unaware of the danger or movement of the tractor. Small children who may not understand the need to get out of the way are at particular risk if they are present in traffic areas. Preventing run-over injuries means never allowing extra riders, being aware of the locations of all bystanders, and keeping small children away from work areas.

Tractors and machines operated on the road should always have proper lighting and markings, as required by law, to minimize the likelihood of a collision with another vehicle. In some countries, such as the United States, the engineering standards applicable to farm machinery, such as those promulgated by the American Society of Agricultural Engineers (ASAE) exceed the requirements of local laws and should be followed, in order to maximize safety of both the machinery operators and the other motorist on the road. Operators must use good judgement and safety practices when operating farm machinery on roads, as the speeds and widths are usually different than other motor vehicles. Operators must remember that other motorists may not be familiar with farm equipment and the manner in which it is transported.

3. Other Farm Machinery

Farm machines other than tractors are involved in many fatal and permanent injuries. Whether it is mobile equipment used in the fields, or stationary equipment used around the farmstead, these machines have a variety of hazards that must be eliminated or avoided. Entanglement in moving parts is the major hazard, including such power transmission components as chains and sprockets, belts and pulleys, and power take-off (PTO) drivelines and connectors. Other common sources of entanglement are the crop or material handling and processing components, which are designed to compress, control, cut, grind, or transport materials, but do not know the difference between the material being processed and an errant hand or foot. A variety of injuries can occur during entanglement, depending on the body part and machine component involved.

Injuries as serious as severe lacerations, loss of flesh and muscle, amputations, mangling and crushing, spinal injury, or death can result.

To prevent entanglement injuries, all shields and guards must always be in place, including the master PTO shield on the tractor. Shield and guards should be repaired or replaced if broken or missing. In addition, proper training and operating practices are necessary. Whenever machines are to be unplugged, adjusted, or repaired, the machine must first be shut off and the power turned off, including the tractor if the machine is PTO-driven. Electrically-operated equipment should have the electrical power locked out, so that nobody else can inadvertently turn on the power and injure the person working on the equipment.

Proper machine maintenance and adjustment will also minimize the risk of entanglements. Properly maintained and adjusted machines operate with fewer problems such as plugging or field breakdowns. Machines that often require unplugging or repair in the field provide many more opportunities for operators to reach into or under a machine and become injured.

Machines can also be involved in pinning the operator or mechanic who works under an inadequately-supported machine, or who enters and exits beneath a skid-steer loader with the bucket in the raised position. A failure in the hydraulic system, or an unexpected movement of a control, can allow a machine to unexpectedly drop. No one should ever work under any machine supported by hydraulics unless it is properly blocked up or a safety stop is in place. Proper jacks or support blocks must be used when working under any machinery, to prevent it from falling.

Machine hydraulic oil also poses a hazard. Hydraulic lines carry very high pressures, and a pin-hole leak can easily penetrate the skin and cause severe tissue damage. Operators or mechanics looking for leaks should always use paper or cardboard and not their hands.

Like tractors, machines can be involved in run-over injuries. Extra riders on tractors or machines can fall off and be run over by the trailing machine even if the fallen person manages to avoid the tractor wheels. Unseen bystanders, particularly small children, may be struck by machines that are being backed up. Thus, extra riders should be prohibited, and unseen bystanders should be kept from the work area.

Children in general should not be allowed around equipment. They may not appreciate the extreme hazards posed by machines in operation, and may reach in or otherwise get too close. Children who play on a parked machine may get injured if they fall from it or have it fall on them. Some children have had their clothing entangled or hung on levers or other components of machines they were playing on, and ended up strangling. Parked equipment should always be lowered to the ground, and large items like extra tractor wheels leaning up against a wall should be secured to prevent them tipping over and crushing someone. Children should not be allowed to play around machinery. Some children have had their clothing entangled or hung on levers or other components of machines they were playing on, and have ended up being strangled.

