



The Basics of On-Farm Safety: An Introductory Guide by the AgrAbility Virginia Program

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Introduction

Agriculture safety is vital to a successful farm operation and cannot be overlooked. This guide gives a brief overview of different hazardous activities associated with agriculture and will direct you to educational resources designed to help keep your workers, your family, and yourself safe. It is essential that everyone set aside time to learn safety precautions and prevent unnecessary accidents. The Centers for Disease Control and Prevention (2020) reports that 100 farmers per day suffer an injury that causes them to lose work time. These injuries occur while farm workers are conducting farm chores such as livestock handling, hazardous material handling, and machine operation (Mariger et al., 2007). Injuries, lost time due to an injury, additional medical costs, permanent impairments, and deaths can all be prevented when safety practices are set and followed.

Agriculture safety should be a major concern to all who work, live, or interact on a farm. It is important that all persons on the farm understand the risks involved if proper safety procedures are not followed. The purpose of this publication is to provide farm safety resources and introduce farmers, workers, and families to some suggestions on the more common safety challenges. This publication is not intended to be used as a comprehensive farm safety resource. Please contact AgrAbility Virginia for more information on making your farm safe:

www.agrabilityvirginia.org

Where do I start?

Agriculture is a dynamic part of any community. Farmers are key to providing fresh and healthy food to their surrounding communities. Sometimes farmers and farm workers sustain injuries, illnesses, or experience a disability that impedes their capability to work and reach life goals. This not only affects the farmer, but the whole community. AgrAbility Virginia recognizes the importance of the farmer in their community and therefore, provides assistance. AgrAbility Virginia promotes safety, wellness, and accessibility on the farm through education, rehabilitative services, and assistive technology. This program is a partnership between Virginia Tech, Virginia State University, Virginia Cooperative Extension, and Easterseals UCP North Carolina & Virginia. AgrAbility Virginia incorporates its programming into Virginia's rehabilitation and agricultural service delivery system to increase organizational capacity and provide high-quality education and services for farmers. If you are concerned with safety on your farm, your AgrAbility Virginia program team can point you in the right direction. You can also reach out to your local Virginia Cooperative Extension office for resources and guidance. The next few sections will point out key areas for you and your family to be aware of as you begin, diversity, or expand your farm operation.

Operating Machinery

Tractor accidents are linked to over half of all farm related deaths (Schwab & Hanna, 2013). A roll over protective structure (ROPS) can help to prevent workers from being crushed underneath the tractor and save lives. This is why its installation is emphasized. Surviving a rollover is greatly increased if you wear your seatbelt and use a ROPS on your tractor. However, if you do not have a ROPS installed, do not wear a seatbelt! If the tractor rolls over, you may not be able to get out from under the tractor while still belted in. There are farmers from all ages and experience levels who have had a close call during a rollover event. It is so common that a West Virginia survey reported approximately 40 percent of farmers have come close to rolling over while operating a tractor and 61 percent reported that someone they knew lost their life due to rolling over (Ohio State University, 2005). Only one person should be on a tractor at a time, extra riders can be thrown off and run over. This not only leads to injuries, but to deaths. A rollover becomes especially dangerous when there are small children who may not be as visible. It is a good practice to continually look before moving the tractor and make sure that children do not play near farm equipment.

There are steps you can take to prevent the likelihood of rolling over while on the tractor. To start, avoid operating tractors near ditches. Terrain changes and hard to see holes can increase your chances of tipping over. It is also important that you turn slowly, especially when on a sloped surface. Turn downhill if you feel like you are losing control. When carrying a load, such as a hay bale, keep it low to the ground. Moving while you are carrying a heavy load shifts your center of gravity and may cause the tractor to tip and rollover. A new operator should practice on level surfaces and be trained by an experienced operator before trying any tricky maneuvers.

