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## Farm Machinery and Equipment Safety Part I: Recognizing and Understanding the Hazards<sup>1</sup>

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Machinery such as tractors and power tools, pose the greatest injury risk on the farm. Nation-wide in 1990 there were 1,300 deaths and 120,000 disabling injuries in the profession of agriculture. Of these deaths and injuries, 46% of the injuries and 64% of the deaths were tractor and machinery related (1,3,6). It is important to be safety conscious when dealing with any job that requires the use of machinery. Statistics show that the majority of machinery related accidents occur as the result of human negligence. Errors include taking shortcuts to save time, failure to read the operators manual, ignoring a warning, improper or lack of instruction and failure to follow safety rules.

The most commonly utilized pieces of equipment around the farm are tractors, trucks, wagons, mowers, spreaders, grinders, blowers, augers, post hole diggers, shredders, balers, rakes, combines, and all-terrain vehicles (ATVs). No matter how different they are in structure, they all, if used improperly or carelessly, can be fatal. 50% of total farm fatalities involve tractors (See Figure 1), and 14% are machinery related. A breakdown of the machinery related fatalities are as followed; 34% corn pickers, 11% silage handling, 11% hay baling, 11% manure handling, and 33% other miscellaneous farm machinery<sup>1</sup> (See Figure 2).

Safety statistics show that the majority of farm-related injuries occur between 10 a.m. and noon, with the period between 3 and 5 p.m. second highest<sup>4</sup>.

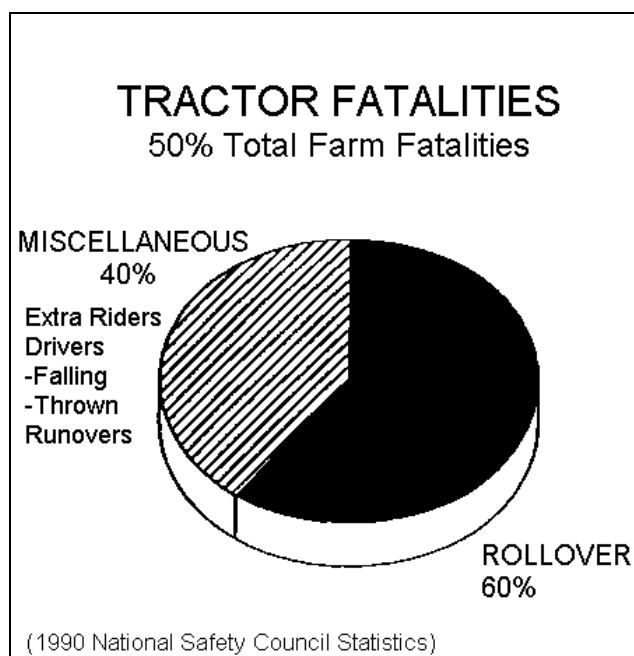


Figure 1.

It has been established that these time periods are when fatigue is most likely to occur, and concentration is not as sharp. It is a good practice to take periodic breaks to lessen fatigue. Climbing down off the tractor and walking around for a couple of minutes will help relieve stress and boredom.

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Children have the highest rate of machinery-related injuries and fatalities. Workers over the age of 65 do not have an excessive number of injuries, but the likelihood of an injury being fatal is the greatest<sup>3</sup>. Between 1985 and 1989, 50% of total farm fatalities involved children under the age of 14 and workers over the age of 65. In the over 65 age group, two-thirds of the fatalities were tractor related. The majority of child deaths resulted from being extra passengers on machinery and being run-over<sup>1</sup>. The most common injuries in children involving equipment include: corn or grain augers, tractors, ATVs, power take-offs, belt or chain attachments, hay balers, and pitch-forks. Because of the seriousness of machinery-related accidents, many injuries result in permanent disabilities; such as the loss of an arm, leg, fingers, toes, or a decreased range of motion. More than three-quarters require surgery or antibiotic treatment for bacterial infection or both<sup>5</sup>.

### MACHINERY AND EQUIPMENT STORAGE BUILDINGS

There are numerous precautions that should be observed when storing machinery on the farm. Precautions include:

- Buildings where machinery and power tools are stored should be located far enough away from structures that house livestock and hay in case of fire.
- Fuel storage tanks should preferably be located below ground, and a minimum of 40 feet from the nearest structure. Fuel cannot be stored in the same structure as machinery or power tools. Tanks should be properly vented. If above ground, the area around the tank should be free of litter, weeds and any fuel spills that could aid in starting or accelerating the spread of a fire. Fuel tanks should be adequately protected from being struck by machinery. An approved 10 B:C fire extinguisher should be located near all fuel pumps and tanks.
- Electrical lines coming into the building should be high enough to facilitate equipment passing underneath.
- Electrical systems in machine sheds should be sufficient for the power tools and equipment that will require the use of electric current.
- Electric outlets should be of the three-prong grounded type.