4. Animals

Large farm animals are responsible for many injuries on dairy and livestock farms. Bulls, particularly dairy bulls, can suddenly attack someone and cause fatal injuries, and should never be trusted. Bulls which have been raised as pets do not understand their tremendous strength and may injure someone while simply trying to butt or be playful. Stallions are also dangerous and should be handled with extreme care. Boars can seriously rip and tear with their tusks, while rams can attack by butting. Any male animal is especially dangerous at breeding time. In addition, new mothers, such as cow or sows, will vigorously defend their young. Even if the animal makes no intentional move toward a handler, any large animal can easily pin a handler against a wall or fence, or step on hands or feet. Facilities should be designed for safe animal handling to minimize the opportunity for such injuries.

5. Confined Spaces and Storage Structures

Confined spaces are defined as spaces with limited access, not intended for constant occupancy, but which a person can enter and work. Storage structures, such as grain bins, silos, and manure pits are confined spaces with serious hazards, which can lead to death. Some transport units, in particular bottom-unloading grain wagons, have similar hazards to storage units.

5.1. Grain Bins

Downward-flowing grain in grain bins can lead to entrapment and suffocation. A person can walk in grain when it is not flowing, sinking in several centimeters, but when the grain is flowing downward to the outlet, the grain is like quicksand. The person will be pulled beneath the surface in as little as 20 seconds, ultimately asphyxiating. The person will even continue all the way to the bottom of the bin as long as the grain is flowing, complicating rescue efforts (assuming they are discovered). No one should ever enter a grain bin during unloading. This is also true in grain wagons/trailers; the downward flow during unloading can easily entrap and asphyxiate a child.

When entry is required into a grain bin, lockout/tagout procedures must be followed to prevent another person from turning on the unloading equipment. Lockout/tagout procedures involve placing a lock on the electrical switch box after the power has been shut off, and the person entering the bin or working on the equipment is the only person who has the key. Thus the power cannot be switched on until the worker is safely out of the bin and unlocks the switch box. An alternate procedure, in absence of a lock, is to tag the switch box to warn others that the power should not be turned on.

Sometimes grain stored in less-than-optimum condition will crust over at the surface. If some of the grain beneath the crust has been unloaded, an unseen pocket may exist. Persons entering the grain bin to break up the crust can and have fallen into these pockets, as the crust gives way, and the grain forms an avalanche which falls down onto and covers the person, leading to suffocation. Large chunks of crusted grain hanging up on the wall of a storage unit may also unexpectedly collapse into an avalanche. Crusted

grain should always be broken up from outside the bin, with a long pole, to minimize the chance of such entrapments.

5.2. Silos

When chopped plant material (forage) is placed into a non-airtight storage structure, fermentation takes place, which produces oxides of nitrogen. This process starts only hours after the material is put into the structure, such as an upright (tower) silo. Inhaling these gases, particularly nitrogen dioxide, a primary component of what is generically called "silo gas", will severely burn the lungs. This is because the nitrogen dioxide mixes with water in the lungs and forms nitric acid. The burning and resultant scarring of the lungs can cause long-term decreased lung function. Severe exposures can result in death, as fluid builds up in the lungs (pulmonary edema) and the person essentially drowns. This process can happen in as little as eight to 30 hours. In addition, silo gas is heavier than air and can thus also displace oxygen, leading to asphyxiation of a person in the silo.

Silos should not be entered for two to three weeks after filling, the peak period for production of silo gas. Silos should always be ventilated before entering, as should silo rooms or any other place where silo gas can collect.

Some silos are designed to be airtight, and thus are oxygen deficient. These sealed silos should never be entered without a supplied-air respirator unless they are totally ventilated, as the lack of oxygen will result in death.

Silo unloaders pose serious entanglement hazards. Silos should never be entered while an unloader is in operation. Controls are available which enable an operator or mechanic to safely operate the unloader for a few seconds at a time while in the silo, in order to diagnose machine problems and make repairs. In the absence of this, lockout/tagout procedures should be followed to prevent another person from turning on the silo unloader while it is being repaired or adjusted.