Power Take-Off (PTO) Shafts are another major cause of injury and death in agriculture. Often farmers become entangled because of their loose clothing or boot laces (Murphy, n.d.). The extremely high-speed rotation of the PTO can lead to a wide range of injuries including amputations or death. To prevent injury, inspect the shaft before operation, make sure the shield is in place at all times, avoid

wearing loose clothing or other items, and keep a safe distance when operating the PTO. Make sure the PTO is turned off before dismounting the tractor. Lastly, never step over a PTO; take the extra time to walk around it to prevent injury (Power Take-Off Safety, 2012).

It is important to stress that operating any type of machinery can be dangerous and poses many risks to farm workers. Loud noises can lead to hearing loss and thus, proper hearing protective equipment should be worn in such environments. Appropriate protective equipment should be used anytime you are around or operating a machine. Of course, having knowledge of what potential hazards that are present, is key to staying safe. The information below should help guide you to specific safety information on diverse machinery:

- **Caterpillar Safety Series:** This is a large collection of safety information for a variety of different machines. Includes videos of safety and operating tips, as well as, checklists for safety and maintenance. For more information please visit: http://www.cat.com/en_US/support/safety.html.
- **Have you Heard? Hearing Loss Caused by Farm Noise is Preventable:** This link provides information on how to correctly insert and wear different types of earplugs. Also, there are tips on using hearing protection and a common noise level chart. Visit: <http://www.cdc.gov/niosh/docs/2007-176/pdfs/2007-176.pdf> for illustrations and charts.
- **How to Install and Maintain a Shaft Cover on a Tractor PTO: A Video:** This video demonstrates how to install and properly maintain a PTO shaft cover. Watch this video at: <https://www.youtube.com/watch?v=uBoINyG7USU>.
- **Safe Implement Hitching:** This includes pictures of what is and is not safe when using different types of connections. Guides on how to use different types of hitches, as well as, how to perform proper maintenance and inspections are covered. Please find more information at:

https://cfaessafety.osu.edu/sites/safety/files/imce/SIH_Guidefinal_0.pdf.

- **Safe Operation of Farm Tractor Videos:** This is a video series that describes how to safely operate a tractor. This video series can be viewed at: <http://fyi.uwex.edu/dairy/safe-operation-of-farm-tractor-videos/>.
- **The Kentucky ROPS Guide:** A guide that will let you search nationwide for a retrofit ROPS designed for the specific make of your tractor. Visit: <https://rops.ca.uky.edu/> for this information.

Personal Protective Equipment (PPE)

Agriculture Personal Protective Equipment (PPE) is vital to your health, maintaining a quality of life, and can save your life. Well-designed protective head, body, eye, and footwear can prevent or minimize many injuries that occur on the farm. Labels found on agriculture chemicals will stipulate the appropriate PPE you will need. When handling chemicals, you should, at a minimum, wear goggles, unlined chemical gloves, a chemical-resistant apron, and face shield while mixing and loading the chemicals (University of Wisconsin Extension, n.d.). For some chemicals, you may need to wear a protective suit and a respirator. The use of PPE, such as masks and face shields, is also recommended to avoid the transmission of the novel coronavirus (COVID-19). See the section below on coronavirus precautions for additional information on keeping you and your workers healthy and safe during the global pandemic.

Falling objects, loose wood, and many other hazards have a potential for causing a head injury while working on a farm. Adding headgear can not only protect you from objects, but can be the difference between a small concussion and major brain damage (Murphy & Harshman, 2012). According to Murphy and Harshman (2012), OSHA regulations mandate employers with ten or more employees ensure that each employee wears a protective helmet when there is potential for a head injury. The American Academy of Ophthalmology reports eye injuries could be reduced by as much as 90 percent if the appropriate eye wear with side eye protection was

added (Murphy & Harshman, 2016). Fairly common occurrences such as: animals stepping on a worker's feet, heavy objects dropping on the feet, and sharp objects piercing the shoe cause injuries to farmers and can be prevented or reduced when safety footwear is used. A good example of safety shoes includes: a steel-toe cap, steel shanks that distribute weight evenly, built in or add on metatarsal guards, built in or slip-on steel midsoles, and slip-resistant soles to help protect and prevent falls (Murphy & Harshman, 2016).

