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Tractor Safety Tips for Arkansas Producers

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Introduction

Over the years, tractor design and development have changed dramatically. Many safety measures have been developed and made a part of the basic tractor design. One example of this is the roll-over protective structure (ROPS) designed to protect the operator in case of a tractor rollover accident. The use of seatbelts and tractor cabs with built-in ROPS are other examples of safety designed into the tractor (see Figure 1).

Advances in technology have allowed the placement of Global Positioning System devices (GPS), laptop computers, self-steering technology utilizing GPS and other technology in the tractor cab. Farmers may be able to check storage bin temperatures or market information from the tractor cab. However, the farmer should maintain situational awareness in the cab because he or she will still have to operate the tractor in a safe manner.

Figure 1. Buckle up if your tractor is equipped with a roll-over protective structure (ROPS).

Too many agricultural workers, unfortunately, perish in farming accidents across the U.S. each year. Farm tractor accidents remain the leading cause of death and injury on farms. They accounted for the deaths of more than 1,500 farm workers in a recent nine-year period. In Arkansas, more than 50 people have been killed by tractor overturns in a 15-year period. Unfortunately, the human suffering and cost of tractor overturns is staggering. Regretfully, tractor accidents have claimed the lives of old and young workers as well as children. Following are examples of some typical fatal tractor accidents:

- A 3-year-old boy was killed when he fell beneath a chicken house being hauled by a tractor.
- An 11-year-old boy jumped from the tractor scoop and was run over by the tractor.
- An 18-year-old male was killed when he tried to drive his tractor back onto the road. The tractor upset on him.
- A 34-year-old man died from a crushed skull when his tractor overturned while towing a car.
- A 49-year-old man was killed when his tractor hit a stump and overturned.
- A 61-year-old man's clothing was caught in the power-takeoff.
- A 64-year-old man fell from his tractor and was run over by the right rear wheel as the tractor rolled down an embankment.

Improper operation of a tractor or equipment causes the greatest percentage of on-farm accidents.

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Tractor turnovers, including side turnovers, rear turnovers and front "tipping" turnovers, are the leading cause of fatalities on the farm. Accordingly, common hazards must be respected. The most important point of tractor safety is to know your tractor. Producers should know how to handle their tractors and be alert to avoid an accident.

Read Your Tractor Operator's Manual, Become Familiar With It, and Follow the Instructions.
Review It Regularly.

This fact sheet provides suggestions that can help Arkansas producers reduce tractor hazards. Following these instructions will help tractor operators develop safe driving practices and eliminate unsafe habits. The fact sheet should also assist every tractor operator to develop a healthy concern for safety to minimize personal danger.

Perform a preoperational check before starting the tractor.

It is advisable to perform a preoperational check before each tractor use. Keeping the tractor in good working order is an important measure of safety. Before starting the tractor, check the following items:

- **a.** Tire condition and inflation level.
- **b.** Fuel, oil and hydraulic fluid levels.
- **c.** Condition of fuel and hydraulic lines – no leaks.
- **d.** Shields in place.
- **e.** Platform and steps clean, free of debris, chains and tools.
- **f.** Clear visibility from within cab, mirrors clean.
- **g.** Brakes operational.
- **h.** Steering operating correctly.
- **i.** Air cleaner and coolant.
- **j.** All lights working.
- **k.** Slow Moving Vehicle (SMV) emblem in place and clean.
- **l.** Neutral-start safety switches operating correctly.

Do not remove or alter your approved roll-over protective structure.

The Occupational Safety and Health Administration (OSHA) enforces a roll-over protective structure (ROPS) standard in an effort to reduce the death rate from overturns. The standard requires that all tractors manufactured after October 1976 have ROPS. However, experts estimate that thousands of old tractors remain unprotected. ROPS with seatbelts can prevent most injuries and deaths from tractor roll-overs. ROPS are designed to take the total roll-over impact while protecting you. The seatbelt is there so you will not be thrown from the ROPS-protected zone and crushed or injured. If the tractor is equipped with a ROPS, never operate the tractor without your seatbelt fastened, except for the one specific situation described in the next paragraph.