Bunker or trench silos, while not confined spaces, can also be hazardous. Care must be taken when packing a bunker silo with a tractor, to prevent tractor rollovers. Workers are also at risk of falls when covering or uncovering the silo.

5.3. Manure storages

Enclosed or under-building manure storages, often called manure pits, hold gases given off by decaying manure. The primary components of what is broadly defined as "manure gas" are hydrogen sulfide, carbon dioxide, ammonia and methane gas. Hydrogen sulfide is a highly toxic gas which can kill a person at relatively low concentrations. Carbon dioxide is not a toxic gas, but can be an asphyxiant when it displaces oxygen. Ammonia is an irritant, while methane is explosive at the right concentrations. Hydrogen sulfide and carbon dioxide are heavier than air and stay down in the pit, while ammonia and methane are lighter than air and tend to dissipate, although they can be trapped by physical features of the storage unit. Agitation of the manure results in a large release of the gases.

Unless the atmosphere has been tested and shown to be safe, a manure pit should never be entered without a supplied-air respirator, such as a self-contained breathing apparatus. Without knowledge that the atmosphere is safe, a person takes a great risk of dying from either hydrogen sulfide, or from asphyxiation as a result of oxygen being displaced by the heavier-than-air gases. Even in a rescue situation, where a person has become disabled in a manure pit, the rescuer should not enter without the supplied-air respirator, since the rescuer will soon become an additional victim. Due to the increased presence of gases during agitation, and the risk to humans and animals alike, special precautions such as building evacuation and extra ventilation must be taken. Manure pits should be properly guarded against accidental or unauthorized entry.

Open manure storages, such as outdoor lagoons or earthen storages, are not confined spaces, but still have hazards. The manure can crust over and appear to be solid enough to walk on, but is not, and drowning can occur. They should be fenced off to prevent animals or children or other unsuspecting individuals from entering. Tractors can roll down steep banks if care is not taken during pumping or when mowing the slope.

6. Slips and Falls

Many agricultural workers have suffered serious or fatal injuries by falling from ladders, roofs, haymows or other high places on the farm. All ladders should be kept in good condition, and ladders on silos and grain bins should be child-proofed to prevent unauthorized use by children who may not understand the dangers of climbing. Ladders for temporary use, such as for painting or making repairs, should never be propped on front-end loaders or other unstable platforms. Openings in the floor, such as haymow openings, should be covered or guarded against falls as much as is feasible, especially for persons who are not familiar with the locations of the openings. Roof maintenance or construction projects should only be undertaken with proper equipment and safety in mind.

Ladders are not the only place where falls occur. Steps, stairways, walkways, and floors around the farm, including steps and platforms on machinery, must be kept clear and clean to prevent slips and falls. Floor defects in older buildings should be repaired.

7. Overhead Power Lines and Electricity

Overhead power lines are a hazard when operating or moving tall machines or components. Contacting these lines, which may operate at as much as 7200 volts, typically results in electrocution. Moving portable augers or elevators around overhead power lines is especially hazardous, as the worker is typically moving the machine by hand, may decide not to take the time to lower the machine, and may not be paying attention to what is overhead. Moving irrigation pipe by hand can also be hazardous. Tall machines such as portable augers and elevators, or any metal item such as pipes, should always be lowered prior to moving. The way to permanently eliminate the hazard is to bury, raise, or move power lines away from work areas.

Any electrical current of more than a few volts can be a hazard if not used with respect. Wet and corrosive environments around the farm require that proper wiring, controls, junction boxes and panels, and extension cords be used for those conditions. These components must be properly repaired and maintained. Ground fault current interrupters should always be used when working in or around water, such as with a high pressure washer.