Purchase good quality products that fit well. If you purchase a good quality product that does not fit properly, you are reducing the protection provided by the equipment. You can find PPE at local farm supply, at a safety supply stores, or in catalogs. Two catalogs that the University of Wisconsin Extension (n.d.) suggest are "Gempler's" and Grainger "Lab Safety Supply." The Gempler's master catalog is designed for the agricultural market, while the Grainger Lab Safety "safety supplies catalog" serves all industries (University of Wisconsin Extension, n.d.). The phone number for Gempler's is 800-382-8473. The number for Grainger Lab Safety Supply is 800-356-0783.

Livestock Handling

Livestock handling is one of the leading causes of injury on a farm. It is important to understand how animals naturally behave in and out of stressful situations. Knowing these natural tendencies, a worker can reduce stress to the animal and simultaneously, prevent injury to both the animal and the farmer or farmworker. Ohio State University (n.d.^a) lists the following points to keep in mind when working with livestock:

- Large animals are usually more dangerous than small ones.
- Mothers will protect their young from danger.
- Males are typically more aggressive than females.
- Animals are naturally territorial and can be frightened, become aggressive, and behave unexpectedly.

- Loud noises are frightening to livestock and should be reduced when handling livestock.
- When possible, avoid cornering an animal. This tends to make them feel threatened and that increases the likelihood of being injured.

Extra precaution should be taken when approaching horses, cattle, or mules. The blind spot for these animals is directly behind them so, it is important to remember you should never approach the animal from behind (Ohio State University, n.d.^b). Instead, approaching them from the side or front is a much better practice. It is a good idea to design an escape plan in case you find yourself in a dangerous situation while working in close proximity to an animal.

- **On Farm Health & Safety:** At <https://extension.umn.edu/dairy-handling-and-best-practices/basic-stockmanship> you can find information about safely handling cattle and working with cattle.
- **Safe Horse Handling:** This safety list offers safety rules and tips. Visit: <https://extension.missouri.edu/publications/g2878> for more information.

Pesticide Safety

Pesticides generally come in concentrated forms making them easier to store, but according to WorkSafeBC (n.d.), pesticides are most dangerous in this concentrated form. To reduce possible hazards, keep the storage room door locked and the room ventilated. Only certain trained workers should be allowed to enter the storage room. A sign out sheet should be filled out by these workers as they use pesticides. On the door should be a clearly posted sheet that includes what chemicals are being stored and the date they were originally stored.

When working with pesticides, it is required by law to follow all the directions on the safety labels. Chemically resistant boots, gloves, goggles, head protection, and the recommended respirator should always be worn when applying pesticides. After every pesticide application, the equipment needs to be cleaned and the person handling the chemicals needs to rinse off in appropriate rinsing areas. These

resources share a number of good practices and additional resources to follow as you plan for chemical and pesticide safety on your farm:

- **Green Book:** This is a free membership that gives you access to over 12,000 chemical product labels for plant pesticides. Find this at: <http://www.greenbook.net/>
- **OSHA Brief:** This Hazard Communication Guide provides information on Safety Data Sheets: <https://www.osha.gov/sites/default/files/publications/OSHA3514.pdf>
- **Practical Solutions for Pesticide Safety:** This guide includes information related to pesticide usage and solutions farmers created to make them safer. Each design comes with directions on setup, pictures, as well as, estimated cost. See this at: http://deohs.washington.edu/pnash/sites/deohs.washington.edu/pnash/files/documents/PracticalSolutionsGuide_ENG19SEPT14.pdf
- **Virginia Cooperative Extension Pest Management Guides** include resources on pest management for home grounds and animals, field crops, horticultural and forest crops, commercial fruit trees, hemp and berries: <https://spes.vt.edu/affiliated/plant-disease-clinic/pest-management-guides.html>

Lifting and Carrying Safety

Many farmers suffer from back problems due to improper lifting techniques. Several of these injuries are permanent and last for a lifetime. To reduce the possibility of permanent damage to your back, use machinery to aid in lifting when possible. It is always a good idea to have more than one person lift a heavy object. Make sure the path is clear before moving an object. Ensure you have a good grip on the item, and secure footing before lifting.