Some tractors are equipped with folding or "telescoping" ROPS. These types of ROPS can be easily lowered when operating the tractor where overhead clearance is inadequate to operate with the ROPS raised in protective position. This type of ROPS should be installed on all tractors operating in low-overhead facilities, such as poultry houses, and raised when clearance is adequate. **When operating these tractors with the ROPS lowered, do not fasten the seatbelt.** If you do, you are likely to be pinned under the tractor in case of an upset. However, **raise the ROPS immediately when clearance is adequate and fasten the seatbelt.** Remember, ROPS and seatbelts go together – when you use one, use the other! A roll-over protective structure (ROPS) and seatbelts can save your life.

If the ROPS structure is damaged in an overturn or by hitting a building, a tree or other obstacle, replace it. In addition to the ROPS, several tractors have a cab for safety, comfort and utility. A cab built around a crush-resistant protective frame will give protection from overturns, dust and weather and will reduce fatigue. It should also be designed to keep noise at a safe level.

Avoid operating a tractor near ditches, embankments and holes.

To ensure safety around ditches, ponds and river embankments, levees and washouts, just stay away. When operating near ditches and banks, keep your tractor behind the shear line as shown in Figure 2. When operating around a ditch, look ahead for holes, gullies and washouts. Embankments can collapse from equipment weight, so never approach any closer to a drop-off than the distance the embankment is above

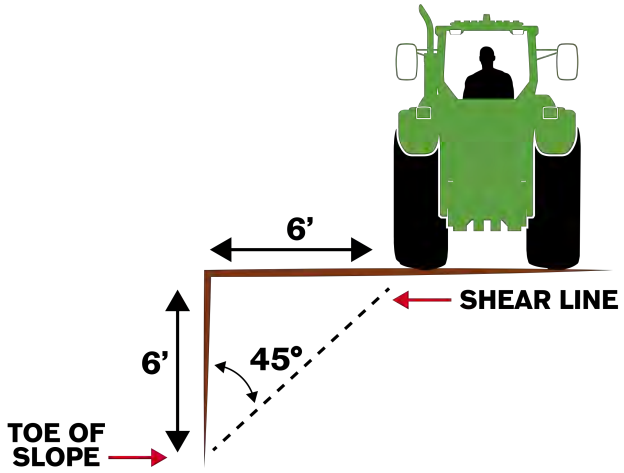

Figure 2. Keep your tractor behind the shear line when operating near ditches and banks.

the toe of the slope. Avoid holes and depressions that are likely to cause a side overturn. When stuck in a hole or soft spot, a tractor can easily upset backwards when the clutch is engaged. Edges may be undercut or weakened and may not be able to support the weight of the equipment. Implements that slip over the edge will tend to pull the tractor with them.

Reduce speed when turning, crossing slopes and on rough, slick or muddy surfaces.

High speed, rough ground and narrow, high-speed wheels greatly increase the chance of upset, especially when turning. Reduce speed when turning, crossing slopes and on rough, slick or muddy surfaces. Slow down before making any turn. Centrifugal force is one of the major causes of tractor upsets. Centrifugal force tends to keep the tractor moving in a straight line (see Figure 3). As you double the speed of a tractor while turning, the danger of upsetting is increased four times. If a tractor begins to slide sideways to the direction of travel, you may turn over into a ditch or hit an obstacle and upset. As you turn with a raised loader, you increase the possibility of a tractor overturn. Keep the loader as low as possible, and watch for ditches, holes and rocks that might cause an upset.