8. Chain Saws and Woodcutting

Chain saws are commonly used on farms, and can result in severe or fatal injuries. Chain saw "kickback" occurs when the nose of the chain bar contacts a limb or other object, and the force of the high-speed chain almost instantaneously pushes the bar back toward the operator. This can result in the chain contacting the face, neck, or other parts of the body, with devastating cutting and tearing. Persons have suffered fatal injuries from cuts of the arteries and veins around the neck, or the chain cutting into the skull, or from blood loss from an amputation.

There are other hazards from chain saw use. Flying wood chips can damage the eyes. Long-term exposure to noise and vibration can cause hearing loss and Raynaud's syndrome, which is a numbness in the hands from vascular constriction. And of course falling trees and limbs can kill or paralyze the saw operator or anyone nearby.

Use of proper personal protective equipment is a must when operating a chain saw. Eye and ear protection and proper gloves and shoes are a minimum. A hardhat and special saw-resistant pants or leggings are recommended. To minimize the risk of being struck by falling trees or limbs, training and use of proper felling, limbing and bucking procedures are essential. A well-maintained, sharp saw will cut smoother and faster and thus minimize the risk of injury.

Tractor or bulldozers used in pushing down trees should always have a Falling Object Protective Structure (FOPS). Trees and limbs can fall unexpectedly or in unexpected directions with serious or fatal consequences to the operator. Even an experienced operator cannot always predict what a tree or limb will do.

9. All-Terrain Vehicles

All-Terrain Vehicles (ATVs) are being increasingly used in a number of farm work applications, as well as for recreational use. This adaptability must not blind farm workers to the need for proper personal protective equipment and proper training. ATVs require special training to be maneuvered safely, and can easily become unstable when improperly operated. They can turn over and cause serious injury or death. Operators can also strike low limbs or collide with trees and other objects. The safety of these machines should not be taken lightly. Helmets are essential to prevent head injuries and should be required at all times. Other protective clothing should be worn. ATV dealers should be contacted about training classes.

10. Fires

The use of machinery and petroleum products, electrical systems subject to harsh environments, various sources of heat or flame, and the storage of dry crop materials results in fire hazards being present on farms. Machines can catch fire if crop-related trash or oils and greases build up in areas prone to overheating, or bearings fail and generate heat. Such fires endanger the operator as well as causing extensive property damage. Sparks or open flames during re-fueling can result in fires. Electrical systems may fail due to rodent damage or environmental conditions, or may be overloaded by improper additions of wiring. Use of welders or other spark-generating tools around flammable materials, or lightning strikes on unprotected buildings, can result in fire. Dry crop materials provide fuel for fires in buildings if ignited by outside heat sources, or may overheat and ignite from biological processes occurring when stored at too high of a moisture content.

Machines must be kept clean and properly maintained. Electrical systems must be designed, installed, and maintained to proper specifications. Crops must be stored at proper moisture contents. Precautions such as not smoking or using spark-generating tools near fuels or flammable materials must be followed. Fire extinguishers must be placed at strategic locations on machines and around farm buildings.

11. Chemicals

Many different chemicals may be used on a farm, depending on the type of operation. Following the instructions and precautions on the chemical label is necessary for safe and proper use. It is also important to obtain from the manufacturer or dealer any additional information available, such as the Material Safety Data Sheet (MSDS). As provided in the United States, the MSDS outlines the health hazards and appropriate precautions needed, along with other important information like handling and disposal procedures.

Some chemicals have the potential to cause injury or illness through acute (severe, one-time) and chronic (repeated, long-term) exposures, and these exposures should be prevented. Acute exposures to certain pesticides can result in severe or fatal poisonings, or other health problems. Accidental ingestion of dairy pipeline cleaner by children results in severe burns and scarring of the oesophagus. An exposure to a blast of pressurized anhydrous ammonia can result in blindness or other injury. Chronic exposures to some pesticides may result in increased risk of certain cancers or other health problems; research is being conducted to better determine the long-term hazards and risks. Due to the uncertainties surrounding chronic chemical exposure, these exposures should be prevented.