Here is a list from Ohio State University (2019). It includes proper lifting techniques:

- Bend using your knees, not your back!

- Do not twist your back when carrying something. Instead move your feet to turn in a different direction.
- Keep the object you are lifting close to your body.
- Push a load rather than pull it.
- Walk slowly.

Confined Spaces

The Centers for Disease Control and Prevention (2016) defines confined spaces as areas which have limited access, poor ventilation, and potentially harbor toxic fumes or other harmful substances. They are not meant for long periods of access and safety precautions need to be taken when entering. Confined farm spaces include grain bins, silos, and manure pits. A permit is required with certain confined spaces that pose a greater hazard. These permit-required spaces include ones that harbor toxic gases or limited oxygen, have an engulfment risk, sloped floor, or moving parts. Caution should always be taken when entering confined spaces and all employees need to be aware of the risks.

Manure Pit Safety

Manure decomposes and produces a bio product of harmful gases. These gases include hydrogen sulfide, methane, ammonia, and carbon dioxide. The recommended safe exposure of these gases is as follows: five (parts per million (ppm) for hydrogen sulfide: seven ppm for ammonia: and 1,500 ppm for carbon dioxide (Doss, McLeod & Person, 1993). Larger amounts of any of these gases leads to adverse health effects and if the concentration is high enough, they can lead to death. When working in these pits, you must wear an appropriate self-contained breathing apparatus along with a safety harness before entering. It is also important to utilize a buddy system in case you become incapacitated and a rescue is needed.

- **Beware of Manure Pit Hazards:** This site contains information on what the recommended level of exposure is for different concentrations of hazardous gases, negative effects of different levels of exposure, and guidelines for safely entering manure pits. Visit at:

<http://nasdonline.org/1292/d001097/beware-of-manure-pit-hazards.html> for this information.

Grain Bin Safety & Grain Handling

Grain bins can be found on many farms and are common, however they can be extremely hazardous. If you need to enter a grain bin, it is **very** important to take needed safety precautions to reduce the risk of entrapment and asphyxiation by grain. Surprisingly, it takes only a few seconds to be trapped and in real danger. In as little as eleven seconds, you can be completely engulfed and unable to breathe (Sadaka, 2017). Most people who get trapped in grain bins do not survive. If you must enter a grain bin, it is important that you never enter it alone and the proper lifeline safety procedures are in place in case you become trapped. Proper safety procedures include the Lifeline System depicted in figures one and two below.