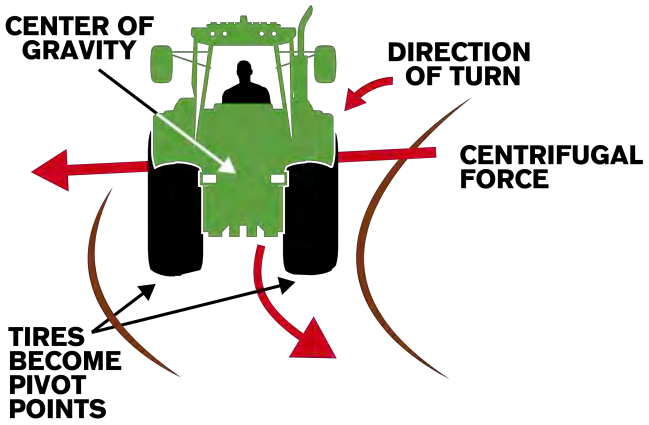

Figure 3. Centrifugal force tends to pivot the tractor on its outside wheels, causing a "side" overturn.

Stay off slopes too steep for safe operation.

Stay off slopes too steep for safe operation. A tractor's stability is greatly reduced on steep slopes. To increase stability, set the wheels at the widest setting suitable for the job. A tractor will overturn sideways much more easily if the wheels are close together. Drive slowly and avoid quick uphill turns. Watch out for holes and depressions on the downhill side and for rocks, terraces and bumps on the uphill side. If you are using side-mounted equipment, keep it on the uphill side of the tractor (Figure 4). If using a loader, keep it in the lowest possible position. Watch for rocks, humps or holes that may cause the tractor to tip. Make uphill turns with caution, particularly with tricycle-type tractors. Turn downhill if stability becomes uncertain. Backward upsets are apt to happen when climbing hills, going forward out of a ditch or overloading the drawbar. If you have to go up a steep slope, back the tractor up the slope. Use a lower gear when going downhill.

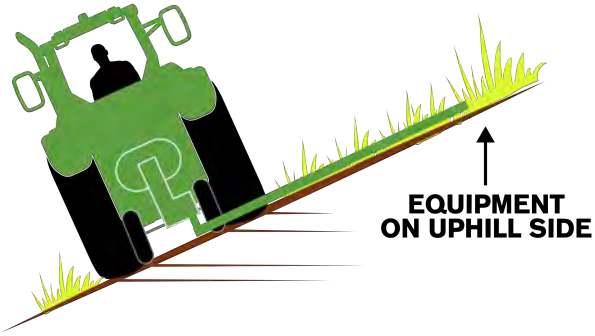

Figure 4. Keep the equipment on the uphill side if you are using a side mount one.

Operate the tractor smoothly.

Never make any abrupt or rough turns, starts or stops. Before moving equipment, make sure no person or obstruction is ahead or behind. Build experience operating at slow speeds so you can recover from a poor decision without an overturn. As you begin to move, engage the clutch slowly and evenly. Engaging the clutch suddenly or quickly shifting a hydraulic transmission to high speed could tip the tractor over backwards, especially when towing a load or starting up a slope.

Hitch only to the drawbar or the three-point hitch.

Tractor hitches are designed to pull heavy loads without risk of a backward upset. Always hitch to the drawbar and keep the hitch point as low as possible. Some operators overlook the fact that stability of the tractor is based on its center of gravity (COG) and the COG is affected by changes in the load or hitch height. Hitching above the normal drawbar height may cause a tractor to tip over backwards. Use the proper chains, cables and straps for towing. Always use a safety-hitch pin for fastening an implement to the drawbar of a tractor. A safety pin cannot bounce out, freeing the implement to careen out of control, possibly causing an accident. Any time you are towing a load with a tractor, the powered rear wheels tend to rotate the front of the tractor upward as illustrated in Figures 5 and 6 (on page 4). A restrained tractor pivots around the rear axle and overturns in less than three-fourths of a second. Add weights on the front weight rack to counterbalance heavy planters and implements to reduce the risk of a rear overturn.