Exposure to chemicals can occur through inhalation, ingestion (including eating with contaminated hands), skin contact and eye contact. The appropriate personal protective equipment (PPE), such as goggles, gloves, aprons, suits, etc. is extremely important when handling chemicals. Proper storage and disposal of chemicals protects unauthorized people like children from exposure, protects animals and feed, and protects the groundwater. The label and MSDS will provide proper instructions for the

use of PPE and other safety-related procedures. Many reports of chemical-related injury are related to improper use of the chemical or lack of PPE.

It should be noted that exposure to natural chemicals occurring in plants may also cause negative health effects. For example, contact dermatitis may result from repeated skin contact with certain crops during hand harvesting or cultivation, depending on the individual workers sensitivities. Handling of tobacco plants when wet may result in nicotine being absorbed into the body, causing what is known as "green tobacco sickness".

12. Respiratory Hazards

Chemical-related respiratory hazards of silo and manure gases, and other farm chemicals, have been discussed earlier. Other farm respiratory hazards include welding fumes, solvent vapors, and soil and fertilizer dusts. Perhaps the most common respiratory hazards on farms are those related to organic plant and animal materials, as these are linked to a number of respiratory illnesses and impairments.

Exposure to molds in hay, silage or grain can result in severe short-term illnesses like Organic Dust Toxic Syndrome (ODTS) or chronic allergic diseases like Farmers Lung. Exposure to grain dusts in general can result in bronchitis or asthma or other lung ailments and should be avoided. Dusts, dander and other particles in livestock buildings can result in various respiratory and other illnesses, particularly when the worker is exposed over long periods of time. Workers in livestock confinement buildings may show decreased lung function. Proper ventilation and personal protective equipment, such as a dust respirator, is always needed to minimize such hazards.

13. Noise

Repeated exposure to loud noise on farms has been shown to result in permanent ear damage and hearing loss. This hearing loss has even been found to begin in the teenage years of youths who work on farms, so this is not just a problem for older farmers. Tractors without sound-protected cabs are often as loud as 100 decibels (dB), but injury to sensitive parts of the ear can begin with repeated exposure to noise louder than 85 dB. Dryer fans and chain saws are louder yet, and even the noise inside a hog or pig confinement building can exceed safe levels. As decibels are calculated on a logarithmic scale, a 95 dB noise is three times louder (higher sound pressure level) than 85dB, and 100 dB is actually 5.6 times louder than 85 dB. Thus, protection should be provided against noises louder than 85dB. Proper hearing protection must always be used against exposure to these noises, as hearing loss will gradually occur even if it is not noticeable at first. Approved hearing protectors, such as ear-muffs and foam plugs tested and approved for hearing protection, should be worn as necessary. Modern, sound-protected tractor cabs are excellent as long as they are well maintained and the doors and windows kept shut. Older tractor cabs without proper sound and vibration protection can actually increase the noise level at the operators ear, due to transmission, entrapment and reflection of the noise.

14. Skin Cancer

Exposure to ultraviolet radiation in sunlight damages the skin. Repeated exposure, without protection, has been shown to be a risk factor for skin cancer. Farm workers are particularly vulnerable to skin cancers on their faces, ears, and neck areas, as these are often left unprotected while out in the fields. Proper clothing and headgear that shades the face, ears, and neck is strongly recommended, as is repeated application of sunscreen lotions with a skin protective factor (SPF) of at least 15. Workers should be trained to check themselves for signs of melanoma, by far the most dangerous form of skin cancer, because it metasticizes (spreads) to other organs.

15. Repetitive Motion and Back Injuries

Repetitive motion, such as constant kneeling when milking cows or repetitive hand motions when hand cultivating or harvesting, can result in joint deterioration or injuries like carpal tunnel syndrome. Efforts must be made to develop ways to avoid such motions, either through restructuring the job, using mechanical aids or mechanization, or redesigning the workplace to eliminate the motions.