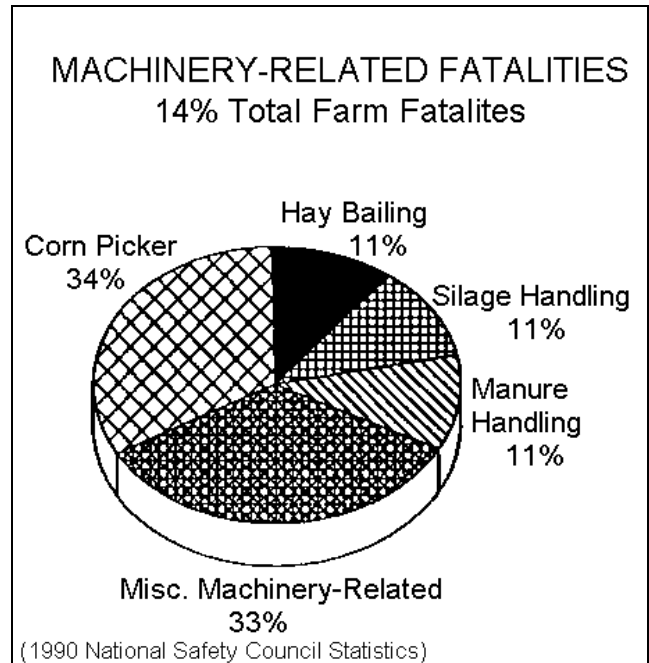


Figure 2.

- Machinery storage buildings should not be used to store debris.
- Doors on machine sheds should be wide enough for machinery to safely pass through without being caught. Doors also need to pull or slide open and close freely in case of an emergency.
- Exits should be clearly marked.
- Doors should be lockable to keep out children and unwanted visitors.
- Floor surfaces should be level and smooth, free of bumps and protruding rocks.
- Equipment should be parked so there is enough space for a person to walk completely around it.
- Buildings should have adequate ventilation for the starting or running of an engine within the structure. (Note - engines should not be left running inside a building for a prolonged period of time unless exhaust is properly being vented externally).
- All tools and accessory equipment should be kept picked up and stored in their proper place, e.g., air hoses, oil cans, spare tires, jacks.

- Keys should always be removed from all equipment or machinery to prevent children or unauthorized people from starting them.
- Do not allow non-employees inside the machine shed. Children should never be allowed to play around or inside the machine shed or on farm machinery itself.

It is important to be able to recognize potential hazardous areas on machinery. These areas include: pinch points, shear points, cutting points, crush points, wrap points, and springs.

- Pinch Point is an area where two rotating surfaces meet such as feed rollers, gears or a belt running around a pulley. Extremities can be caught in pinch points directly, or be drawn in by loose fitting clothing that has become entangled in the rotating parts.
- Shear Point is an area where the edges of two surfaces come together in a manner so as to cut a softer material placed between the surfaces. Shear points are found on shrubbery shears or grain augers. The resulting injury is usually amputation.
- Cutting Point is found on machinery designed to cut such as mowers and harvesters. The blades move with a rapid motion often unseen by the eye. Injuries are of the same nature as those caused by a shear point.
- Crush Points occur when two objects are joined; either with both ends moving towards each other or with one being stationary. Fingers and hands are often injured by crushing between a draw bar and wagon hitch. Numerous fatalities occur when people helping the operator or the operator him/herself is crushed between pieces of equipment or equipment and a solid object such as a wall or tree.
- Springs are found on numerous pieces of farm machinery. When a spring is compressed, 'energy' is 'stored' within the spring. When the spring is expanded, the energy is released. The larger the spring the greater the amount of energy produced. When springs break they explode with great force and can inflict serious damage. It is important to inspect springs regularly for cracks and wear.
- Wrap Point is any moving point on a piece of equipment where clothing or long hair may become

entangled such as a Power Take Off (PTO) shaft. A wrap point grabs the victim and actually wraps him/her around the moving part or it can also draw the victim into the machine. Tangled clothing can wrap tight enough to crush, amputate or suffocate the victim. All wrap points on machinery should be shielded if possible.

## REFERENCES

1. "Agriculture: A Dangerous Industry", *Delmarva Farmer*, October 10, 1991.
2. Johnson, Steven and Dennis J. Murphy, 1985. "Agricultural Hand Signals". Penn State University Cooperative Extension Service Fact Sheet #19.
3. Marshfield Clinic. Agricultural Health & Safety Bulletin. 1989.
4. Meath, Micheal. Farm Safety Part I. *Agway Cooperator Magazine*. March 1991.
5. Metcalf, Jane. "It's More Dangerous on the Farm". *Hoard's Dairyman Magazine*. August 10, 1991.
6. Purschwitz, Mark A. "Fatal Farm Injuries to Children". Wisconsin Rural Health Research Center. Marshfield, WI. 1990.
7. Schneider, Rollin D. "Safe Tractor Operation". Nebraska Cooperative Extension EC 89-2103. 1984.
8. West Virginia University Cooperative Extension Service. "Beware of Farm Machine Hazards". SA-21.4.
9. Wisconsin Rural Health Research Center. "A Guide to Tractor Roll Bars & Other Rollover Protective Structures". 1990.