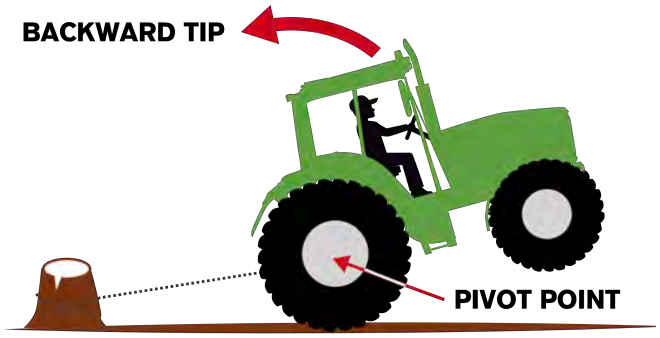

Figure 5. Rear axle torque will upset the tractor if rear wheels cannot spin or move forward.

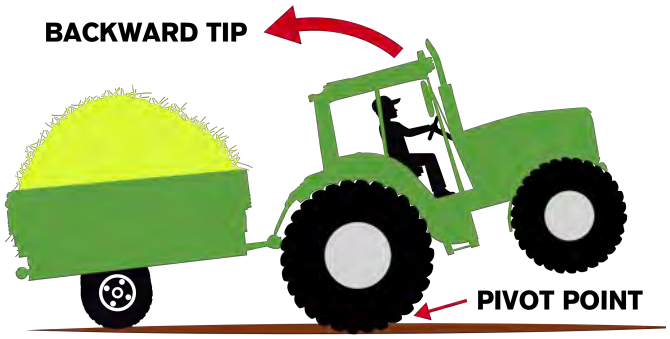

Figure 6. Hitching above normal drawbar height may tip the tractor backward.

Set the brakes securely and use the park lock if available.

When stopping a tractor, set the brakes securely and use the park lock if available. Do not depend on leaving the transmission in one of the driving gears to keep your tractor from rolling (see Figure 7). If your tractor does not have a parking brake, then shift the transmission lever to the park position. This locks the transmission, keeping the tractor stationary. If neither a transmission lock nor brakes is reliable, warn all others of the defect and have the tractor repaired as soon as possible. This will prevent an accident when it is restarted. Make this a habit every time you leave the tractor seat.

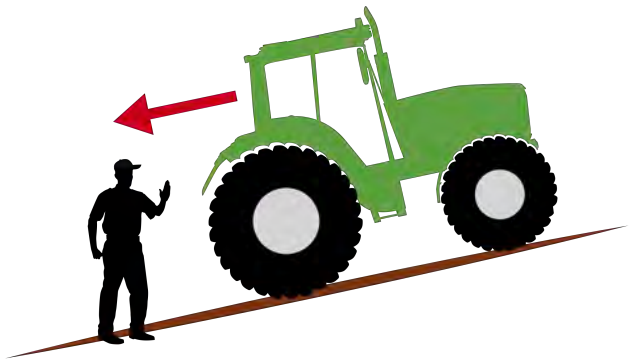

Figure 7. To avoid this, set the parking brake or shift into park.

Keep tractor in gear when going downhill.

Keep the tractor in gear when going downhill. This allows the tractor engine to serve as a brake. If in doubt about which gear to use, select the lower-speed gear and make the shift before you start downhill.

Follow all traffic rules when operating your tractor on public roads.

Many farmers do not have their entire operating area located on adjacent lands. This creates the need to move or tow equipment from one field to another, often on gravel or paved county or state roads. Out-of-field travel creates an environment of increased automobile exposure and the possibility of collisions. All safety flashers and slow moving vehicle (SMV) emblems should be working and/or replaced if they become inoperable or faded. Make sure to fasten a slow moving vehicle emblem securely to the rear. Maintain a bright, reflective finish to warn oncoming motorists at least 500 feet behind you. The closure time between an automobile and a SMV, especially when the SMV is towing an implement or trailer, is much less than the driver of the automobile might think.

Locking the rear brake pedals together when traveling between fields or on roads may be desirable to avoid tractor swerve if only one pedal is accidentally pushed for braking. Caution should be exercised and the brakes should be tested when locked to be sure one brake does not engage earlier than the other and that the locked pedals operate the brakes as one system (see Figure 8). Tractor operators must follow all traffic rules when operating on public roads. Then turn as wide as you can with engine power pulling the load.