Many farm workers are plagued by lower back pain. Numerous farm activities can lead to back pain, including lifting objects that are too heavy, lifting heavy objects incorrectly, lifting awkward-to-handle objects, moving or hitching equipment, or pushing or wrestling with cattle. Care must always be taken to lift properly, using the back and keeping the load close to the body. Where this is not possible, machines or other lifting aids should be employed. Since back pain can last a lifetime, thought should be given as to how to make those jobs involving pushing or wrestling easier to manage.

16. Maintenance, Repair, and Construction

Farmers and farm workers are commonly involved in maintenance, repair, and construction activities, often without specialized tools or apparatus used by dealerships or contractors. Serious injuries can result from misuse of tools and unsafe maintenance or repair operations. Haphazard use of jacks and other lifting devices without proper blocking and stabilization can result in fatal collapses. Personal protective equipment for the eyes and/or other parts of the body are necessary when using various hand and power tools. Inflating tires can be hazardous, especially truck tires on split rims, which can explode with fatal force, and locking air chucks and safety cages should be used as appropriate.

Construction operations should be undertaken with safety in mind. Trenches can easily collapse if not properly stabilized. Work on farm buildings or other structures should involve the use of appropriate devices like scaffolding or safety harnesses to prevent falls.

Lockout/tagout procedures should be used when working on any electrical system or electrically-operated equipment, or even engine-driven machines that might be turned on by another person. As described earlier, this involves locking the switch box and

keeping the key, so that only the person doing the maintenance or repairs can turn on the system, or at a minimum, tagging the switch box to warn others not to switch on the power. This procedure is commonly followed in factories and other industrial areas.

17. Child Safety on the Farm

Children as well as workers are at risk of farm injury; since the home and workplace are combined, children are often present in the workplace. In the United States alone, over 100 children die each year from injuries related to farm work or the farm workplace. Children may be injured while playing in or wandering into a work area; while accompanying parents into the workplace; while working alongside and helping parents; or while operating equipment or performing other farm tasks independently.

It is imperative that children are not brought into hazardous areas, such as being extra riders on tractors, or being allowed to play in busy farmyards or other hazardous areas where they can get into trouble or may not be seen by equipment operators. Dangerous areas like manure lagoons and ponds must be fenced off to prevent access by children. When children are old enough to help, it is equally important that parents give their children age-appropriate tasks, suitable to the mental, physical, and emotional development of each individual child. Every child is different, and generalizations should not be made from other children or from traditions handed down over generations. Children should also receive thorough training in these tasks, and be given appropriate levels of supervision.

18. Stress and Depression

Farm operators are often under stress for a variety of reasons. Weather, time pressures, poor commodity prices, rising expenses, livestock disease, crop pestilence, and political changes are just a few of the stressors experienced by farmers the world over. Unfortunately, many farmers fail to develop healthy ways of dealing with stress, or feel that they should be able to overcome any difficulty on their own, and may fall into depression. During times of crises in agricultural economies, increasing numbers of farmers turn to suicide. Family members and people who deal with farmers on a daily basis should learn about, and become alert for, signs of serious depression. A few such signs are loss of interest in various activities, failure to take care of livestock and other property in the normal way, or just displaying general hopelessness.

19. Regulations and Management

It goes without saying that health and safety regulations should always be followed. In some countries, states, or provinces, farms and farm workers may have fewer such regulations compared to general industry. Regardless of the status of regulations in a particular area, farm operators, managers, and farm contractors should always keep the best interests of their people in mind. The absence of regulation is no excuse to ignore the health and safety needs of workers and family members.

Any successful business will have a strong safety program for its workers, as healthy workers are more productive, not to mention the moral obligation of protecting people

from injury and illness. Farms should be no different. A written safety program, hazard control activities, proper training and supervision, and safety committees are components of a successful safety program.

The safety of the general public, especially the neighbors to the farm, is also important. Protection of surface and ground water requires proper use and disposal of chemicals and livestock wastes. Safe operation of machinery on public roads protects other motorists. Safe movement of livestock, and proper maintenance of fences to keep livestock off roads, is also necessary. Being a good neighbor involves protecting the health and safety of others.