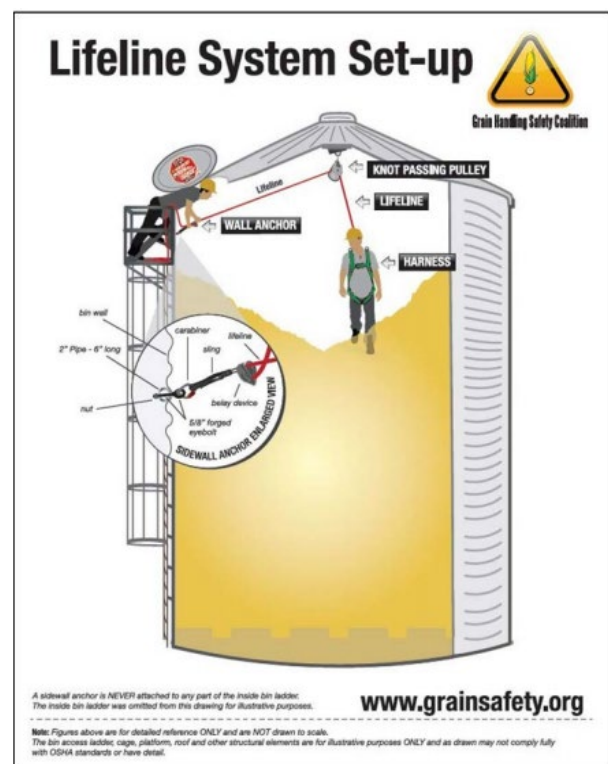


Figure 1 Lifeline System Set-up

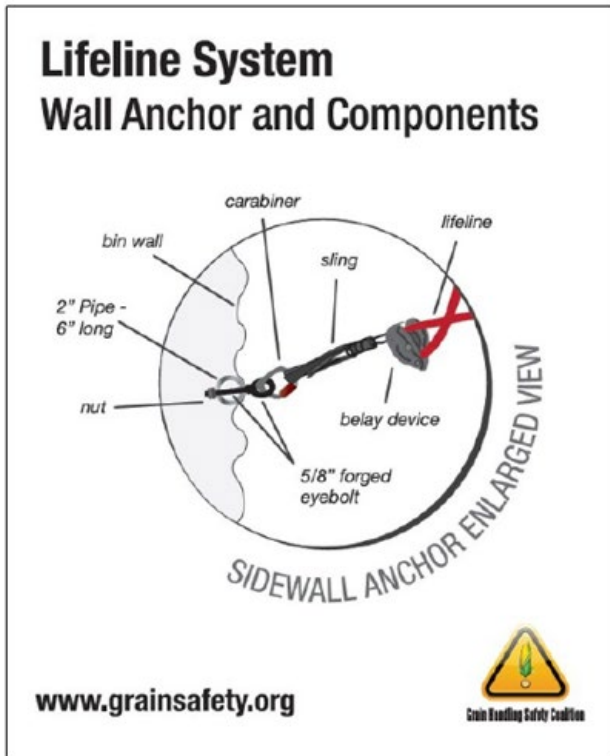


Figure 2 Lifeline System: Wall Anchor and Components

- **Grain Handling Safety Coalition Courses:** These courses include a PowerPoint and cover the hazards and safety precautions associated with grain bins. Visit: <http://grainsafety.org/training-2/course-descriptions/> for more information

Skin Cancer

Farmers spend hours working in direct or partial sunlight. Without proper skin care during prolonged sun exposure, skin cancer can become a real concern. One way to protect against skin cancer, is to avoid as much midday sun exposure as possible. If it is not possible to stop working, utilizing machinery with overhead covers maybe the answer. Julie Mitchell of Oklahoma Cooperative Extension Service (n.d.) suggests these other safe practices:

- Wearing sunscreen and sunglasses that protect against both UVA and UVB rays
- Wearing a hat with at least a three-inch brim surrounding it

- Wearing dark, tightly woven, long-sleeve shirts and pants
- Using sunscreen with 30 SPF or higher and reapplying it at least every two hours
- If your skin turns red or shows significant color change, get out of the sun immediately

Coronavirus (COVID-19) Precautions

COVID-19 continues to be a threat to all, including to agricultural workers. Farmers and other agricultural workers are considered to be “critical infrastructure workers within the Food and Agriculture Sector” (CDC, 2021). This means that farmers and farm workers may continue to following the Critical Infrastructure Guidance provided by the CDC. The Centers for Disease Control and Prevention recommends these best practices to help curtail the spread of COVID-19 in the agricultural workplace:

- Conduct a worksite assessment to determine risks of transmission of COVID-19.
- Follow current guidance for instances when social distancing is difficult or impossible, including in shared worker housing, transportation vehicles, and work settings. This may include the use of PPE like masks or face shields and maintaining good ventilation.
- Group workers together in cohorts to minimize the number of different individuals that workers come into contact with.
- Provide up-to-date information about COVID-19 risk and prevention in languages that workers can understand. The CDC has resources in a variety of languages at this site: <https://wwwn.cdc.gov/Pubs/other-languages?Sort=Lang%3A%3Aasc>.
- Work with state and local public health officials, as well as occupational safety and health professionals to continue to adapt best practices to the changing COVID-19 environment.