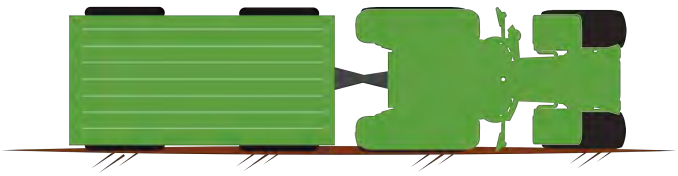

Figure 8. Fishtailing or severe braking at high speed can cause jackknifing and rollover.

Do not start a tractor when you are not in the seat.

Never try to start a tractor when you are not in the seat. “Bypass-starting” or “jump-starting” cancels all the safety interlocks designed by the manufacturer to prevent tractor run overs. When starting problems dominate your thoughts, you may fail to check that the transmission is not in park or neutral. People working on the starter are frequently crushed by the front or rear tire because there is not enough time to stop the tractor or jump beyond the path of

the wheel. It has been mentioned that more than 20 Arkansans have been killed when they were run over by a tractor. A portion of these deaths resulted from bypass starting. Additionally, victims who bypass the interlocks intended to prevent starting a tractor in gear are typically crushed, but not killed, by the tractor wheels.

Disengage the power take-off shaft before leaving the tractor seat.

Nearly all, if not all, tractors are fitted with a power take-off (PTO) shaft that may be used to power implements, e.g., mowers and grain carts. Rotating shafts are extremely dangerous, and loose clothing, gloves or anything that might come in contact with the rotating shaft can be wrapped in the shaft before an individual can react. The PTO should never be engaged when the operator is on the ground and there is no control over the equipment. A broken shaft attached to the PTO may act as a flail and be deadly to anyone within its arc. There is a high probability of an extremely serious injury or death if this occurs. It is a good practice to shut down the tractor completely and remove the key from the ignition when connecting to the tractor PTO shaft.

Keep the tractor PTO shield in place and in good repair. An unshielded or partially-shielded stub shaft can be deadly to the careless or unsuspecting operator. Keep the stub shaft guarded when not in use to provide power to other implements. If you must remove the PTO master shield for installation of mounted implements, the stub shaft guard should always be in place. **Use older tractors that lack adequate PTO stub shaft protection with extra caution.** If a shield becomes damaged or lost, replace it as soon as possible. Also, keep all implement drivelines properly shielded and in good repair.

Keep the engine compartment closed while operating the tractor.

Avoid operating the tractor's engine while the engine compartment is open. The hot exhaust, radiator and other components can burn you. Radiator fluid can cause damage to the skin or eyes, especially when at operating temperature. Check the operator's manual for the proper procedures for removing radiator caps or servicing the radiator, especially when it is under pressure. Hydraulic fluid can be extremely hot and operates under high pressure. Hoses should never be checked for leaks with the hand due to the possibility of even a small leak injecting hydraulic fluid under the skin. It is better to use a piece of cardboard or such to check for leaks in the hose. Hold the cardboard in such a way that the hands are in no danger of being exposed to any leak. If hydraulic fluid is injected under the skin, medical treatment should be sought immediately.

Prevent fires and asphyxiation while refueling your tractor.

The greatest danger occurs when handling gasoline, gasohol or LP-gas, because these fuels vaporize easily to form explosive mixtures. Never refuel your tractor while the engine is running or is hot. Static electricity, a spark from the ignition system or a hot exhaust could cause the fuel to ignite. Grounding out the tractor by use of a ground wire or by dropping mounted equipment so it touches the ground can reduce static electricity. Always refuel your tractor outside. Areas where internal combustion engines are operated should be properly ventilated. Dangerous gasses can be generated and accumulate in closed areas by running equipment and pose a danger of asphyxiation to the worker. Exposure to the gasses may also make the individual less alert and more likely to have an accident, trip, fall or worse. Locate large storage tanks at least 40 feet from any building. Keep the storage area free from weeds and other easily ignited materials. Label your fuel containers so they can be identified quickly and accurately. Carry gasoline and diesel fuel in approved safety cans. Approved cans bear Underwriters Laboratories® or Factory Mutual® labels. Never smoke or use your cell phone while refueling. Make sure to carry a first-aid kit and an approved ABC-type dry chemical extinguisher. Every tractor should have at least one 5-pound extinguisher.