Glossary

All-Terrain Vehicle (ATV):	A small single-rider vehicle with low pressure tires (typically four), powered by an engine similar to a small motorcycle engine, used to traverse various types of terrain.
Bucking:	Sawing felled trees into logs.
Carpal Tunnel:	The canal in the wrist through which tendons and nerves pass.
Chuck:	The attachment to an air hose, which fits onto the valve stem of a tire.
Dander:	Dried skin particles, such as from animals.
Decibel (dB) :	A unit of measure for the loudness of sounds.
Falling Object Protective Structure (FOPS) :	A structure on a tractor, which protects the operator from falling objects.
Haymow:	The part of a barn where hay is stored, typically on a floor above the livestock.
Lockout/Tagout:	A procedure whereby the energy source to a machine or system is locked in the "off" position during maintenance or repair, to prevent activation by another person; or tagged to warn others not to turn it on.
Material Safety Data Sheet (MSDS) :	A document provided by the manufacturer of a chemical which provides information on health hazards, appropriate precautions, handling, disposal, first aid, and other important details about the chemical.
Organic Dust Toxic Syndrome (ODTS) :	A short-term respiratory illness resulting from overexposure to organic dusts from grain, silage, hay, and other similar materials.
Personal Protective Equipment (PPE) :	Various protective devices or clothing worn by an individual to protect the wearer from hazards. Examples include hearing protection, eye protection, chemical-resistant gloves and clothing, respirators, hardhats, steel-toed shoes, etc.
Power Take-Off (PTO) driveline:	A rotating shaft, connected between a tractor and an implement, which transfers power from the tractor engine to the implement.
Rollover Protective Structure (ROPS) :	A structure on a tractor, which protects the operator in case of a tractor rollover (overturn). ROPS may be open frames or built into the structure of a cab.

Bibliography

Aherin R.A., D.J. Murphy, J.D. Westby. (1992). *Reducing Farm Injuries: Issues and Methods*, 58 pp. St. Joseph, MI, USA: American Society of Agricultural Engineers. [This reviews past and current methods at controlling agricultural injuries].

Bellinger P.L. (1994). *Farm and Ranch Safety Management*, 346 pp. Moline, IL, USA: Deere and Co. [This is a text focusing primarily on machinery-related safety, aimed at farmers and farm machine operators and agricultural students].

Langley R.L., R.L. McLymore, W.J. Meggs, G.T. Roberson, eds. (1997). *Safety and Health in Agriculture, Forestry, and Fisheries*, 758 pp. Rockville, MD, USA: Government Institutes Inc. [This is an in-depth technical treatment aimed at professionals and students in occupational safety and health].

McDuffie H.H., J.A. Dosman, K.A. Semchuk, S.A. Olenchock, A. Senthilselvan, eds. (1995). *Agricultural Health and Safety: Workplace, Environment, Sustainability*, 617 pp. Boca Raton, FL, USA: CRC Press Inc. [This is the proceedings of the Third International Symposium: Issues in Health, Safety, and Agriculture, May 10-15, 1992, Saskatchewan, Canada].

Murphy D.J. (1992). *Safety and Health for Production Agriculture*, 253 pp. St. Joseph, MI, USA: American Society of Agricultural Engineers. [This is a text aimed at college-level students and professionals in agricultural safety and health].

Biographical Sketch

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EOLSS Online (For editors/authors):
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Print Volumes of Knowledge For Sustainable Development An Insight into the Encyclopedia of Life Support Systems :
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*Page range See :**KSD's List of Contents.**

Print Volumes of Our Fragile World (OFW):
[Author Name], [2001], [Chapter Title], in OUR FRAGILE WORLD (OFW) *Challenges and Opportunities for Sustainable Development*Volumes I,II, pp---*, Eolss Publishers, Oxford, UK.

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Hi Evelyn ,

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Have a nice day,
Nora