- Refer to [Interim Guidance from the CDC and U.S. Department of Labor](#) – this resource shares guidance for agriculture workers and their employers related to COVID-19 exposure risk, creating a COVID-19 assessment and control plan, and special conditions for shared housing and transportation, and for youth workers. This information can be found at: <https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-agricultural-workers.html>

Working in Elevated Locations

Using a ladder is often required, so it is important that proper safety procedures are followed to prevent injury. When working on a ladder, it should be positioned one foot away from the wall for every four-feet of vertical rise. Ladder safety is especially important because more than 500,000 people are treated for ladder-related injuries and about 300 people die from these injuries each year (Simeonov & Webb, 2017). Falling from high elevations or slippery surfaces has led to many injuries on farms. Further, stairs and pathways should always be kept clear to avoid tripping over an unexpected object.

- **Ladder Safety WorkSafeBC:** This is a ladder safety series on how to use different types of ladders safely. It can be found at: <https://www.worksafebc.com/en/health-safety/tools-machinery-equipment/ladders>

Conclusion

The AgrAbility Virginia Program and Virginia Cooperative Extension seek to promote a safety culture on farms. Because agriculture continues to rank among the most dangerous industries, farmers and their families should review this educational information regularly with the goal to eliminate, reduce, or control physical hazards. As populations across Virginia continue to rise, coordinated efforts will be needed to increase food production, while at the same time, enhance safety for our farmers. It is our goal to help make your farm a safer place, where you will be able to thrive. For more information, we have provided a list of additional resources for you to use that come from a number of national sources.

Visit the Virginia Beginning Farmer and Rancher Coalition's resources on farm safety, health, and

wellness:

<https://www.vabeginningfarmer.alce.vt.edu/resource/safety-health-wellness.html>

Additional Farm Safety Resources

This list includes resources on a variety of topics related to farm safety.

Safety Topics & General Information

- **Ohio State University Extension's Ohio AgrAbility Series:** Links to different safety documents for farmers. <https://ohioline.osu.edu/tags/ohio-agrability-series>
- **Texas A&M University AgriLife Extension:** Different agricultural safety topics with a list of facts and safety information related to the topic. <https://agsafety.tamu.edu/farm-and-ranch-safety/>

Informative Videos About Farm Safety

- **A Tractor Accident Can Happen to Anyone:** YouTube video provides statistics about tractor accident and discusses how tractor accidents happen, focusing especially on tractor rollover <https://agsafety.osu.edu/resources/free-video>
- **Agricultural Health & Safety Videos:** Safety videos covering a large amount of farm safety topics. <https://ag-safety.extension.org/agricultural-safety-and-health-video-resources/>
- **Farm Safety Campaign Ad 2015:** Powerful ad showing why farm safety is so important. https://www.youtube.com/watch?v=lhsCY_25nCc
- **Farmaccidents YouTube Channel:** Dedicated to farmers telling their stories of being injured in order to help promote safety. <https://www.youtube.com/user/farmaccidents>
- **Plan.Farm.Safety.:** Award winning farm safety video produced by the Canadian Agricultural

Safety Association. Goes over major farm hazards and the importance of running a safe farm.

<https://www.youtube.com/watch?v=IGzNiAy67HA>

- **SaskPower Farm Safety:** Great animated video which demonstrates what to do if you are operating a vehicle which hits a power line, and also what to do if the vehicle catches on fire if it does. Talks about how to safely operate around power lines on the farm.
<https://www.youtube.com/watch?v=ktDjppUvzZY>
- **U.S. Agricultural Safety and Health Centers:** Video series designed to inform farmers of safe practices and hazards doing different farming tasks.
<https://www.youtube.com/user/USagCenters>

Safety Related to Youth and Children

- **Progressive Agriculture Safety Day:** Helpful resources geared to teaching farm safety to children through a farm safety day.
<https://www.progressiveag.org/>
- **North American Guidelines for Children's Agricultural Tasks (NAGCAT):** Guidelines on appropriate agricultural tasks for children.
<https://nasdonline.org/7064/c000026/north-american-guidelines-for-childrens-agricultural-tasks-nagcat.html>
- **Virginia Cooperative Extension Guidelines for Protecting Youth Workers: Promote Safe Practices and Protect Youth Workers:** This training guide is designed to reduce the number of farm accidents and injuries among youth workers.
<https://resources.ext.vt.edu/contentdetail?contentid=2250>

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