Do not let others ride the tractor.

Do not allow extra riders, and do not ask to be a rider. Make this a firm rule, and avoid a major cause of tractor accidents. Tractors are designed only for the drivers. Even in cabs, riders have only limited protection, and they may interfere with the tractor's operation (see Figure 9). The warning "hold tight" is practically useless after the first minute or two.

Figure 9. Observe the "No Passengers" rule.

Know some human safety factors.

Knowing what to do and how to do it goes a long way to ensure safe tractor operation. Another vital factor is you. It is important to be in good physical and emotional condition when you are operating a tractor. If you are ill, tired, angry, emotionally upset or if your mind is on something else, you could make a fatal mistake.

It is important that you are comfortable enough while operating the tractor so that you can function well. If you are too cold or too hot, the tractor noise level is too high, or the seat adjustment is incorrect, you will not operate the tractor as well as you would if you were comfortable. Discomfort is distracting, and it contributes to fatigue.

Short, frequent breaks will provide better and faster rest than longer, less frequent breaks. Do not choose a higher gear or throttle setting just to get finished before dark. Many machinery accidents occur at the end of a long day when people are in a hurry to finish and more likely to make mistakes and cut safety corners. If you do not have the time or energy to take these safety tips into consideration, it is time to shut down. You could save your life by doing so.

Resources

- National Ag Safety Database – A Guide to Safe Farm Tractor Operation http://nasdonline.org/1650/d001534/a-guide-to-safe-farm-tractor-operation.html
- National Ag Safety Database – Tractor Accident Victim Rescue http://nasdonline.org/1095/d000886/tractor-accident-victim-rescue.html
- U.S. Department of Labor – Program Highlight – Fact Sheet No. OSHA 91-39 http://ehs.okstate.edu/training/oshafarm.htm
- OSHA: Agricultural Safety Fact Sheet, Protecting Agricultural Workers from Tractor Hazards. www.osha.gov
- National Institute for Occupational Safety and Health (NIOSH): Agricultural Safety http://cdc.gov/niosh/topics/aginjury/default.html
- Utah State University Cooperative Extension: Farm Machinery Fact Sheet FM-27 – *The Ten Commandments of Tractor Safet*y (Reprinted by permission from Kubota Tractor Corporation) https://extension.usu.edu/files/publications/factsheet/FM-27.pdf
- Centers for Disease Control and Prevention: Volunteer Fire Fighter Dies After Being Struck by a Shackle on a Recoiling Tow Rope – South Dakota http://www.cdc.gov/niosh/fire/reports/face200622.html
- The Ohio State University Agricultural Tailgate Safety Training Agricultural Safety Program Training Module: Loader Safety http://www.uaex.edu/farm-ranch/special-programs/docs/loader_safety.pdf
- U.S. Department of Labor Program Highlight Fact Sheet No. OSHA 91-39 FARM SAFETY. http://ehs.okstate.edu/training/oshafarm.htm
- Penn State College of Agricultural Sciences, Cooperative Extension, Agricultural and Biological Engineering: Power Take-Off (PTO) Safety. http://extension.psu.edu/business/agsafety/vehicles-and-machinery/tractor-safety/e33
- Huitink, G., P. Tacker and V. Vories, University of Arkansas Division of Agriculture Research and Extension, MP 287, *Identify Hazards and Prevent Accidents*. www.uaex.edu/publications/PDF/MP297/12_identify_hazards.pdf

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